United States Patent

Holzer et al.

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[54] TIMING GEAR

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[52] **U.S. Cl.** **74/143**

[51] **Int. Cl.** **F16h 31/00**

[58] **Field of Search** 74/143, 142; 200/38

[56] **References Cited**

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[57] **ABSTRACT**

A timing gear for the production of timing and switch movements consisting of a control cam disc and ratchets or pawls which are driven by a motor through a reduction gear by means of eccentrics and act on two sets of teeth on the cam disc, the teeth being of even pitch wherein at least two pawls are provided which engage a set of teeth on the control cam disc and are given differing strokes.

3 Claims, 4 Drawing Figures

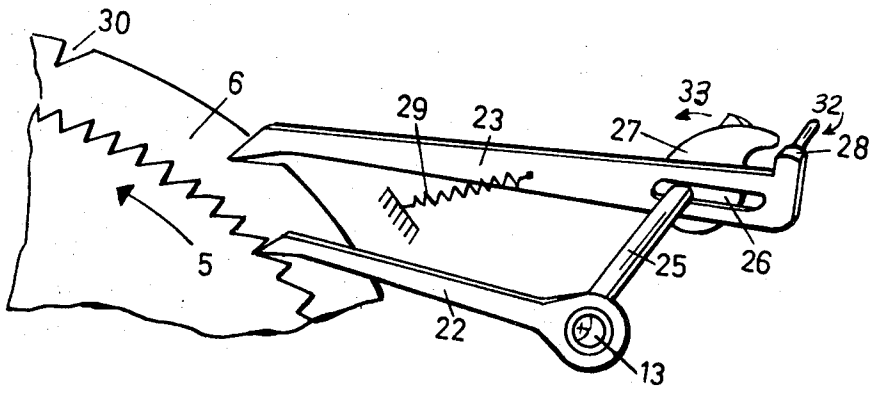
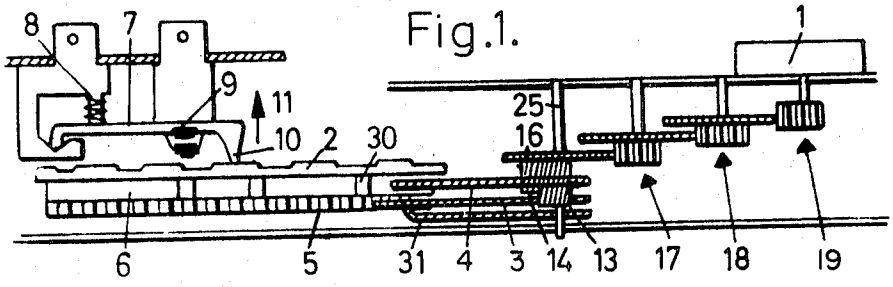


Fig.1.



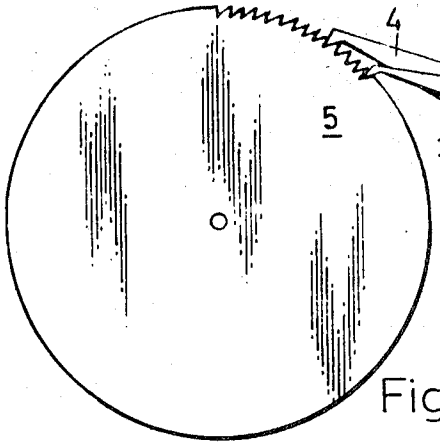
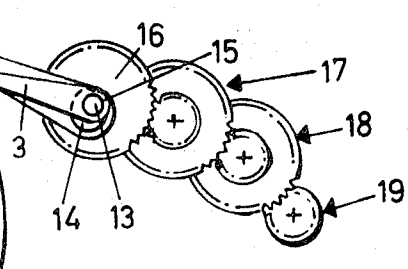


Fig.2.



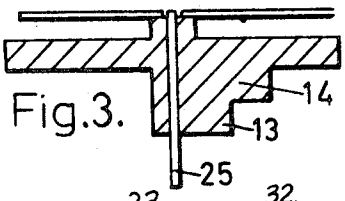


Fig.3.

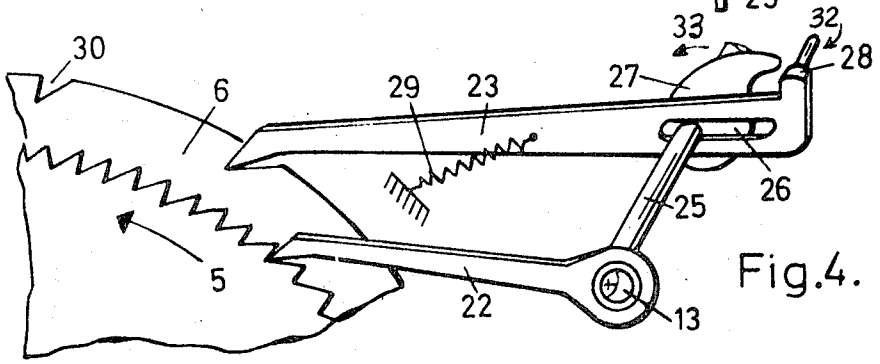


Fig.4.

