

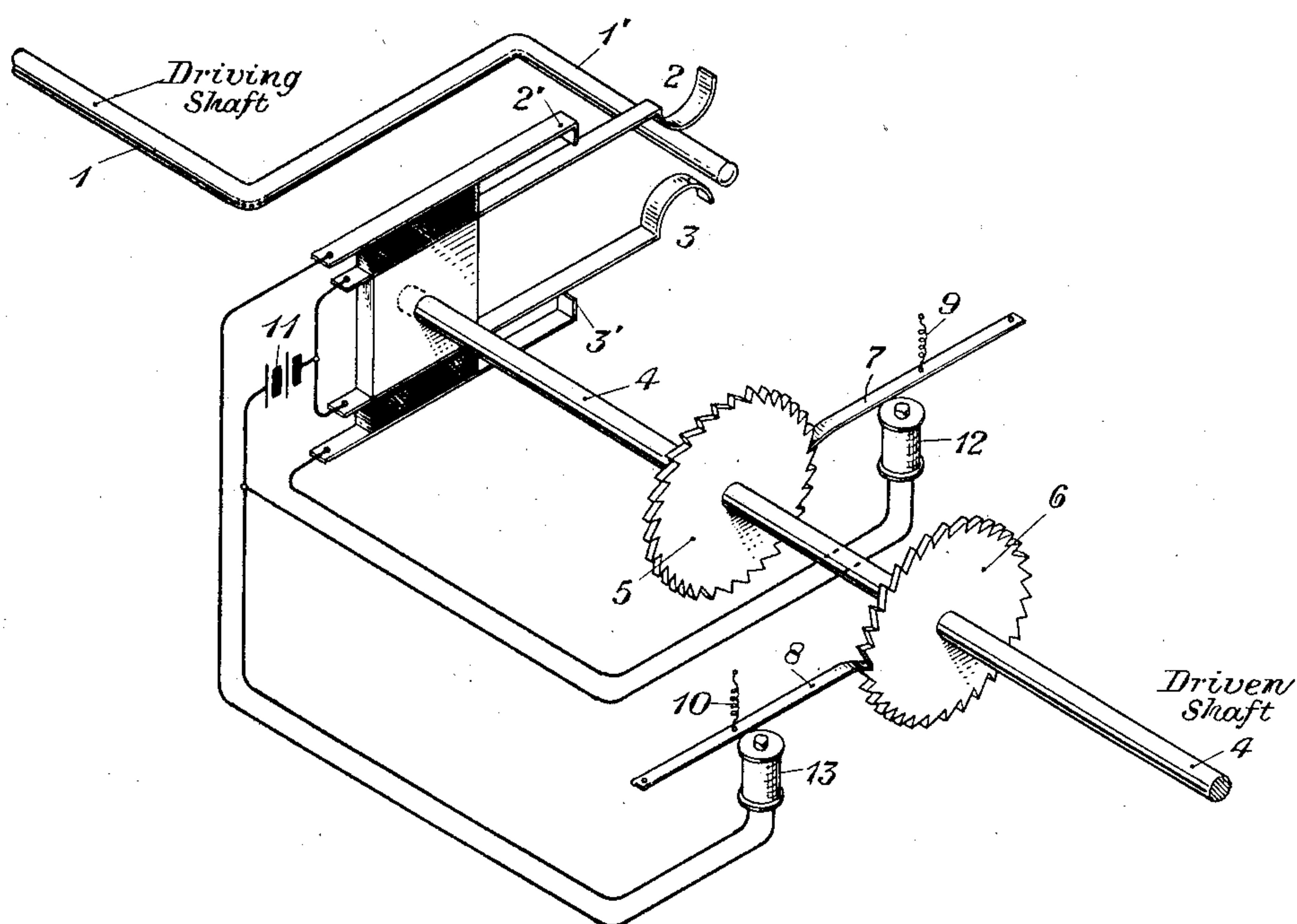
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APPARATUS FOR CONVERTING CONTINUOUS MOTION INTO INTERRUPTED MOTION

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APPARATUS FOR CONVERTING CONTINUOUS MOTION INTO INTERRUPTED MOTION

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This invention relates to arrangements for changing continuous motion into interrupted motion. More particularly, this invention relates to arrangements for converting continuous rotary motion into discontinuous rotary motion. Still more particularly, this invention relates to arrangements for the conversion of random rotary or oscillatory motion into motion which varies in finite and discrete steps.

