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[54] **ELECTROMAGNETIC PULSE COUNTER**

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[51] **Int. Cl.** **G06m 1/08**

[58] **Field of Search** ..... 235/92 C, 92 EV, 235/91 M

[56] **References Cited**

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[57] **ABSTRACT**

An electromagnetic pulse counter of the kind with two digit rollers which are rotatable about a common axis and each of which is adapted to be turned by one of two impulsion magnets through transmission elements cooperating therewith, the magnets being disposed one below the other and their armatures being pivotable about axes parallel to the axis of the digit rollers and having their free ends substantially in line with one another.

6 Claims, 3 Drawing Figures

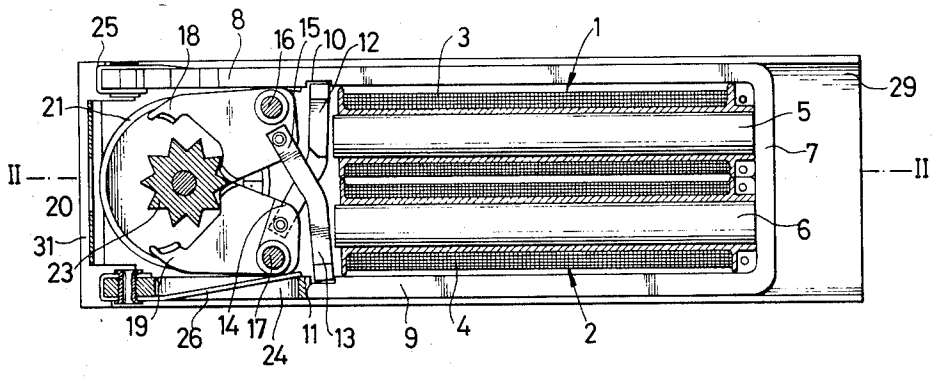


Fig. 3

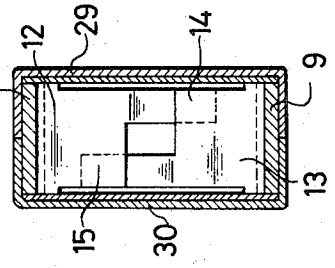


Fig. 1

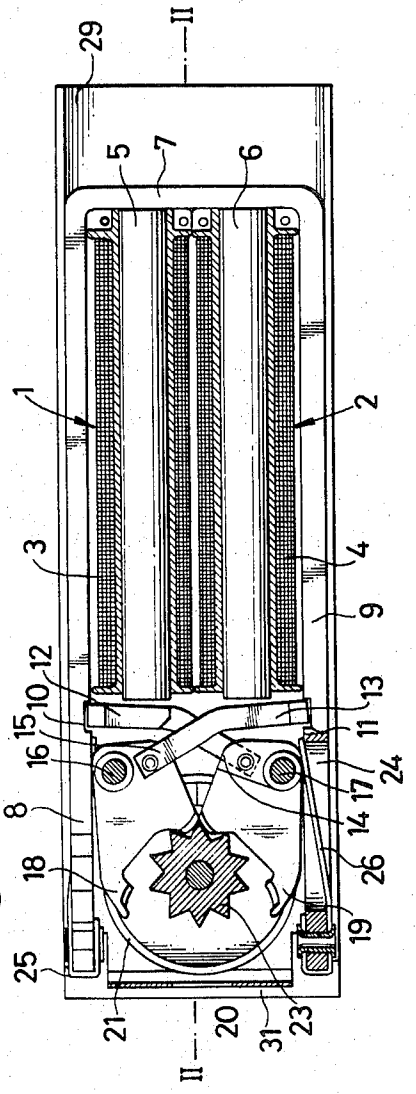
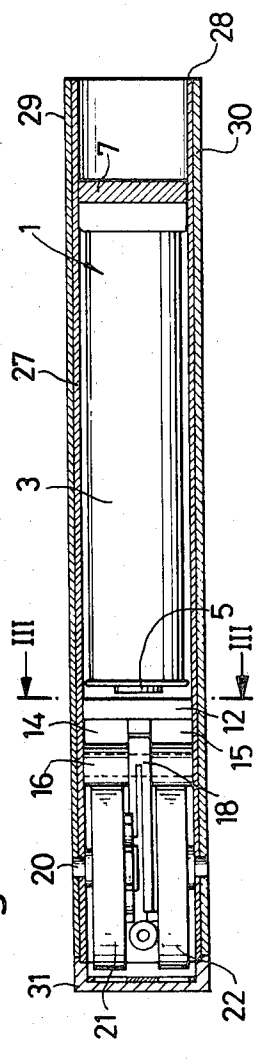