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TIMING GEAR

The invention refers to a timing gear for the production of timing and switch movements, consisting of a control cam disc and ratchets or pawls which are driven by a motor through a reduction gear, by means of eccentrics, and act on two sets of teeth on the cam disc, the teeth being of even pitch.

Timing gears which drive control cam discs are already known. The timing gears drive the control cam disc with a ratchet or pawl at even or regular intervals. If one requires for instance 60 minutes to elapse during a revolution of the control cam disc, a very small pitch can be provided and the ratchet then moves the cam disc always a very small distance. A disadvantage of this design is that the actual movement which actuates the contacts has an inadequate stroke, because the ratchet or pawl which moves the control cam disc during one minute can move it forward only a very small amount per step if the control cam disc is not to have too large a diameter. By this means therefore only relatively inexact switching can be achieved and consequently care must be taken that with this small stroke the control disc contacts snap closed.

If the other possibility is adopted, in order to ensure an adequate switch stroke, namely the engagement of the ratchet or pawl in the control cam disc with much larger or longer intervals, then this latch can move the disc forward only at correspondingly long intervals. As the drive is to be taken from the motor and not from a lifting magnet, the ratchet or pawl, moving at long intervals, would move only very slowly and the switching movement required to actuate the contacts would be critical as the movement would be too slow.

A further disadvantage of these two ratchet or pawl switchgears is that the control disc can be moved only at even intervals, because if the ratchet or pawls are actuated by an eccentric the engagement intervals of these ratchet or pawls must be equal.

The object of the invention is to avoid these disadvantages and to design a timing switchgear or a movement switchgear with ratchets or pawls in such a way that on the one hand the control cam disc is always moved forward with a small lift, this lift being defined as a timing step and for instance divides an entire revolution into 60 minutes; on the other hand however there is a further switching step which allows, at varying intervals according to the arrangement of the engagements in the control cam disc, of a larger stroke after varying lengths of time i.e., a stroke which actuates the contacts at an adequate speed.

In accordance with the invention this is achieved by providing at least two ratchets or pawls which each engage into its own set of teeth on the control cam disc and produce different strokes.

By the means taken in accordance with the invention it is possible, apart from the timing switch impulses which effect a relatively slow forward movement of the control cam disc, to carry out rapid switch impulses also. The engagement of a pawl with a larger working stroke makes possible a relatively longer switching path and therefore a higher switching speed.

Through the design in accordance with the invention whereby the pawls are mounted on a common shaft, each pawl being provided with an eccentric of different size, no great adjusting or finishing work is required. Nevertheless, precision switching can be obtained at predetermined intervals and at adequate speeds to effect the switching.

By this means one pawl in conjunction with the tooth disc provided for it, effects a continuous revolution of the control cam disc. The other pawl with the tooth disc provided for it, effects at determined intervals the rapid switch strokes.

The fact, in accordance with the invention, that the pitch circle diameters of the teeth are equal in size makes possible a simple manufacturing process. It can therefore be pressed, molded or cast without a particularly complicated mold.

A further advantage of the invention lies in the fact that the gear wheel driven direct by the motor or indirectly through a gear, and the eccentrics are mounted on a common shaft and are preferably made integral.

This is of importance both from a finishing technical point of view and from the point of view of true running of the timing switch gear since once a mold has been made the same positions of the eccentrics in relation to each other and the same accuracy of dimensions may be ensured.

Further the invention provides for at least one locking pawl which engages in one of the sets of teeth without a working lift or stroke, preferably in the even set of teeth.

This structure makes it possible to carry out a switch movement more rapidly since both the switch contacts and the apparatus which these contacts actuate are protected.

Further features and special advantages of the invention may be seen from the accompanying drawings, but the invention is not to be limited to the examples shown and described:

FIG. 1 shows a timing switchgear represented in part schematically;

FIG. 2 shows a side elevation of the same;

FIG. 3 shows a section through the eccentrics of the pawls;

FIG. 4 shows a further design example of a pawl.

In FIG. 1 a timing switchgear is represented which is driven from a motor 1. The forward movement of the control cam disc 2 is achieved by the pawls 3, 4 which act in conjunction with the sets of ratchet teeth 5 and 6.

A timing switchgear of this kind will find application especially in program controlled washing machines, but also in other controlled equipment.

