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EP 0 143 417 B1

Description

Field of the Invention

The present invention refers to an automatic flip-over mechanism that swiftly increments the numeric display determined by the turning of a set of cylinders, so that the display is always clear and easily readable without ambiguities and many chances of mistakes. The present invention is particularly suitable for cyclometric registers, such as those used in electric energy meters, for which it was particularly envisaged.

The meter measures the energy consumed during a certain period by a load fed by a supply line passing through the meter, and displays the energy consumption on a set of cylinders, which, in some models, are six in quantity displaying successively tenths, units, tens, hundreds, thousands and tens of thousand kilowatt hours. Each cylinder is marked with the ten 0 to 9 digits of the decimal system.

The metering data is generated by a sensor and transducer disk coupled to the load's supply line. Through a series of transmitters, the disk is synchronously coupled to the cylinder indicating tenths of kilowatt hour, this cylinder is called the driver cylinder because, apart from displaying this data. it drives the rest of the cylinders at longer or shorter intervals according to their significance.

The driving action is carried out by a set of pinions, each engaging two consecutive cylinders. The driven cylinders only turn during a 9 to 0 transition of the respective immediate lower order cylinder, when carrying a digit to a higher order.

Generally, the driver cylinder turns extremely slowly, causing the moving cylinders to show portions of two consecutive numbers during a considerable portion of time. Apart from making a visual reading rather difficult, it may be appreciated that this may also be a source of reading mistakes. In short, there is sometimes a rather ambiguous display of the energy consumption, due to the slowness of the carry operation.

Description of the Prior Art

It has previously been attempted (see e.g. GB-A-985.778) to correct this mishap by adding a very unbalanced fly-wheel on the cylinder axle so that, pushed by the first or driver cylinder, it stored mechanical potential energy which was unleashed against the driven cylinders during a 9 to 0 transition, to hasten their switching.

Various setbacks were found in this system. Upon discharging the potential energy and converting it to kinetic energy, the fly-wheel oscillated about its minimum potential energy position. The fly-wheel would swing back and forth striking the first cylinder, bugging the indication of the least significant digit, for which reason it was customary to only record zeroes around it, relinquishing an order of magnitude of sensitivity. The sensitivity of those meters was then typically reduced to 1 kwh. Furthermore, no provision had been made to permit adjustment of the fly wheel's imbalance to attain exact operation of the mechanism.

Summary of the Invention

Therefore, an object of the present invention is a flip-over mechanism as defined in claim 1 to obtain clear readouts, without ambiguities, at least from the most significant digits of the cyclometric register.

Another object of the present invention is to attain the previous object without sacrificing resolution and sensitivity.

A particular object of the present invention is to obtain an electric energy meter having a net display with .1 kWh of sensitivity.

Another object of the present invention is to provide for and simplify adjustment of the effects, caused by the fly-wheel's imbalance.

These and other objects of the present invention are achieved by inserting an unbalanced fly-wheel between the driver cylinder and the second cylinder and opening the connection between the driver cylinder and the first pinion (which directly coupled these two cylinders). The fly-wheel is connected to the driver cylinder so that during half a turn of the latter, it is dragged from a point of minimum energy to one of maximum mechanical potential energy. Upon reaching its point of maximum potential energy, the fly-wheel automatically disconnects itself and begins to rotate under the influence of its own inertia due to its considerable imbalance. The fly-wheel is connected to the first pinion in turn coupled to the second cylinder, so that at the instant the fly-wheel reaches its point of maximum kinetic energy, a striker solidary to the fly-wheel slams against the first pinion, unloading suddenly all its kinetic energy to increment the most significant digits in one unit practically instantaneously. The driver cylinder then gives another half-turn before reconnecting with the fly-wheel and recommencing the cycle. To optimize operation, a mountable and removable weight is provided for permitting adjustment and readjustment of the fly-wheel's imbalance, to vary its capacity for accummulating potential energy and discharging kinetic energy.

