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COMMUTATOR COMPRISING RADIALLY POSITIONED CAMMING BALLS
FOR ACTUATING SWITCH MEANS
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3,257,535

Fig. 1.

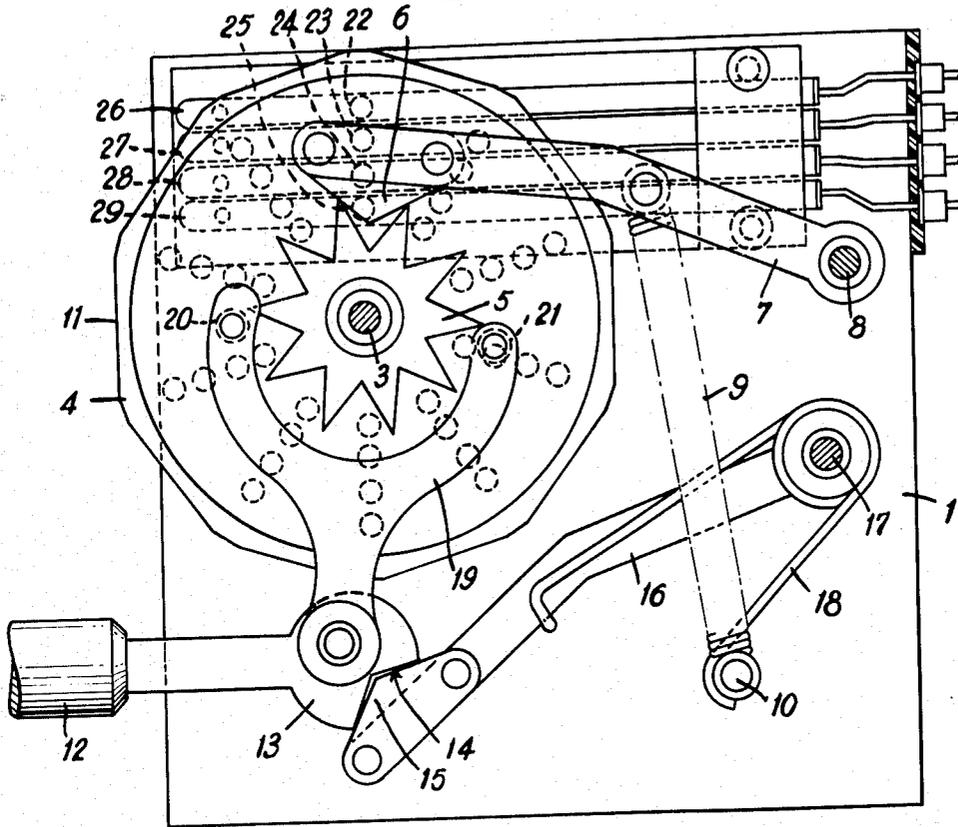
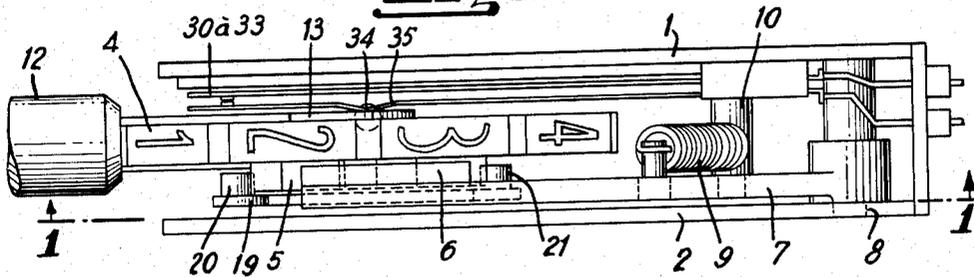


Fig. 2.



1

3,257,535
COMMUTATOR COMPRISING RADIALLY POSITIONED CAMMING BALLS FOR ACTUATING SWITCH MEANS

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Claims priority, application Switzerland, Sept. 4, 1959, 77,833/59

8 Claims. (Cl. 200-156)

This application is a continuation of my copending application S.N. 53,824 filed on September 2, 1960.

The present invention has for its subject a commutator comprising a body capable of being moved angularly so as to occupy a number of distinct angular positions, said body controlling contacts in such a manner as to provoke the opening or the closing of at least one contact in each of the said positions, characterised in that the element has camming members disposed on one of its faces, and adapted to provoke the closing or the opening of contacts each comprising a flexible blade, disposed parallel to the said face in such a manner as to be displaced by a camming member.

One form of construction of the commutator according to the invention is illustrated by way of example in the accompanying drawings, wherein:

FIG. 1 is a view in elevation, partly in cross-section on the line 1-1 of FIG. 2; and

FIG. 2 is a view in plan corresponding with FIG. 1.

