United States Patent

Jullien-Davin

[15] **3,660,642**

[45] **May 2, 1972**

[54] IMPULSE COUNTER

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[73] Assignee: **Crouzet,** Paris, France

[22] Filed: **Mar. 10, 1970**

[21] Appl. No.: **18,046**

[30] **Foreign Application Priority Data**

Mar. 14, 1969 France 6907796

[52] **U.S. Cl.** ..... **235/92 C,** 235/92 R, 235/144 HC

[51] **Int. Cl.** **G06m 1/30**

[58] **Field of Search** ..... 235/92, 144 HC

[56] **References Cited**

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Primary Examiner—Maynard R. Wilbur
Assistant Examiner—Joseph M. Thesz, Jr.
Attorney—Holman & Stern

[57] **ABSTRACT**

An electromagnetically operated impulse counter comprising a casing, numeral wheels disposed within said casing and freely mounted on a bearing shaft, releasable transmission means for operatively interconnecting said wheels, heart cams associated with said wheels and provided with a control lever for resetting the counter to zero, an electromagnet rigidly fixed to said frame, a moving armature for cooperating with said electromagnet at each current impulse, an escapement anchor which is pivotally coupled to said armature, the first numeral wheel being provided with a toothed escape wheel for cooperating with said escapement anchor which is so shaped as to permit the free rotation of the first numeral wheel and of the escape wheel when said anchor is brought by the zero resetting control lever into a position located between the two end positions thereof.

2 Claims, 18 Drawing Figures

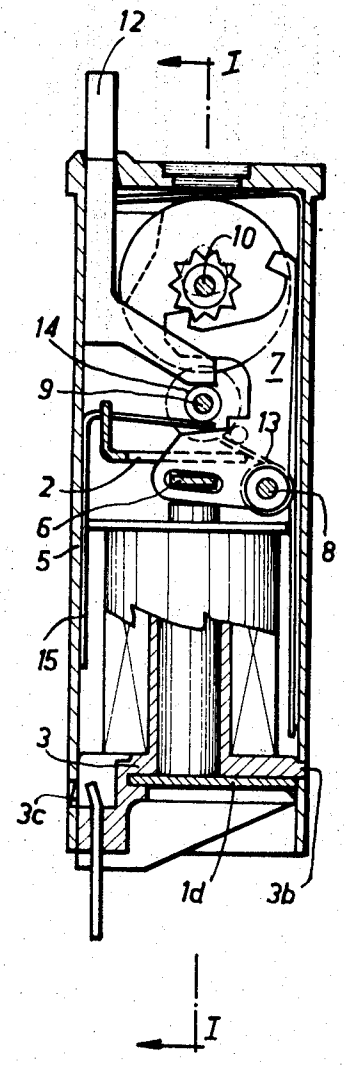


FIG. 1

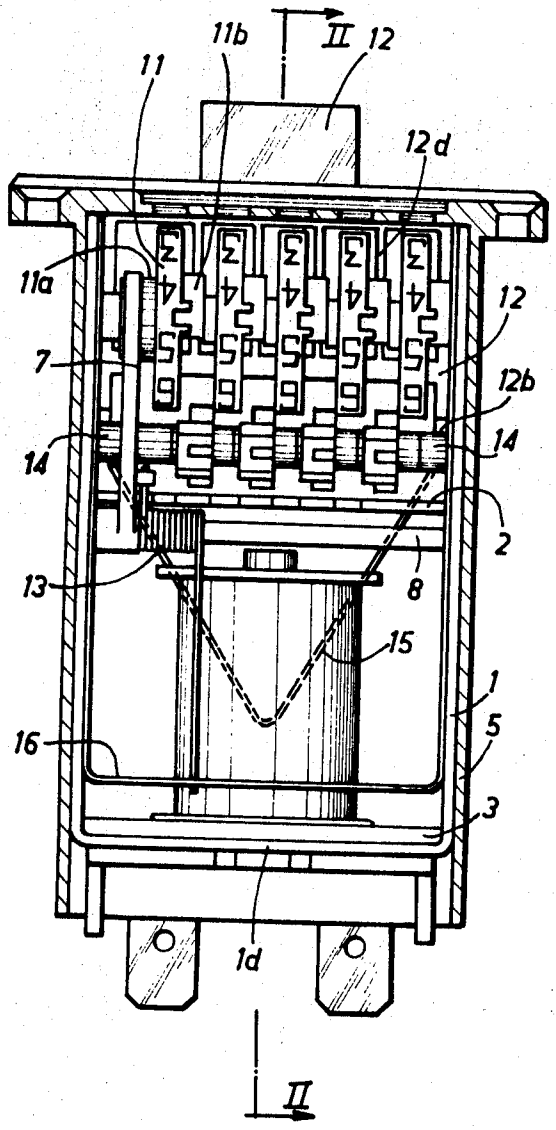
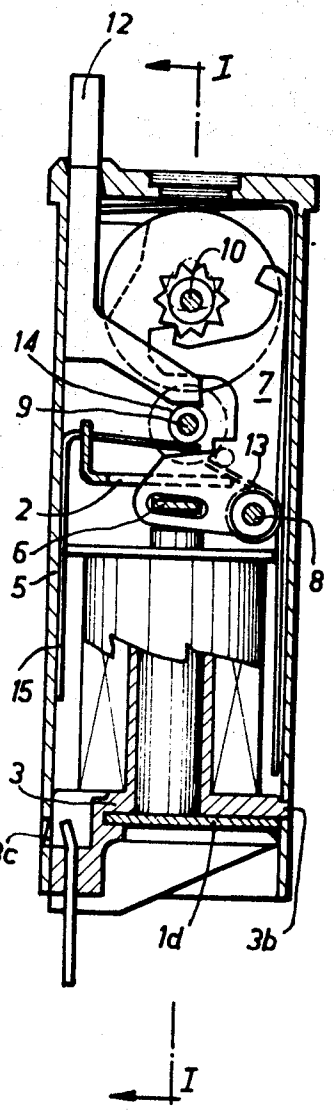