Brief Description of the Drawings

Figure 1 illustrates a perspective of the automatic flip-over mechanism, partially exploded according to the present invention.

Figure 2 illustrates a cross-section of the cyclometric register including the automatic flip-over mechanism of the present invention.

Figure 3 shows a perspective view of the fly-wheel.

Figure 4 is a side view of the fly-wheel as seen from the second cylinder.

Lastly, figure 5 is view of the driver cylinder, as seen from the fly-wheel.

Detailed description of the preferred embodiments

The location of a fly-wheel 73 between the driver cylinder 23A and the second cylinder 23B is shown in fig. 1 and 2 The periphery of the driver cylinder 23A is marked with digits corresponding to tenths of kilowatt hour, and on that of the second cylinder, those corresponding to kilowatt hour units. The mechanism is driven by the gearwheel 21A solidary to cylinder 23A. The latter is coupled to cylinder 23B successively via the fly-wheel 73 and the pinion 63A. The higher order cylinders are conventionally coupled by pinions to their adjacent cylinders; for clarity reasons, only pinion 63B and cylinder 23C are illustrated. The wheels 23A, 73, 23B, 23C are all mounted on an axle 24 of stainless steel, 3.17 mm diameter, 95 mm long.

Pinions 63A, 63B are mounted on an axle 57, also of stainless steel, 2mm diameter, 79 mm long. The cylinders 23A, 73, 23B, 23C and the pinions 63A, 63B are all of polyamide 11 (RILSAN) and are pressure mounted on their respective axles 24, 57.

The side face 74 of fly-wheel 73 giving onto cylinder 23B can be seen in a perspective view in figure 3 and in an enlarged plan view in figure 4. The driver cylinder 23 (not illustrated in these figures 3 and 4) is located behind the fly-wheel 73.

The fly-wheel 73 has a relatively large hole of about 180° which creates a considerable initial imbalance in it. Two pins 78A, 78B of the same polyamide 11 material are fixed to the solid portion 77, opposed by axle 24 to the hole 76 and removably mount an iron counterweight 81 (shown in dashed lines) weighing between 9 and 6 grammes, to adjustably increase the imbalance of fly-wheel 73. The counterweight has a pair of orifices corresponding to the pins 78A, 78B. During preliminary testing, the mass of counterweight 81 is gradually adjusted until exact operation of the mechanism is achieved, the protruding ends of the pins 78A, 78B are then heated and riveted to fix the counterweight 81 to the fly-wheel 73. The imbalance is adjusted so that all the most significant digits may be driven either simultaneously or in chain fashion. The fly-wheel 73 also has a proper striker 82 associated with a slot 71. The striker 82 is for effecting the practically instantaneous carry function, as will be explained further along. During this function it is necessary to free pinion 63A by means of slot 71. As is known in the art, pinion 63A (alike pinions 63B, ...) has an alternating series of short 68 and long 69 teeth, the long teeth 69 stretching across the whole breadth of pinion 63A, whilst the short teeth 68 are located on the side engaging second cylinder 23B (i.e. the driven cylinder). The longer teeth 69 are for jamming the pinion 63A during intercarry periods, to avoid glitches producing undue transitions, due to e.g. external vibrations. Between carries, pinion 63A is jammed by the long teeth 69 against the fly-wheel 73. During carry, the striker 82, in fact two pins 82A, 82B on opposite sides of slot 71, engages the facing short teeth of pinion 63A, impelling it; at the same time, the next tooth, long tooth 69, penetrates slot 71, unjamming the pinion 63A. Once the carry is over, the slot 71 passes on, leaving the pinion 63A jammed yet again.

Figure 5 illustrates the face 83 of the driver cylinder 23A on the side of fly-wheel 73. Unlike the higher order cylinders 23B, 23C, it has a solidary bolt or tooth for impel ling, during half a turn, fly-wheel 73 by means of a tooth or pin 86 (fig. 1) fixed behind and below the slot 82 (figs. 3 and 4) of fly-wheel 73.