Fig. 2



ELECTROMAGNETIC PULSE COUNTER

Pulse counters in which the individual digit rollers are adapted to be driven independently of one another, can be used in practice as stores, as read-out counters, or as counters for the identification of merchandise or order numbers, for example. The counters may if desired have more than two digit rollers. Each digit roller can represent a decade, the digit value in which can be varied independently of the other decades, so that a desired number consisting of a plurality of digits can be reached more quickly than in the usual pulse counters, in which the individual digit rollers are connected together by transmission gears engaging teeth provided on these digit rollers, and the digit rollers are driven only by a single impulsion magnet.

An electromagnetic pulse counter of the kind first mentioned above has already been put on the market. This counter has two digit rollers which are rotatable in the same direction about a common axis and carry characters capable of printing, the rollers being connected, one through a pulling pawl and the other through a pushing pawl, to the free end of a magnet armature. The two magnet armatures, the free ends of which lie opposite one another, are pivotable about axes parallel to the axis of the digit rollers, and belong to two impulsion magnets situated one below the other, the pivoting axes of the magnet armatures being situated in each case at the ends of magnet yokes disposed at the top and the bottom of the magnet assembly. The magnet yokes of the two magnets are screwed to angle pieces which are fastened on to two triangular side plates of a frame for the housing of the counter. These side plates, which represent essential structural components of the counter as a whole, are held in position with respect to one another by additional spacer elements, and they carry not only the magnets and pawls but also the digit roller shaft. Restoring springs for the magnet armatures are connected at one end to the angle pieces and at the other end to ends of the magnet armatures that project through the magnet yokes.

Even a pulse counter as described in the preceding paragraph, however, has considerable disadvantages. A serious disadvantage is to be seen in the construction of the frame for the housing, because the two triangular side plates and their connecting means, as well as the magnets attached to the connecting means or to the side plates, and also the transmission elements and the digit rollers must be accurately aligned in relation to one another, if the counter is to work correctly. Considerable expenditure of labor is necessary for this purpose. Moreover, the two magnet armatures must be of adequate length so as to permit a stroke which is sufficiently long to ensure that the digit rollers are reliably advanced by one step in each case. This entails a relatively great overall height, which is further increased by the restoring springs disposed above and below the magnet yokes.

It is an object of the present invention to provide an electromagnetic pulse counter of the kind first described which, while of small overall width, also has a small overall height; and which at the same time can be assembled in a simple manner, and without laborious adjustment, from only a few parts which are to a large extent identical in contour, and which in addition is very compact and strong and relatively insensitive to external shocks.

According to the present invention, we provide an electromagnetic pulse counter with two digit rollers which are rotatable about a common axis and each of which is adapted to be turned by one of two impulsion magnets through transmission elements cooperating therewith, the magnets being disposed one below the other, and their armatures being pivotable about axes parallel to the axis of the digit rollers and having their free ends substantially in line with one another, wherein the magnet armatures are mounted symmetrically on the two arms of a U-shaped magnet yoke which accommodates both magnets and which forms a frame for a housing for the counter, and have extensions which extend to and act on the said transmission elements, the said extensions passing to one side of each other.

Since the extensions of the magnet armatures pass to one side of each other, it can be insured that, despite the spatial proximity of the two cores, an adequately long stroke is obtained which is sufficient to advance the digit rollers by one step at a time. By this means the overall height of the counter as a whole can be kept down, since the two magnets can be placed very close to one another. The entire counter is practically bounded at top and bottom by the common magnet yoke, by which the magnets and magnet armatures are at the same time secured in the requisite aligned positions.

A preferred feature which assists in keeping down the overall height is that of using Graham armatures as the transmission elements. In their forward and backward movements Graham armatures advance the digit rollers by only a half-step at a time, so that when they are used the stroke of the magnet armatures need be only half as long as in the case of pushing or pulling pawls. The use of Graham armatures thus means that the magnet armatures need not be as long as when pushing or pulling pawls are used, so that the overall height of the counter as a whole can be smaller.

