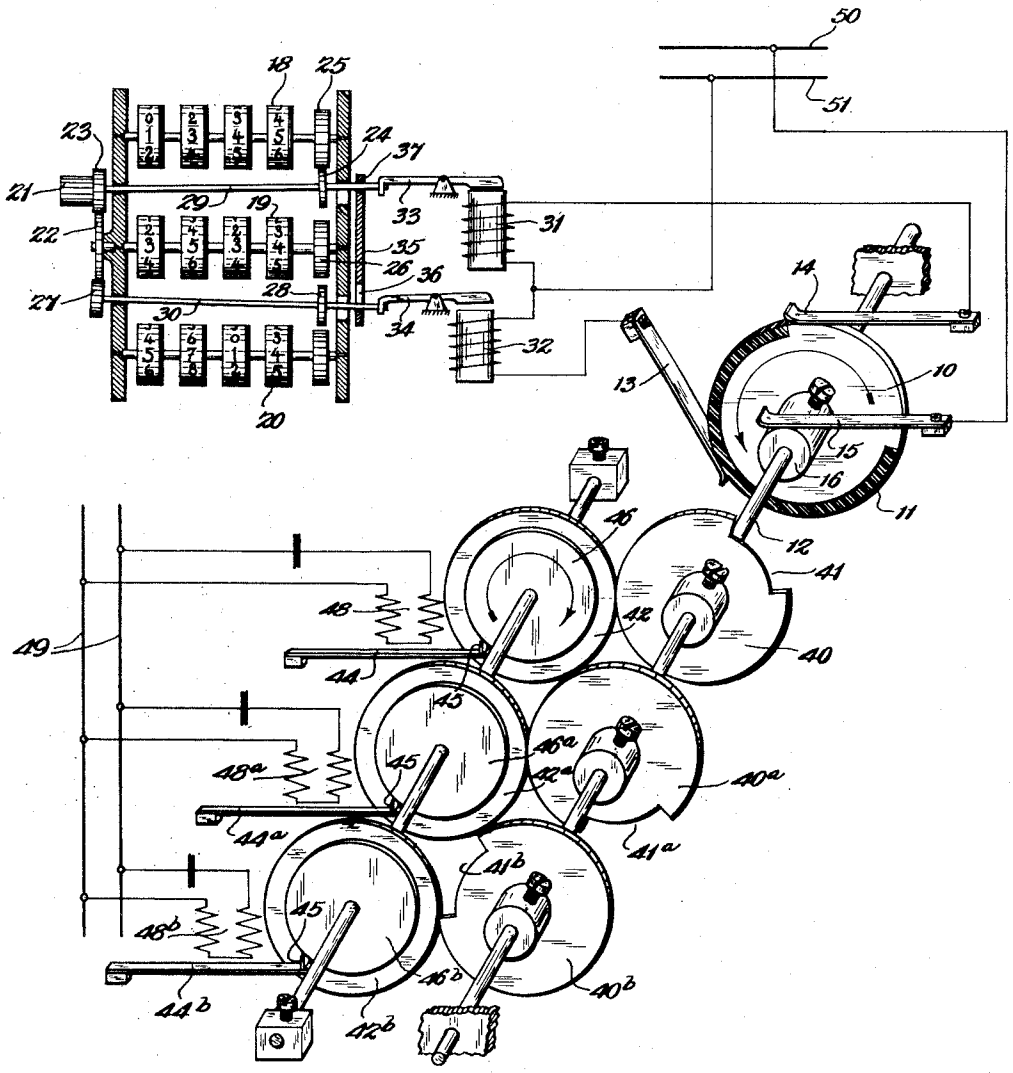
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SWITCHING APPARATUS

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SWITCHING APPARATUS

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2 Claims. (Cl. 200—17)

The present invention relates to distributors or switching apparatus, and more particularly to such an apparatus adapted for use in connection with electricity meters controlled by frequency.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates one embodiment of the invention, and together with the description, serves to explain the principles of the invention.

The single figure of the drawing is a diagrammatic view illustrating the present preferred embodiment of the invention as applied to the control of a multiple-rate electricity meter.

The present invention has for its object the provision of an improved and novel distributor or switching mechanism particularly adapted for use in controlling multiple rate meters. A further object of the invention is the provision of a switching apparatus in which the operation of the distributor is effected by actuation at a predetermined frequency and the distributor can be moved from that position only by actuation at a different frequency or can be returned to its original position only after actuation at a different frequency. Still another object of the invention is the provision of a frequency controlled distributor which is reliable and positive in its operation and is not easily placed out of adjustment.

The present embodiment of the invention, illustratively shown in connection with a multiple rate electricity meter, comprises a rotatable switching element, which controls the distribution of current to a plurality of branch circuits, and is rotated by means of a shaft carrying a plurality of mutilated gears, the mutilated portions being staggered relative to each other. Means are also provided for driving the mutilated gears, and as embodied, a plurality of selectively operated resonant reeds, each responsive to a different frequency are provided which selectively drive gears meshing with the mutilated gears, so that as any one of the reeds is vibrated at its resonant frequency the mutilated gear and rotatable switching element are driven until the mutilated portion of the gear reaches the driving gear. After reaching this position, the rotatable switching element is moved only by vibration of another of the resonant reeds at its resonant frequency. In the illustrative embodiment, the mutilated portions of the gear correspond with definite switching positions and insure proper positioning of the rotatable switching element.