Both the radial and axial coordinates of salients 84, 86 coincide with each other, to permit direct contact therebetween.

The imbalance of cylinder 23A due to the eccentricity of bolt 84 is compensated by a counterweight 87, so as not to unduly affect operation of the cyclometric register, and basically, the linearity between the speed of the transducer disc and the load power sensed by the disc.

The mechanism operates as follows: while cylinder 23A travels from 5 to 9, bolt 84 is lifted and pushes fly-wheel 73 with it until the hole 76 reaches its lowest point, which coincides with the 9 to 0 transition of the cylinders 23A, after which it begins to rotate under the effect of its own inertia until the hole 76 is located at its highest point; this instant coincides with the striker slamming against the pinion 63A, incrementing in one unit the display of cylinder 23B. When the latter transits from 9 to 0, it transmits this data to the pinion 63B which updates cylinder 23C and so on, using the kinetic energy unloaded suddenly by the fly-wheel 73. The mechanism thus acts like a striker, storing energy during a time interval previous to discharging it practically instantaneously. This discharge is effected intermittently and automatically when the

stored energy reaches a certain level, precisely when the drive cylinder changes from 9 to 0.

Claims

1. A flip-over mechanism for a cyclometer register of a type including at least first and second cyclometer drums rotatable on a drum shaft and a carry pinion for incrementing said second cyclometer drum, comprising: means (21A) for permitting said first cyclometer drum to be driven by an external device;
a fly-wheel (73) on said drum shaft; engaging means (84/86] on said first cyclometer drum and said fly-wheel for concertedly rotating said fly-wheel by said first cyclometer drum during a predetermined portion of a rotation of said first cyclometer drum; said engaging means (84/86) including means for permitting said fly wheel to perform a free forward rotation upon said shaft at a predetermined point in a rotation of said first cyclometer drum; said fly-wheel (73) including means (82) for momentarily urging said carry pinion at an end of said free forward rotation whereby a substantially instantaneous carry is
provided;
characterized by
a hole (76) within said fly-wheel (73) extending across approximately 180° of its body and a removable mass (81) adjustably and eccentrically mounted on said fly-wheel
(73) at a location substantially opposed to said hole
(76) to increase its imbalance.

2. A flip-over mechanism according to claim 1 wherein said removable mass is attached to said fly-wheel (73) by at least one pin (78A, 78B) integrally formed in said fly-wheel and said mass includes a matching orifice for fitting over said at least one pin.

3. A flip-over mechanism according to claim 2 wherein said mass (81) includes a selectable weight of from about 3 to about 6 grams.

4. A flip-over mechanism according to claim 2 wherein said at least one pin (78A, 78B) is a thermoplastic and includes a heat rivetting at an outer end thereof effective for securing said mass (81) to said fly-wheel (73).

5. A flip-over mechanism according to claim 1 wherein said engaging means (84/86) includes a tooth on one of said first cyclometer drum and said fly-wheel and a pin on the other of said first cyclometer drum and said fly-wheel, said tooth and said pin being mutually disposed at a same radial distance from said drum shaft.

6. A flip-over mechanism according to claim 1 wherein said means (82) for momentarily urging includes a striker on said fly-wheel (73).

7. A flip-over mechanism according to claim 6 wherein said striker (82) includes first and second striker pins (82A, 82B) said first and second striker pins being positioned to engage a tooth on said carry pinion.

8. A flip-over mechanism according to claim 6 wherein said means (82) for momentarily urging further includes a slot (71) in said fly wheel, said slot being effective to permit the entry therein of a tooth on said carry pinion whereby said carry pinion is momentarily unlocked.

9. A flip-over mechanism according to claim 8 wherein said first striker pin (82A) is disposed at a first side of said slot and said second pin (82B) is disposed at a second side of said slot.