As another preferred feature, the digit rollers may have teeth adapted to be engaged by the transmission elements, the teeth of each roller being on that side of the roller which is the nearer to the other roller. This enables not only the magnet armatures but also the transmission elements to be identical in contour, and it may be noted that when the transmission elements are actuated the two digit rollers in this preferred arrangement are turned in opposite directions. When a plurality of counters are connected together, moreover, this preferred arrangement of the digit rollers in a given counter enables the digit rollers of all the counters always to be the same distance apart. The placing of the teeth on the side nearer to the other roller does insure in fact that the digit rollers proper, i.e., the elements carrying the digits, will themselves come close to the lateral boundary of the counter, so that the sum of the thicknesses of two lateral closure elements, or side walls, of two counters can be made equal to the distance between the two digit rollers of a single counter.

The extensions of the magnet armatures may extend in the same plane as the magnet armatures themselves, and in this case the end faces of the cores are preferably inclined in relation to the axis of the cores; however, it is a preferred feature of the invention that each of the magnet armature extensions should be bent over in relation to the respective magnet armature, so as to extend in the direction of the digit rollers. The effect is

thereby achieved that the magnet armatures themselves can pass into a position at right angles to the axis of the core without the armature extension belonging to either magnet coming into contact with the armature belonging to the other magnet. In addition, this bent-over arrangement prevents the armature of either magnet from being magnetically affected by the other magnet.

In a further preferred feature of the invention, the arms of the magnet yoke engage at top and bottom over the transmission elements and are provided with apertures through which restoring springs, in the form of leaf springs, act on the transmission elements and thus on the magnet armatures. Not only does this result in a simple and cost-saving arrangement of the restoring springs, but at the same time it enables them to be accommodated in a space-saving manner, since in this arrangement they do not need to be disposed at the top or side or in any other position which would be unfavorable to the compactness of the counter construction. This arrangement of the restoring springs, however, not only permits small overall dimensions, but also facilitates the assembly of the counter as a whole, since the restoring springs can simply be inserted at the very end of the assembly operation.

Another preferred feature whereby the object of the invention may be particularly advantageously attained consists in providing the magnet yoke with projections for the engagement of additional components of the counter disposed laterally and/or frontally in relation to the magnet yoke arms. These components may for example be conductor plates, which may be printed circuit boards, disposed at the sides of the magnet yoke, side walls of the housing of the counter which hold both the digit roller shaft and the pivot pines of the Graham armatures (assuming that these are in fact provided), or front plates provided with apertures for reading the digit rollers. The use of a sturdy and accurately constructed yoke will then enable the position of all other components of the counter to be fixed, so that the entire counter can be assembled extremely simply, and also in a space-saving manner; at the same time the sturdiness of the yoke makes the counter extremely insensitive to shocks.

The invention will be explained more fully with reference to the accompanying drawing in which:

FIG. 1 is a sectional side view of one form of electromagnetic pulse counter in accordance with the invention,

FIG. 2 is a section on the line II—II in FIG. 1, and

FIG. 3 is a section on the line III—III in FIG. 2.

The counter shown in the drawing has two impulsion magnets 1 and 2 comprising cores 5 and 6 surrounded by coils 3 and 4; a magnet yoke 7 accommodates both magnets.

Recesses 10 and 11, in each of which is mounted a magnet armature (12 and 13 respectively), are provided in the two arms 8 and 9 of the magnet yoke 7, approximately in line with the front surfaces of the cores 5 and 6. The two armatures 12 and 13 are identical in contour, and their free ends each have an extension (14 and 15 respectively) which is bent over to extend forward in relation to the respective armature. The extensions 14 and 15 are so arranged that they do not impair the freedom of movement of each other and of the armatures 12 and 13 (cf. FIG. 3).

Each of the extensions 14 and 15 is pivoted on a Graham armature (19 and 18 respectively) the Graham armatures being pivotable about pivot pins (17 and 16 respectively) so that they are rocked to-and-fro when the respective magnet armatures 12 and 13 move.

At the front part of the counter (i.e., that on the left in FIGS. 1 and 2), two digit rollers 21 and 22 are rotatably mounted on a common shaft 20, and these rollers have a gear of which only the teeth of gear 23 can be seen in FIG. 1, the teeth of each roller being on that side of the roller which is the nearer to the other roller. Each of the Graham armatures (18, 19) engages in the teeth of the digit roller adjacent to it, so that on operation of the armatures the digit rollers 21 and 22 are turned, in opposite directions of rotation.