When viewed from a different angle, this invention relates to arrangements for converting the motion of a device which continuously varies in accordance with, for example, the temperature of some device or apparatus, or with the resistance or gain of a circuit into other motion which may correspond to the variable motion but which will vary only in finite or discrete steps.

It is contemplated that this arrangement is applicable to numerous instances involving for example, the control of the gain of a telephone repeater from the resistance of a pilot wire in order to compensate for changes in loss of the associated line due to temperature. The invention is also applicable to compensate for changes in gain and frequency characteristics of carrier circuits under control of a pilot channel or the like.

This invention will be better understood from the detailed description hereinafter following, when read in connection with the accompanying drawing, which illustrates one embodiment of the invention.

Referring to the drawing, the reference character 1 designates a driving shaft which may be associated with apparatus having a characteristic, let us say, of temperature, pressure, resistance, gain or other property which may continuously change. In other words, the driving shaft 1 may rotate and carry its arm 1' between two switchhooks 2 and 3 which may be spaced from each other by some predetermined distance. The arm 1' may under normal conditions be equally spaced from the switchhooks 2 and 3 or it may, under the action of the apparatus which controls the driving shaft 1, assume some other position between these switchhooks. When the characteristic of the apparatus which determines the rotation of the driving shaft 1 is such that the arm 1' is moved through a larger distance, either of the switchhooks 2 or 3 may then be moved sufficiently to close the corresponding contacts 2' or 3'. Thus if the driving shaft is rotated in a clockwise direction and the torque is sufficient to have the arm 1' strike contact 3, the switchhook 3 will then close contact 3'. On the other hand,

if the torque on the driving shaft 1 is in a counterclockwise direction, the arm 1' may be caused to contact switchhook 2 and thereby close contact 2'.

The reference character 4 designates a shaft which is intended to be driven in a direction which corresponds to the direction of rotation of the driving shaft 1. There are two ratchet wheels 5 and 6 which are keyed to the driven shaft 4. These ratchet wheels may be rotated under the control of two pawls, 7 and 8, both of which are normally spaced from the teeth of the ratchet wheels. In order to produce the necessary spacing of these pawls from the corresponding ratchet devices, springs 9 and 10 are employed. The pawls 7 and 8 may be made of iron or other magnetic material in order that they may be attracted by the electromagnetic fields produced by electrical windings, as will be pointed out hereinafter.

A battery or other source of current is designated 11. One terminal of this source is connected to both of the switchhooks 2 and 3. The other terminal of the source is connected to one of the terminals of electrical windings 12 and 13 which control the movement of the corresponding pawls 7 and 8. The other terminal of the winding 12 is connected to the contact 3' and the second terminal of the winding 13 is connected to the contact 2'.

The switchhooks 2 and 3 are normally insulated from the corresponding contacts 2' and 3'. These switchhooks and associated contacts are all mounted upon the shaft 4 so that any movement of the shaft 4 will change the relative positions of both of the switchhooks with respect to the arm 1'. In other words, if the shaft 4 is rotated in a clockwise direction, both of the switchhooks 2 and 3 will also be rotated in a clockwise direction for a corresponding angular distance and will carry the corresponding contacts 2' and 3' along with them.

The operation of the arrangement shown in the drawing is as follows:

When the driving shaft 1 is rotated in a counterclockwise direction, the shaft 4 will remain stationary until the arm 1' is brought into contact with the switchhook 2. When this happens the contact 2' will be closed by the switchhook 2 and a circuit will be established from the source or battery 11 through the winding of the electromagnetic device 13. The device 13 will be energized by the flow of current therethrough and the electromagnetic field established thereby will be sufficient to attract the pawl 8 against the tension of the spring 10. As the pawl 8 is moved downwardly in the direction of the wind-

ing 13, it will engage the ratchet wheel 6 and rotate the ratchet wheel one step in a counter clockwise direction. Thus, the distance through which the ratchet wheel 6 is rotated will be no more than the spacing between any two of its adjacent teeth. When the ratchet wheel 6 rotates in a counter clockwise direction, it will carry with it the shaft 4 upon which it is mounted. The rotation of the shaft 4 in a counter clockwise direction will also carry with it the device which supports the switchhooks 2 and 3. Thus the switchhook 2, which was formerly closed by the arm 1', will be separated from the arm 1' and thereby open the circuit of the winding 13 at the contact 2'. In other words, after the shaft 4 has rotated through a small angular distance, the current formerly supplied by the source 11 to the winding of the electromagnetic device 13, will be interrupted.