The control cam disc 2 is followed by the feeler levers 7. A suitable pressure is applied by a spring 8. The contacts 9 are closed when the nose 10 of the feeling lever 7 falls into the hollows between the cam tracks and open again when the cams of the control cam disc 2 move the feeler lever 7 in the direction of arrow 11.

The sets of teeth 5, 6, are components of the control cam disc 2. The set of timing teeth is of even pitch whereas the indentations 30 of the set of teeth 6 are arranged at a distance from one another according to the length of time of intervals between the individual switching.

The pawl 3 (timing pawl) is in effectual connection with the set of timing teeth 5 and the pawl 4 engages with the set of teeth 6. A locking pawl 31 prevents back running of the control cam disc 2. This locking pawl 31 acts on the set of teeth 5 and is mounted on a shaft 25 which carries eccentrics 13, 14.

The pawls 3, 4 are actuated by the eccentrics 13, 14 which are mounted on the shaft 25. The gear wheel 16 as well as the eccentrics 13, 14 are preferably made in a single piece which simplifies manufacturing and fitting. The gear wheel 16 is driven by the motor 1 through gear wheels 17, 18, 19.

The function of the timing switchgear will now be described:

At equal intervals of time the pawl 22 and the locking pawl 31 engage in the set of timing teeth 5. The control cam disc 2 is therefore moved forward at equal intervals of time and with the pawl 23 engages in one of the range of teeth 30, of the set of switch teeth 6.

There is obtained, therefore, a very even, accurately timed forward movement of the control cam disc 2 and in between at predetermined intervals switch strokes occur which are sufficiently long to carry out an exact switching and besides this by suitable tooth pitchings of the set of switch teeth 6 any desired length of time interval i.e., any required pause between switching can be ensured.

FIG. 4 shows a possible modification of the invention. There are again two sets of switch teeth 5, 6 as well as two pawls 22, 23. The pawl 22 is again mounted on the eccentric 13 which is mounted on the shaft 25. The pawl 23 on the other hand operates on a guiding or stop slot 26 through which the shaft 25 passes. On the shaft 25 an eccentric cam 27 is also mounted for rotation in the direction of the arrow 33 and this is followed round by a stop 32 attached to the pawl 23. By means of a spring 29 the pawl 23 is tensioned in the direction of the control cam disc 2.

As the shaft 25 or the eccentric cam 27 is moved around the pawl 22 and with it the pawl 23 are liberated so that the latter

owing to the force of the spring **29** springs back in the direction of the control cam disc **2**, so that a relatively speedy switch stroke is achieved. The pawl **22** then continues to slide round the periphery of the eccentric cam and the pawl **23** is returned to its tension position so that the pawl **23** is prepared for a fresh switch stroke. This construction makes it possible on the one hand to impart a uniform drive to control cam disc **2** through the first pawl **22**, while the stop **32** is freed with each complete revolution of the shaft **25** to deliver the working strokes whereby the second pawl **23** is pulled to the left as shown in FIG. **4**, because the corresponding degree of freedom of movement is determined by the slot **26**. Both movements are thus obtained from a single drive which allows precise working strokes without faulty control.

At this point it should be noted that the sets of teeth **5** and **6** associated with the cam disc **2** are slightly different in the modification of FIG. **4** from those of FIG. **2**. In FIG. **2**, for example, sets of teeth **5** and **6** have the same diameter, while in FIG. **4** set **5** has a slightly smaller diameter than set **6** and therefore a different pitch.

There are of course many other possibilities of carrying into effect the thought behind the invention. Essential and important however is the arrangement of at least two switch pawls with working strokes of different lengths where preferably each pawl is provided with a set of teeth on the control cam disc.

What we claim is:

1. A timing gear with a driven control cam disc having a ratchet and pawls, characterized by the fact that the control cam disc (**2**) has on its circumference a first set of teeth (**5**) and a second set of teeth (**6**), a first pawl (**22**) engaging the first set of teeth (**5**) and a second pawl (**23**) engaging the second set of teeth (**6**), an eccentric (**13**) on which said first pawl (**22**) is mounted, a shaft **25** driving said eccentric, said second pawl (**23**) having a slot (**26**) therein, a spring (**29**) acting to press said second pawl against the second set of teeth (**6**), a stop (**32**) on said second pawl (**23**), said shaft (**25**) extending through the slot (**26**), an eccentric cam (**27**) fastened firmly to said shaft (**25**), said stop (**32**) resting against said eccentric cam (**27**), so that a uniform driving of the shaft (**25**) will result in the control cam disc (**2**) being driven through the first set of teeth (**5**) and pawl (**22**) uniformly in small steps and through the second set of teeth (**6**) and the pawl (**23**) in larger steps and at longer time intervals.

2. A timing gear in accordance with claim **1** wherein the two sets of teeth have a different pitch.

3. A timing gear in accordance with claim **1** wherein the two sets of teeth have a pitch of equal size.

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