The commutator shown comprises two plates 1 and 2, for example of metal, between which is disposed a shaft 3 mounted for turning by its two ends in the plates 1 and 2. On the shaft 3 is secured a contactor 4 secured to a star wheel 5, with ten branches. The contactor 4 and the wheel 5 may thus take up ten determined positions about their axis of rotation, each position being exactly determined by a pawl 6 actuated so as to jump on the teeth of the wheel 5 when this turns and for lodging between two teeth of this wheel so as to fix the position. The pawl 6 is mounted on an arm 7 capable of turning on a shaft 8 mounted between the plates 1 and 2. A tension spring 9 is mounted between the arm 7 and a pin 10 secured in the plate 1.

The contactor is constituted by an insulating element in the form of a disc provided at its periphery with ten faces numbered from 0 to 9, one of them, indicated by the reference 11, being visible at the exterior of the element and indicating the arithmetical position of said latter.

A lever 12 is mounted on a spindle secured to the plate 1 and can turn about this spindle, in one and the other direction. The lever is mounted on a spindle by a member 13 having a notch 14 in which lodges a pawl 15 carried by an arm 16 capable of turning on a spindle 17 mounted between the plates 1 and 2. A wire spring 18 urges the pawl 15 into the notch 14. It will be seen that the shape of the pawl relatively to the notch is symmetrical, which permits of moving the lever 12 slightly upwards or downwards at will. A stop, not shown, limits these two movements.

The member 13 of the lever 12 carries, eccentrically relatively to its spindle, an anchor 19 actuated for co-operating with the star wheel 5 in such a manner as to constitute an escapement. The anchor carries two pistons

2

20 and 21 capable of coming into engagement with the teeth of the wheel 5. It will thus be seen that by moving the lever 12 in one direction or the other, the wheel 5 and the contactor 4 are turned through one tenth of a revolution in one direction or the other.

The contactor 4 has ten series of four cavities 22, 23, 24, 25. A series of four cavities being opposite four movable contacts 26, 27, 28 and 29 mounted on the plate 1. These contacts co-operate with four stationary contacts 30, 31, 32, 33. All these contacts are connected to terminals placed on the outside of the element and permitting of connecting, for example, the four stationary contacts to one pole of a source of current not shown, whilst the four terminals connected to the movable contacts constitute the electric outlet of the element.

Balls 34 are mounted in the cavities 22 to 25 of the contactor, according to the contacts which it is desired to form in each position of the said contactor, each ball acting by pressure on a boss 35 provided on each movable contact.

The contacts may represent, for example, the factor 1 (contacts 26, 30), the factor 2 (contacts 27, 31), the factor 3 (contacts 28, 32) and the factor 4 (contacts 29, 33). When the contactor is in the position 0, the face marked 0 is visible from the outside of the counter and none of the four cavities of the contactor opposite contacts contains any ball. It thus follows that no movable contact is displaced and that no current passes from the element. When the contactor is in position 1, the cavity 22 of the corresponding position has a ball which moves the movable contact 26 for bringing it into contact with the corresponding stationary contact 30. The closing of this contact permits the outlet of a current of the counter, representing 1.

It will be understood readily how the balls should be disposed in the various positions of the contactor for giving outlet currents representing, by the linear combination of four factors, the result of the arithmetical recording in the element. These combinations may be as follows:

Position of the contactor	Contacts closed	Value of the outlet
0		
1	26, 30	1
2	27, 31	2
3	26, 30; 27, 31	1+2
4	27, 31; 28, 32	2+2
5	26, 30; 29, 33	1+4
6	27, 31; 29, 33	2+4
7	26, 30; 27, 31; 29, 33	1+2+4
8	27, 31; 28, 32; 29, 33	2+2+4
9	26, 30; 27, 31; 28, 32; 29, 33	1+2+2+4

By lowering the lever 12, the contactor is caused to advance step by step (additional), whilst by raising the lever 12, the contactor is caused to advance step by step rearwardly through one unit (subtraction). It will be understood that it is possible to use two different controls for the addition and the subtraction, for example two knobs which replace the lever 12 and which produces either an advance or a retraction of the element when they are pressed. It will also be evident that the element may be remote controlled by any suitable device capable of acting, for example, on the lever 12.

It will be seen that the element described comprises an arithmetical inlet of which the value may be read from

3

4

the outside of the element. Said latter is provided with an outlet represented by the combination of four factors corresponding to the arithmetical value of entry into the element.

A number of elements such as that described may be disposed side by side so as to form a complete counter, by reason of an element for each numerical order of the counter. Each element may be controlled separately or, on the contrary, only the first element may be controlled, each element then comprising a device capable of causing the upper element to advance through one unit when it passes itself from 9 to 0.