11b
II
12
11
12d
11a
12
7
12b
14
14
2
13
8
15
1
16
5
3
1d
II

FIG. 2


12
I
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14
7
9
13
2
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8
5
15
3
3c
1d
3b
I

FIG.3

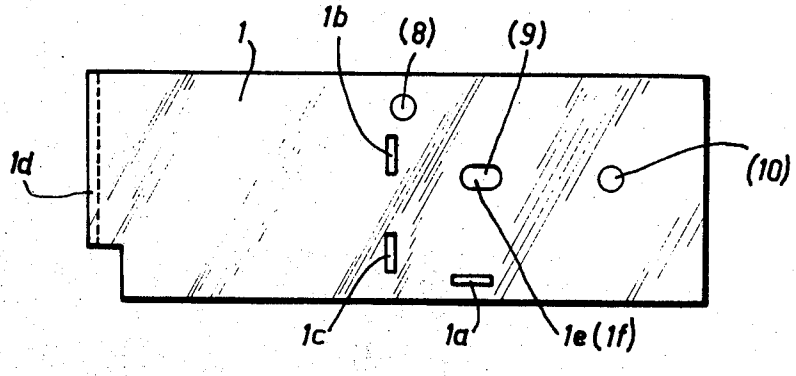


FIG.4

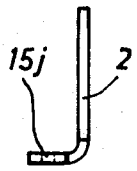


FIG.4a

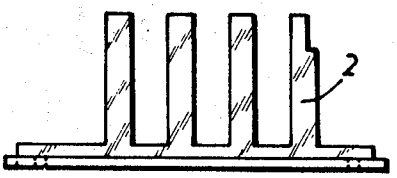


FIG.5

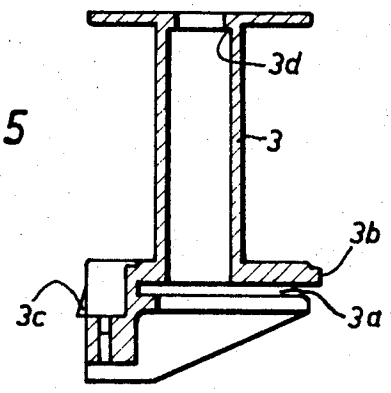


FIG.6

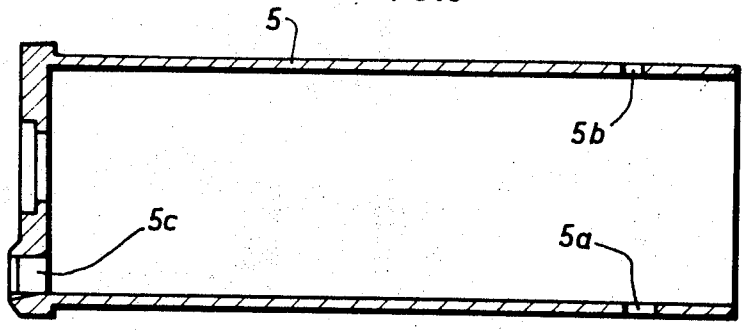


FIG.7

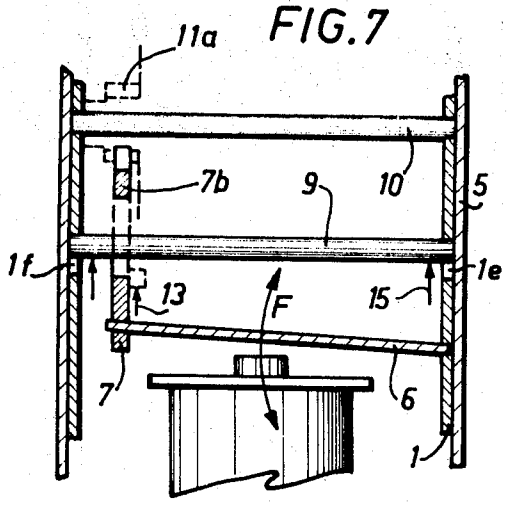


FIG.9

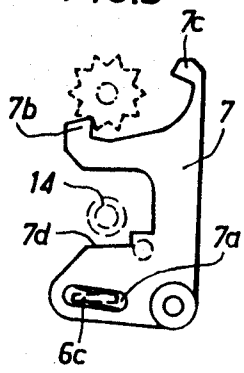


FIG.8

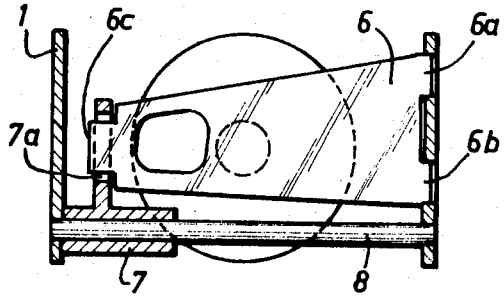


FIG. 10

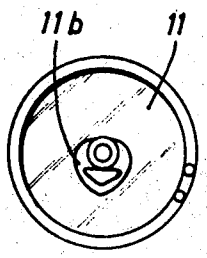


FIG. 10a

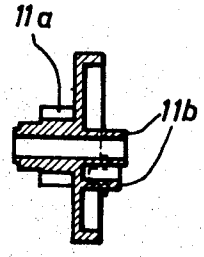


FIG. 10b

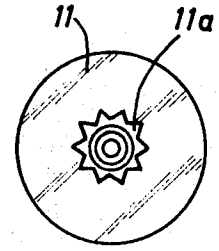


FIG. 11

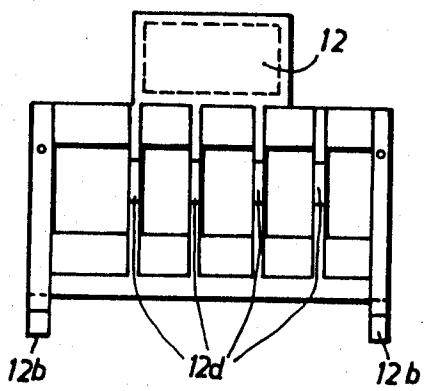


FIG. 11a

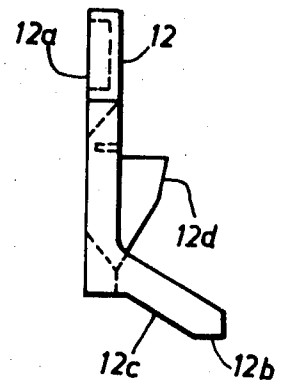


FIG.12

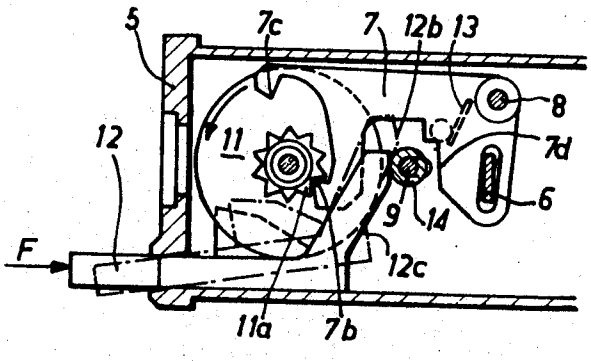


FIG.13

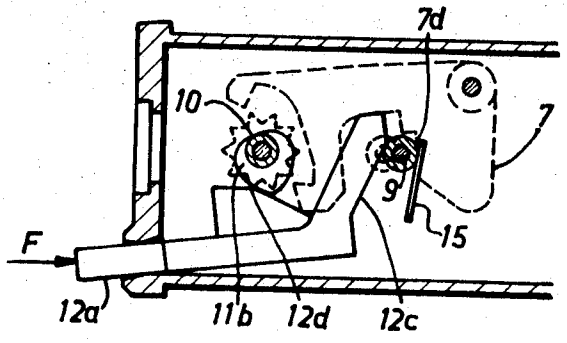
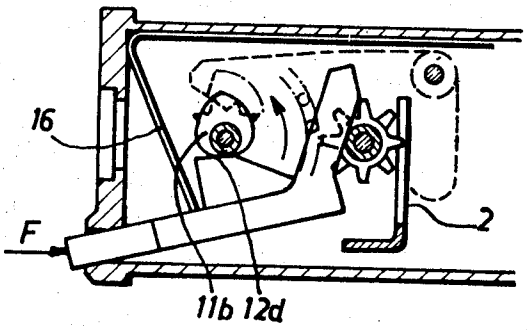


FIG.14



IMPULSE COUNTER

This invention is directed to an electromechanical impulse counter with zero resetting which is of very small overall size and can be constructed in large-scale production under particularly economic conditions of capital expenditure.

In counters which are at present known, the control system comprises an electromagnet for attracting an armature which is fixed on a rocking bridge and the alternating motion of which is transmitted to a ratchet-and-pawl system so that a step-by-step movement of rotation is thus obtained. This step-by-step movement is transmitted by means of a secondary pinion to a gear-wheel which is usually integral with the graduated numeral wheel of the lowest order (units). Transmission to the other numeral indicating wheels is carried out in a well-known manner by means of secondary pinions which are mounted coaxially on a shaft.