Revendications

1. Mécanisme d'avancement pas à pas pour un enregistreur cyclométrique du type comportant au moins un premier et un second tambours de cyclomètre en rotation sur un arbre de tambour et un pignon d'entraînement pour incrémenter le second tambour de cyclomètre, comprenant :
- un moyen (21A) pour permettre au premier tambour de cyclomètre d'être entraîné par un dispositif externe;
- un volant (73) placé sur l'arbre de tambour ;
- un moyen d'engagement (84, 86) situé sur le premier tambour de cyclomètre et sur le volant pour faire tourner de manière appropriée le volant au moyen du premier tambour de cyclomètre pendant une partie prédéterminée d'une rotation du premier tambour de cyclomètre ;
le moyen d'engagement (84, 86) comportant un moyen pour permettre au volant d'effectuer une rotation libre en avant sur l'arbre en un point prédéterminé lors d'une rotation du premier tambour de cyclomètre ; le volant (73) comportant un moyen (82) Pour hâter momentanément l'amenée du pignon en une extrémité

de la rotation libre en avant par laquelle un avancement sensiblement instantané est obtenu ;
caractérisé par :
une ouverture (76) ménagée dans le volant (73) qui s'étend sur approximativement 180° de son corps et une masse qui peut être ôtée (81) montéede manière réglable et en excentricité sur le volant (73) en un emplacement sensiblement opposé à l'emplacement de l'ouverture (76) afin d'augmenter son défaut d'équilibre.

2. Mécanisme d'avancement pas à pas selon la revendication 1, dans lequel la macco qui peut être ôtée et fixée au volant (73) par au moins un axe (78A, 78B) qui fait corps avec le volant, et dans lequel cette masse comporte un orifice qui est étudié pour s'adapter sur au moins un axe.

3. Mécanisme d'avancement pas à pas selon la revendication 2, dans lequel la masse (81) comporte un poids qui peut varier entre environ 3 ot 6 grammes.

4. Mécanisme d'avancement pas à pas selon la revendication 2, dans lequel au moins un axe (78A, 78B) est réalisé en un matériau thermoplastique et comporte un rivetage réalise à la chaleur situé au niveau d'une extrémité externe du mécanisme et qui maintient efficacement la masse (81) au volant (73).

5. Mécanisme d'avancement pas à pas selon la revendication 1, dans lequel le moyen d'engagement (84, 86) comporte une dent située soit sur le premier tambour de cyclomètre soit sur le volant ainsi qu'un axe situé sur l'autre dispositif, c'est à dire soit le premier tambour de cyclomètre, soit le volant, cette dent et cet axe étant placés mutuellement à une même distance radiale par rapport à l'arbre du tambour.

6. Mécanisme d'avancement pas à pas selon la revendication 1, dans lequel le moyen (82) pour hâter momentanément l'amenée du pignon comporte un percuteur placé sur le volant (73).

7. Mécanisme d'avancement pas à pas selon la revendication 6, dans lequel le percuteur (82) comporte des premier et second axes de percuteur (82A, 82B), ces premier et second axes de percuteur étant positionnés de manière à engager une dent sur le pignon d'entraînement.

8. Mécanisme d'avancement pas à pas selon la revendication 6, dans lequel le moyen (82) pour hâter momentanément l'amenée du pignon comporte en outre une ouverture (71) ménagée dans le volant, cette ouverture permettant de manière efficace l'entrée d'une dent sur le pignon d'entraînement, et de ce fait, le pignon d'entraînement est momentanément bloqué.

9. Mécanisme d'avancement pas à pas selon la revendication 8, dans lequel le premier axe de percuteur (82A) est placé en un premier côté de l'ouverture et dans lequel le second axe (82B) est placé en un second côté de l'ouverture.