It will be understood that it is possible to select other correspondences than those described between the contacts 26 to 33 and the positions of the contactor 4 and that, for example, the four contacts may be utilized for giving linear information from the ten positions of the contactor. It is also possible to provide modifications in which the number of positions capable of being occupied by the contactor are different by ten.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed is:

1. An electric switching device comprising a support, disc means rotatably mounted on said support for rotation relative thereto, said disc means having a number of substantially equidistant markings on the periphery thereof to visually indicate a plurality of angular positions of said disc means, a plurality of cam followers overlying one face of said disc, each of said cam followers being spaced a different distance radially from the axis of said shaft, a plurality of camming balls on said one face of the disc means at said different radial positions for actuating selected ones of said cam followers at each of said angular positions, an electric switch associated with each of said cam followers and actuated between open and closed positions in response to the actuation of said cam followers by said camming balls, means for selectively bi-directionally rotating said disc means through each of said angular positions, and detent means for releasably retaining said disc means in each of said angular positions whereby the positions of the switches at each angular position can be used to generate coded electrical signals.

2. The invention as defined in claim 1 wherein there are four cam followers aligned with one another along a line extending generally toward said axis, said rotating means advancing said disc through ten distinct angular positions per revolution, said cam followers being actuated by said camming members at each of said angular positions in the following sequence wherein the cam followers are numbered one through four:

Angular position of disc:	Number of cam follower actuated
0	0
1	1
2	2
3	1 and 2
4	2 and 3
5	1 and 4
6	2 and 4
7	1 and 2 and 4
8	2 and 3 and 4
9	1 and 2 and 3 and 4

3. The invention as defined in claim 2 wherein said markings on the periphery of said disc comprise the

numbers 0-9 to visually indicate each of said ten angular positions.

4. The invention as defined in claim 1 wherein said disc is made of an electric insulating material.

5. An electric switching device comprising a support, a shaft mounted on said support, a star wheel rotatably mounted on said shaft having a plurality of equally spaced teeth on the periphery thereof, a disc rotatably mounted on said shaft for rotation with said star wheel, wheel actuating means for selectively bi-directionally rotating said star wheel step by step into a plurality of operative angular positions, the number of said angular positions corresponding to the number of teeth on said star wheel, detent means for releasably holding said star wheel in each of said angular positions, said disc having a number of substantially equidistant markings on the periphery thereof to provide a visual indication of said angular positions of said wheel, the number of said markings being equal to the number of teeth on said wheel, a plurality of cam followers overlying one face of said disc, each of said cam followers being spaced at a different distance radially from the axis of said shaft, a plurality of camming projections projecting from said one face of the disc at said different radial positions for actuating selected ones of said cam followers at each of said angular positions, and an electric switch associated with each of said cam followers and actuated between open and closed positions in response to the actuation of said cam followers by said camming projections.

6. An electric commutator comprising: a plate; an insulator support fixed to said plate; a first series of electrically conductive blades carried by said support and extending from said support in a plane substantially parallel to said plate; a second series of electrically conductive resilient blades carried by said support and extending therefrom in a plane substantially parallel to the first series of blades; an electrical contact member carried by each blade of said first and second series, the contact members carried by the blades of said first series being arranged opposite the contact members carried by the blades of said second series to form a plurality of cooperating pairs of contact members; a shaft carried by said plate normally thereto; a rotatable wheel mounted on said shaft, said wheel having a plurality of peripheral equidistant teeth; wheel actuating means for selectively bi-directionally rotating said wheel step-by-step into one of several operative positions, the number of said positions corresponding to the number of teeth on said wheel; a stop pawl pivotally mounted on said plate and biased into engagement with said wheel between two adjacent teeth thereof in each of the several operative positions of the wheel thereby to hold said wheel in each of said positions between rotary displacements of said wheel by said actuating means; a disc made of insulating material, mounted on said shaft to rotate with said wheel and having a face adjacent and parallel to said second series of blades, said disc having a number of peripheral substantially equidistant markings for giving a visual indication of the several operative positions of said wheel, which number is equal to the number of teeth on said wheel; and a plurality of projections on said face of the disc for actuating selected blades of said second series in the several operative positions of the wheel; said wheel actuating means including a lever pivotally mounted intermediate its ends on said plate to form two arms, and spring means for holding said lever in a normally inoperative position and out of engagement with said wheel, one lever arm projecting beyond said plate, and the other lever arm having a fork-like portion defining two prongs selectively operatively engaging the teeth of said wheel to rotate the latter in opposite directions depending on the direction of pivotal movement of the lever upon actuation of said projecting lever arm, said operative engagement of a wheel tooth by one of said prongs causing rotary displacement of said wheel in one of said two oppo-

site directions and simultaneously causing said stop pawl to be dislodged from between said two adjacent teeth to clear the trailing tooth of said two teeth and be pressed between said trailing tooth and the next following tooth of the wheel.

7. The commutator as claimed in claim 6 wherein said prongs carry projections engaging the teeth of said wheel.

8. The commutator as claimed in claim 6 wherein said projecting lever arm is provided with a knob for manual operation of the lever.

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