In the case of resetting to zero, a pressure applied to an articulated lever has the effect in a first stage of disengaging the secondary pinions and locking these latter against a fixed component in order to maintain them in a suitable angular position and, in a second stage, of resetting the numeral wheels to zero by means of the well known heart cam system.

In order to carry out these functions, counters of existing types are composed of a large number of parts which entail costly operations of machining or assembly such as dowelling, insetting, riveting, screwing and so forth.

The present invention is directed to the novel industrial product which is constituted by a manual-reset impulse counter as characterized by a design concept which permits of particularly economical large-scale manufacture by virtue of:

a reduction in the number of components,

ease of machining of said components,

a structure which consists only of free assemblies and in which such operations as riveting, dowelling, insetting, screwing and the like are dispensed with.

Moreover, the reduction in the number of parts and the simplicity of design of such parts make it possible to construct counters which are of very small overall size.

This invention is also characterized in that:

the alternating motion derived from the pulse is transmitted directly and therefore without any intermediate pinion to the first numeral wheel;

the zero resetting mechanism is so arranged that it is possible by means of a single operation to obtain the disengagement of the feed mechanism, the disengagement of the secondary pinions and locking of these latter and zero resetting of the numeral indicating wheels by means of a heart cam.

All these properties will be clearly brought out by the following description, reference being made to the accompanying drawings, in which:

FIG. 1 is a view in elevation of the assembled apparatus, the casing being shown in cross-section along the line I—I of FIG. 2;

FIG. 2 is a profile view of the same apparatus, the casing being shown in cross-section along the line II—II of FIG. 1;

FIG. 3 is a profile view of the cage of the apparatus;

FIGS. 4 and 4*a* are two views at right angles to each other and showing the component which performs the function of spacer member and wheel-locking member;

FIG. 5 is a sectional view of the coil former;

FIG. 6 is a transverse sectional view of the casing of the apparatus;

FIG. 7 is a sectional view showing the mode of actuation of the anchor by means of the armature;

FIG. 8 is a plan view of FIG. 7;

FIG. 9 is a detail view of the anchor;

FIGS. 10, 10*a* and 10*b* are respectively a front view, a sectional view and a rear view of the first numeral wheel together with its escape wheel and its heart cam;

FIGS. 11 and 11*a* are views at right angles to each other showing the push-lever for zero resetting;

FIG. 12 shows the arrangement of the anchor and of the push-lever prior to zero resetting;

FIG. 13 shows the arrangement of the anchor and of the push-lever after disengagement of the secondary pinions; and finally,

FIG. 14 shows the arrangement of the push-lever and of the heart cams at the moment of zero resetting.