Ansprüche

1. Umklapp-Mechanismus für ein Zyklometerregister mit wenigstens ersten und zweiten Zyklometertrommeln, die um eine Trommelwelle drehbar sind, und ein Übertragritzel zum Inkrementieren der zweiten Zyklometertrommel, enthaltend:
Mittel (21A), durch die die erste Zyklometertrommel durch eine externe Vorrichtung antreibbar ist,
ein Freilaufrad (73) auf der Trommelwelle,
Eingriffmittel (84/86) auf der ersten Zyklometertrommel und dem Freilaufrad für ein gemeinsames Rotieren des Freilaufrades durch die erste Zyklometertrommel während eines vorbestimmten Teils einer Rotation der ersten Zyklometertrommel,
wobei die Eingriffmittel (84/86) Mittel aufweisen, durch die das Freilaufrad eine freie Vorwärtsrotation auf der Welle an einem vorbestimmten Punkt in einer Rotation der ersten Zyklometertrommel ausführen kann,
wobei das Freilaufrad (73) Mittel (82) aufweist zum momentanen Beschleunigen des Übertragritzels an einem Ende der freien Vorwärtsrotation, wodurch ein im wesentlichen augenblicklicher Übertrag herbeiführbar ist,
gekennzeichnet durch
ein Loch (76) innerhalb des Freilaufrades (73), das sich über etwa 180° seines Körpers erstreckt, und eine lösbare Masse (81), die einstellbar und exzentrisch auf dem Freilaufrad (73) an einer Stelle angebracht ist, die dem Loch (76) im wesentlichen gegenüberliegt, um sein Ungleichgewicht zu vergrößern.

2. Umklapp-Mechanismus nach Anspruch 1, wobei die lösbare Masse an dem Freilaufrad (73) durch wenigstens einen Stift (78A, 78B) ange-

bracht ist, der einstückig in dem Freilaufrad ausgebildet ist, und die Masse eine passende Öffnung aufweist, die über den wenigstens einen Stift paßt.

3. Umklapp-Mechanismus nach Anspruch 2, wobei die Masse (81) ein wählbares Gewicht von etwa 3 bis etwa 6 Gramm aufweist.

4. Umklapp-Mechanismus nach Anspruch 2, wobei der wenigstens eine Stift (78A, 78B) ein Thermoplast ist und eine Wärmenietung an einem äußeren Ende davon aufweist, die für eine Befestigung der Masse (81) an dem Freilaufrad (73) sorgt.

5. Umklapp-Mechanismus nach Anspruch 1, wobei die Eingriffmittel (84/86) wenigstens einen Zahn auf einem von der ersten Zyklometertrommel und dem Freilaufrad und einen Stift auf dem anderen von der ersten Zyklometertrommel und dem Freilaufrad aufweisen, wobei der Zahn und der Stift gegenseitig an dem gleichen radialen Abstand von der Trommelwelle angeordnet sind.

6. Umklapp-Mechanismus nach Anspruch 1, wobei die Mittel (82) zum momentanen Beschleunigen einen Stößel auf dem Freilaufrad (73) aufweisen.

7. Umklapp-Mechanismus nach Anspruch 6, wobei der Stößel (82) erste und zweite Stößelstifte (82A, 82B) aufweist, die so angeordnet sind, daß sie an einem Zahn auf dem Übertragritzel angreifen.

8. Umklapp-Mechanismus nach Anspruch 6, wobei die Mittel (82) zum momentanen Beschleunigen ferner eine Nut (71) in dem Freilaufrad aufweisen, in die ein Zahn auf dem Übertragritzel eintreten kann, wodurch das Übertragritzel momentan entriegelt wird.

9. Umklapp-Mechanismus nach Anspruch 8, wobei der erste Stößelstift (82A) an einer ersten Seite der Nut und der zweite Stift (82B) an einer zweiten Seite der Nut angeordnet ist.