If the driving shaft 1 is further rotated in the same direction, that is counter clockwise, the arm 1' may again be moved sufficiently so as to contact the switchhook 2. The circuit of the winding 13 will be closed at contact 2' and the same operation will be repeated causing the rotation in a counter clockwise direction of the ratchet wheel 6 and the shaft 4 upon which it is mounted, as well as the device which supports the switchhooks 2 and 3.

If the driving shaft 1 is moved in a clockwise direction by a torque which is sufficient to move the arm 1' into contact with the switchhook 3, the contact 3' will then be closed and current will then flow from the source 11 through the winding 12. The electromagnetic field produced by the winding 12 will attract the pawl 7 against the tension of the spring 9 and it will engage one of the teeth of the ratchet wheel 5, causing this ratchet wheel to move in a clockwise direction and carry with it the shaft 4. The shaft 4 will also carry the device upon which the switchhooks 2 and 3 are mounted and therefore the switchhook 3 will be separated from the arm 1' and the contact 3' will be opened. Just as soon as the contact 3' is opened, the current from the source 11 flowing through the winding 12 will be interrupted and the shaft 4 will then become stationary. Unless the torque on the driving shaft 1 is sufficient to cause the arm 1' to contact the switchhook 3, no current will flow from the source 11 through the winding 12.

So it will be seen that the continuously rotating or oscillating driving shaft 1 is caused to rotate the shaft 4 in a corresponding direction, that is, clockwise or counter clockwise, but the continuous rotation of the shaft 1 will be responsible for discontinuous rotation of the shaft 4. In other words, the continuous rotation of the shaft 1 will produce rotation of the shaft 4 in finite or discrete steps.

While the ratchet wheels 5 and 6 have been shown mounted upon a common shaft, separate and independent shafts, properly coupled to each other by gears, sprockets or the like, and cou-

pled to the switching means may be employed. When so arranged, one of these shafts will only rotate in one direction and the other shaft will only rotate in the opposite direction. Moreover, the ratchet wheels may be replaced by any toothed or other stepping devices.

While the driving shaft 1 and the driven shaft 4 have been shown and described as being in alignment, such an arrangement is not essential. These shafts may be parallel, but not aligned with each other or they may make an angle with each other. Such an arrangement may be particularly desired where the driving shaft rotates only through some predetermined angle as, for example 150°.

It will be understood also that the driving shaft 1 and the arm 1' may be the moving element of any instrument such as an ammeter, voltmeter or the like and that the closure of either of the associated contacts or switchhooks 2 or 3 will control the driven shaft 4 which in turn may control a circuit or other apparatus.

While this invention has been shown and described in certain particular arrangements merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to many and widely varied organizations, without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. Apparatus for converting the motion of a continuously rotating shaft into interrupted motion of another shaft mechanically coupled to the continuously rotating shaft comprising two toothed wheels mounted upon the driven shaft, means including a resilient switching device mounted upon and carried by the driven shaft and a circuit controlled by said device and responsive to the rotation of the driving shaft in one direction to rotate one of the toothed wheels step by step in one direction, and means including another resilient switching device mounted upon and carried by said driven shaft and a circuit controlled by the latter device and responsive to the rotation of the driving shaft in the other direction to rotate the other toothed wheel step by step in the opposite direction.

2. The combination of a driving shaft, an arm carried by the driving shaft and out of alignment therewith, a driven shaft, two toothed wheels mounted concentrically about the driven shaft, two flexible switchhooks supported and carried by the driven shaft and spaced on opposite sides of the arm of the driving shaft, each switchhook being flexed when engaged by said arm, two electromagnetic devices each operatively associated with one of the switchhooks when the switchhook is flexed, and means for coupling each of the electromagnetic devices with one of the toothed wheels to control its rotation.

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