FIGS. 1 and 2 show very clearly the compactness of a counter as constructed in accordance with the invention and comprising five numeral wheels.

In the exemplified embodiment of FIGS. 1 and 2, the dimensions of the apparatus are only 33 × 22 mm in body section and 48 × 24 mm in the case of a projecting front face and conform to recommended standards. Among other advantages, the apparatus can consequently be readily built-in and fixed on standard supports by means of the front face.

The apparatus comprises a cage 1 formed of magnetic metal. This cage has the double function of supporting the mechanism and of serving at the same time as a stationary magnetic armature. Said cage is usually formed by folding and has the shape of a U, the two arms of which have a tendency to converge. The spacing of the arms is maintained by means of a spacer member 2 whose extremities in the form of a tenon are intended to engage in an easy fit in two rectangular slots 1*a* of the cage 1.

The cage 1 is intended in the first place to support the coil, the molded former of which in turn carries the connecting terminals and the magnetic core. The coil former 3 of molded material is illustrated in FIG. 5. A slot 3*a* is formed at the base of said former so that this latter may be moved by sliding over the base 1*d* of the cage 1. The magnetic core of the coil is first inserted into the coil and maintained within this latter in a longitudinal position by that portion of its machined extremity which is applied against the portion 3*d* of the coil former while the opposite extremity of the core is applied against the base 1*d* of the cage 1 (as shown in FIG. 2). The complete assembly is fixed in position by means of the casing 5 which is provided with two relatively displaced slots 5*a* and 5*b* while the coil former 3 is provided with two lugs 3*b*, 3*c*. It is apparent from FIG. 2 that the two lugs 3*b*, 3*c* are capable of engaging respectively in the slots 5*b* – 5*a*. The elasticity of the casing walls permits the deformation of the casing in order that this latter may slide over the two lugs at the time of fitting in position. The lug 3*c* is additionally provided with an inclined face so as to facilitate the engagement of the casing and the deformation of its wall.

The constructional details of the moving armature 6 are shown in FIGS. 7 and 8.

One extremity of the armature is provided with two tenons 6*a* – 6*b* which are adapted to fit into two openings 1*b* and 1*c* of the cage 1. A sufficiently easy fit is provided in order that the armature should be permitted to oscillate as shown by the arrow F in FIG. 7. The extremity 6*c* of the armature 6 is adapted to fit into an opening 7*a* of the feed anchor 7 which pivots about the shaft 8.

FIG. 9 gives the details of the anchor and also shows among other things the shape of the elongated slot 7*a* in which the extremity 6*c* of the moving armature 6 is intended to engage.

As is apparent from FIGS. 7 and 9, the edges of the elongated slot 7*a* are convex both in the longitudinal direction and in the transverse direction, thereby permitting a free articulation between the armature 6 and the anchor 7.

Another remarkable feature of the apparatus is the simplicity of the feed mechanism which will be described hereinafter.

The anchor 7 to which the impulse movement is applied is acted upon by a spring 13 and, and the action of the same spring, in turn urges the armature 6 to the initial position which is remote from the electromagnet.

The anchor 7 provides a direct drive to the first numeral indicating wheel 11 (shown in FIG. 10) which is cast in one piece with the escape wheel 11*a*. Said indicating wheel is also cast in one piece with the heart cam 11*b* which will serve for zero resetting.

A distinguishing feature of the anchor 7 lies in the fact that the anchor pallets 7*b* and 7*c* are suitably spaced so that, when

the anchor is maintained in an intermediate position, the escape wheel is capable of rotating freely and thus permits resetting of the first numeral wheel which is integral therewith.

Another feature of the apparatus is provided by the mechanism for resetting to zero. This operation can be carried out by means of a non-articulated push-lever **12**, one example of construction of which is illustrated in FIG. **11**.

The function of this lever is explained hereinafter with reference to FIGS. **12, 13** and **14**.

FIG. **12** illustrates the apparatus which has carried out a recording operation and in which the counter is ready to be reset to zero.

The anchor is maintained in the position which is shown in the drawings (the anchor pallet **7***b* being in the engaged position) under the action of the spring **13**.

The extremity of the push-layer **12** projects outside the casing **5** in order to permit the application of manual pressure, for example.

Said lever is adapted to slide within a slot **5***c* (as shown in FIG. **6**) which is formed in such a manner as to permit the inclination of the lever in the direction which is shown in FIGS. **13** and **14** under the action of the force F.