In the arms of the magnet yoke 7 there are provided apertures (in FIG. 1 one such aperture 24 can be seen), through which pass leaf springs 25 and 26 attached to the ends of the yoke arms 8 and 9; each of these leaf springs bears against the adjacent Graham armature (18 or 19) in such a sense as to urge the respective magnet armature (13 or 12) away from the respective magnet (2 or 1).

At the side of the digit rollers there are provided conductor plates, which may be printed circuit boards, shown at 27 and 28, by means of which the reading of the respective digit rollers at any particular moment can be sensed. These conductor plates or printed circuit boards have cutouts adapted to receive projections (not shown) on the magnet yoke arms 8 and 9, and thus they can be fastened in the requisite position by pressing them on to these projections. The counter has a housing comprising two U-shaped halves 29 and 30, which are engaged by the magnet yoke arms similarly to the conductor plates or printed circuit boards. In the same way a front plate 31 is engaged by projections provided on the magnet yoke arms. The shaft 20 on which the digit rollers 21 and 22 are mounted, and the pins 16 and 17 on which the Graham armatures 18 and 19 pivot, are carried by the conductor plates or printed circuit boards and by the two halves of the housing, so that this shaft and these pins are brought into the requisite positions upon the attachment of the printed circuit boards and housing halves to the magnet yoke arms.

By virtue of this arrangement, the assembly of the counter as a whole is very simple. The accurately aligned magnet yoke, to which are attached the cores 5 and 6, serves as a frame for the counter housing and determines the position of all the remaining components of the counter. On assembly, therefore, all the components take up the correct positions in relation to this frame without any further adjustment or the like being necessary. After all other parts of the counter have been assembled, the leaf springs 25 and 26 can be finally inserted, so that these springs need not give rise to any difficulties in assembly.

The construction of the counter illustrated in the drawing shows that a counter according to the present invention can be kept extremely compact and can have a very small overall height; in addition, however, the use of a magnet yoke which acts as a frame, and the arms of which locate all the remaining components of the counter, has the advantages not only of establishing the positions of all components, but also, because of the sturdiness of the yoke, of insuring that these positions are maintained and all components are protected. The counter is thus well protected against shocks, since

because of its strength the magnet yoke is relatively insensitive to shocks.

It is to be understood that the invention is not restricted to the embodiment illustrated. Thus, for example, it is also possible to use different kinds of transmission elements instead of the Graham armatures illustrated. The contours of the individual components may also be modified in various respects without thereby departing from the scope of the invention.

I claim:

1. An electromagnet pulse counter with two digit rollers, two electromagnets and two armatures, comprising:

a single U-shaped magnetic yoke having two legs, the two electromagnets being mounted between the two legs respectively alongside thereof and having axes parallel to each other, the digit rollers being journalled on an axis transverse to the plane of extension of the U and spaced in front of the magnets as facing the open end of the U;

the two armatures respectively pivotally mounted on said legs each having a first portion extending in front of one of the magnets and a second portion constituting an extension and being offset axially in relation to the axes of the magnets towards the digit rollers, and extending in front of the first portion of the respective other armature, the two armatures being symmetrically arranged to each other and with reference to a center line between the magnets, the respective two armature extensions bypassing each other, so that each extension is separated from the respective other magnet by the first portion of the respective other armature; and

two transmission elements respectively for cooperation with and actuation of the digit rollers and respectively pivotally linked to the second portions of the armatures by means of pivot points, the pivot points being located so that the respective pivot point of an armature of the two armatures is closer to the one of the magnets not actuated by the respective armature than to the respective other one of the magnets with which the respective armature cooperates magnetically.

2. A counter according to claim 1, wherein the transmission elements comprise Graham armatures.

3. A counter according to claim 1, wherein the legs of the magnet yoke extend beyond the transmission elements and are provided with apertures, restoring springs, in the form of leaf springs, acting on the transmission elements and thus on the armatures and projecting through the apertures.

4. A counter according to claim 7, wherein the transmission elements are flat and the digit rollers each have a gear respectively adapted to be engaged by the transmission elements, the gear of each roller being on that side of the roller which is the nearer to the other roller, so that the gears are disposed between the digit rollers, and the transmission elements reach between the digit rollers.

5. Pulse counter as in claim 1, including a casing for receiving the yoke and digit rollers, the digit rollers journalled in the casing, the yoke being provided with means for engaging the casing for positioning the casing relative to the yoke.

6. Pulse counter as in claim 1, including circuit conductor plates mounted to the yoke to both sides thereof, parallel to each other and to the plane of extension of the U, and a casing containing the yoke.

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