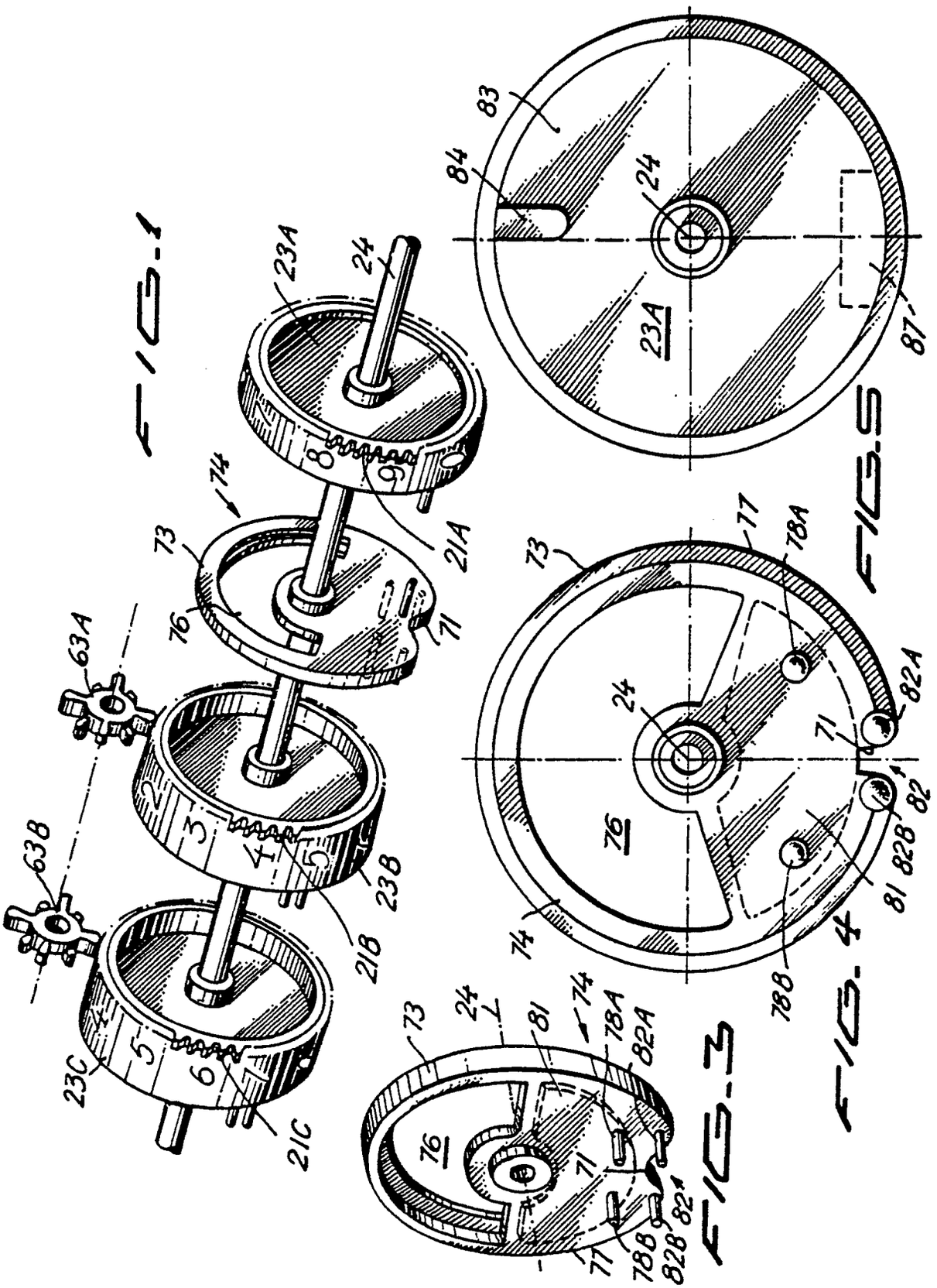
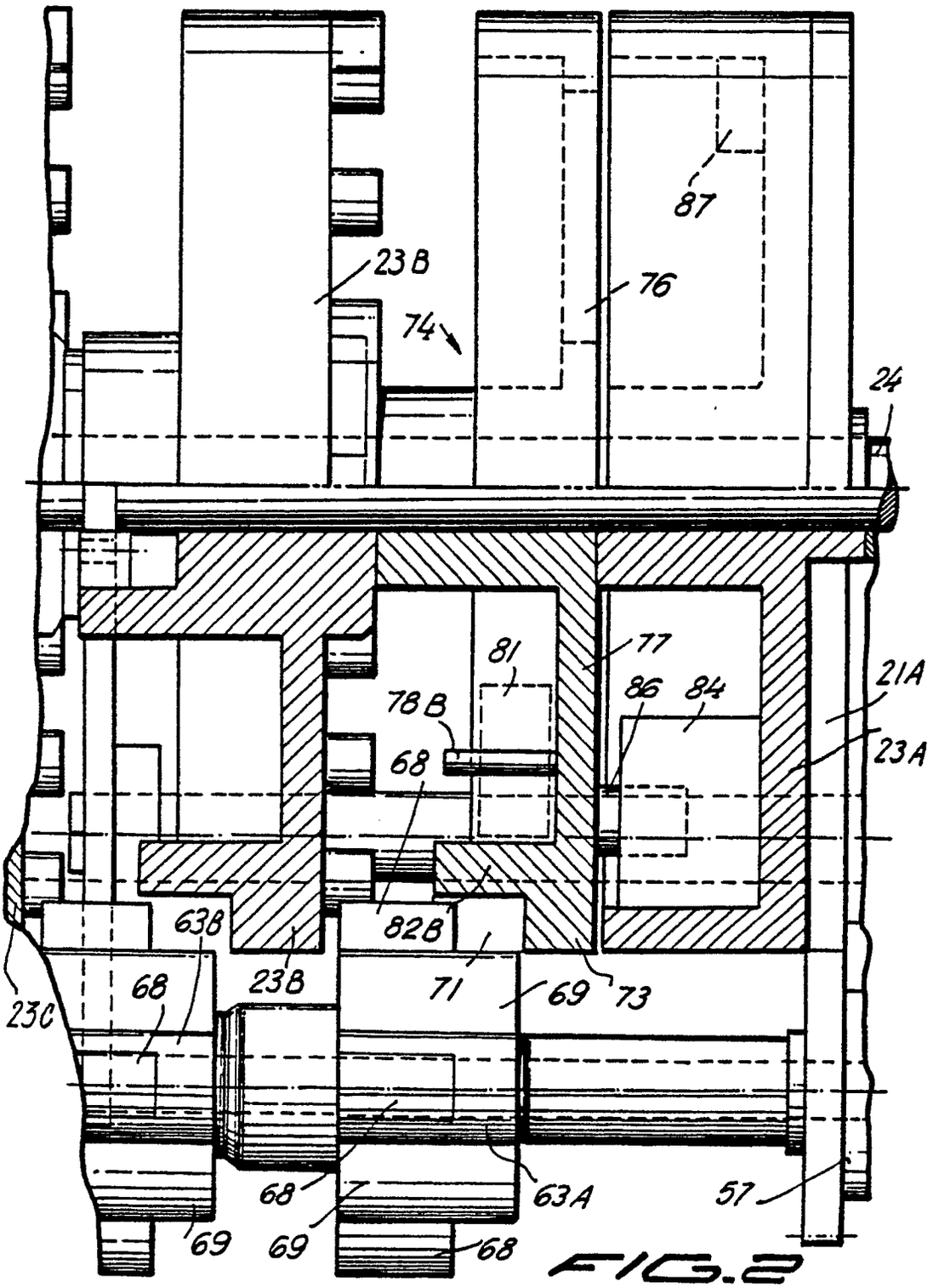


FIG.1
FIG.2
FIG.3
FIG.4
FIG.5


87
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78B
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84
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638
82B
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73
23C
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63A
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FIG.2