The face **12***b* of the lever **12** is intended to rest on a cylindrical sleeve **14** which is freely mounted on the shaft **9** of the secondary pinions.

Said shaft **9** is rotatably mounted in two holes of the cage **1** which are in the form of elongated slots **1***e* and **1***f*, with the result that the shaft **9** can be set in two end positions, one of which permits the engagement of the secondary pinions with the teeth of the numeral wheels while the other end position permits both the disengagement of said pinions and the free rotation of all the numeral wheels for the purpose of subsequent resetting of these latter to zero.

In the disengaged position, the secondary pinions will be locked against the spacer member **2** in order to maintain the angular position-setting of their teeth with respect to that of the numeral wheels.

In order to carry out the resetting operation, a pressure is exerted on the outer extremity of the lever **12** in the direction of the arrow F (as shown in FIG. **12**).

Inasmuch as the rear face **12***a* of the lever is applied against the wall of the casing, said lever will necessarily be inclined at an angle as shown in chain-dotted lines in FIG. **12** by reason of the fact that the guide face **12***b* has rolled on the periphery of the sleeve **14** ; under the action of pressure which continues to be applied to the lever, the guide face **12***c* will come into contact with the sleeve **14**, with the result that the lever is inclined at a progressively larger angle of slope until, in a first stage of its movement, the guide face **12***d* comes into contact with the cam **11***b*. In this position, the cam and the numeral wheel which is integral therewith can no longer rotate since the anchor **7** is still in the initial position of FIG. **12** and the escape wheel is locked in position by the engaged anchor pallet **7***b*.

As pressure is maintained on the lever **12** and transmitted to the shaft **9** by means of the sleeve **14** against which the guide face **12***c* is applied, so the shaft **9** will be displaced while causing the disengagement of the secondary pinions and locking of these latter against the spacer member **2**, as shown in FIG. **13**. At the same time, the sleeve **14** which is applied against the shoulder **7***d* of the anchor **7** will cause this latter to swing through an angle such that the two anchor pallets **7***b* and **7***c* will be disengaged from the escape wheel, thus permitting the rotation of the assembly consisting of cams and numeral wheels.

At this moment, the shaft **9** comes into end-of-travel abutment and the pressure exerted by the guide face **12***d* on the cam **11***b* will cause this latter to rotate up to the position corresponding to zero resetting as indicated in FIG. **14**.

As soon as the pressure F is no longer applied, the shaft **9** is returned to its initial position by the spring **15**. The secondary pinions which have been locked in a suitable position engage once again with the teeth of the numeral wheels while the lever **12** is thrust back to the initial position by means of the spring **16** ; since the anchor **7** is then released, the spring **13** returns it to the initial position as shown in FIG. **12**.

In the apparatus according to the invention which comprises a plurality of numeral wheels, each wheel is provided with its own heart cam which is intended to be actuated by a lever element having a shoulder **12***d*. These elements are disposed in a comb-tooth arrangement ; FIG. **11** illustrates a preferred form of construction of a push-lever which is formed in one piece by molding.

I claim:

1. An electromagnetically operated impulse counter comprising a casing, numeral wheels disposed within said casing and freely mounted on a bearing shaft, releasable transmission means for operatively interconnecting said wheels, heart cams associated with said wheels, an electromagnet rigidly fixed to said casing, a moving armature for cooperating with said electromagnet at each current impulse, an escapement anchor which is pivotally coupled to said armature and so shaped as to permit in a predetermined position the free rotation of the first numeral wheel, a non-articulated zero resetting control push-lever, said lever being provided with a plurality of juxtaposed teeth in cooperating relation with the said heart cams and provided with two lateral arms which are integral therewith and adapted to cooperate with a secondary shaft carrying transfer pinions, the complete assembly making it possible against the action of a spring and under the action of a single manual pressure on said push-lever in a first stage to effect the disengagement of the transfer pinions and to maintain said pinions in an angular position, in a second stage to release said first numeral wheel by positioning said escapement anchor in a position in which it permits the free rotation of said first numeral wheel, and in a third stage to bring the heart cams to the zero position while the re-engagement of the anchor and of the transfer pinions is carried out at the same time when pressure is no longer applied to the push-lever.

2. An impulse counter according to claim **1** which includes a toothed escape wheel integral with said first numeral wheel and directly actuated by said anchor for moving the said first numeral wheel.

* * * * *