It will be understood that the foregoing general description and the following detailed description as well, are exemplary and explanatory of the invention, but are not restrictive thereof.

Referring now in detail to the present preferred and illustrative embodiment of the invention, the switching element preferably comprises a rotatable disc 10 of conducting material provided with an insulated portion 11 extending for about 240° on its periphery, the disc being rotatably mounted by means of the shaft 12 to which it is securely fastened. A pair of brushes 13 and 14 contact with the periphery of the disc 10 and these are arranged slightly less than 120° apart, so they can both contact with the conducting portion of the edge of the disc when the disc is properly positioned. A third brush 15 is provided and contacts with the metallic hub 16 of disc 10 so that a circuit is established through it whenever brush 13 or 14 contacts with the conducting portion of disc 10.

As illustratively shown, the multiple rate meter may comprise three totalizing registers 18, 19 and 20 of conventional construction adapted to be driven from an electricity meter not shown. The meter drives pinion 21 which in turn drives gear 22 through pinion 23. Mounted on the same shaft 29 as pinions 21 and 23 is a pinion 24 which may be moved alternatively into engagement with gear 25 or 26 so as to drive either of the two upper totalizing registers 18 or 19. Another pinion 27 is similarly mounted on an oscillatable shaft 30 which also carries pinion 28 adapted to be moved into driving engagement with either of the two lower registers 19 or 20 alternatively. For shifting the pinions 24 and 28 from driving engagement with one of the registers to driving engagement with another, electromagnets 31 and 32 are provided and pivoted armatures 33, 34 carry the bearings for the outer movable ends of the shafts 29, 30, so that as a magnet is energized a pinion is raised, and when the magnet is de-energized, the pinion drops. For lifting pinion 28 out of driving engagement with a lower totalizing register 20, a slidable plate 35 is mounted at one side of the register frame and is provided with a slot 36 to receive the lower pinion shaft 30 and with a small hole 37 only slightly larger than the upper shaft, so that as the upper

shaft 29 is raised, the lower shaft 30 is raised out of engagement with the driving gear for the lower train, while when the upper pinion 24 is in its lower position, the lower pinion 28 may be moved in driving engagement with either of the totalizing registers 19 or 20.

For driving the rotatable switching element, a plurality of mutilated gears 40, 40*a*, and 40*b* are provided, securely fixed on shaft 12 with their mutilated portions 41, 41*a*, 41*b*, staggered relatively to each other and preferably corresponding with definite switching positions of the rotating switching element 10.

For driving the mutilated gears, and thereby the rotatable switching element, a plurality of frequency-actuated means are provided, equal in number with the mutilated gears and the switching positions of the switching element, each of these frequency-controlled means being responsive to a predetermined resonant frequency which is different from that to which the other frequency-controlled means are responsive.

The frequency-controlled means each comprise a gear 42, 42*a* or 42*b* rotatably mounted on shaft 43 and fixedly secured to a driving disc 46, 46*a*, 46*b* which is actuated and driven by its respective resonant reeds 44, 44*a* or 44*b*. Each of the resonant reeds near its free end is provided with a driving tongue 45 which contacts with the driving disc. As the reed is vibrated at its resonant frequency, it drives the corresponding disc in the direction of the arrow. Electromagnets 48, 48*a*, 48*b* are provided adjacent to the resonant reeds and capacitatively coupled to the controlling circuit 49 so that as the controlling current is supplied to the mains the magnets are energized.

Driving gears 42, 42*a* and 42*b* mesh with their respective mutilated gears 40, 40*a*, 40*b* and drive the mutilated gears until thrown out of mesh therewith, due to the mutilated portion 41, 41*a*, or 41*b*, thereby stopping the rotatable switching element 10 at one of the definite switching positions. This prevents its being moved therefrom until another one of the resonant reeds has been vibrated, to cause the mutilated gear again to be moved into meshing position with its driving gear.

In operation, a current having a frequency of sixty cycles, for example, might be impressed upon the electromagnet 48 to cause gear 42 to be rotated until mutilated gear 40 was positioned with its mutilated portion 41 adjacent to driving gear 42, thereby positioning the rotatable switching element with the brushes 13 and 14 in contact with the conducting portion of the periphery of disc 10 and establishing a circuit from main 50 to brush 15 through disc 10 to brushes 13 and 14 through electromagnets 31 and 32 and out to main 51. This would cause pinions 24 and 28 to be raised to totalizing registers 18 and 19. The driving of these registers by the meter continues until the resonant frequency to which reed 44*a* responds is impressed upon the driving electromagnet 48*a*. When it is desired to change the register being operated, the frequency corresponding to reed 44*a*, 80 cycles for example, is impressed upon the controlling circuit 49, causing gear 42*a* to rotate, which results in disc 10 being rotated until brushes 13 and 14 contact with the insulating member 11 carried by the disc, thereby de-energizing the magnets 31 and 32, dropping the pinions 24 and 28 into contact with gears for totalizing registers 19 and 20. This driving continues until the third controlling frequency, say 100 cycles, is impressed on the magnet 48*b*, driving resonant reed 44*b*, gear 42*b*, and mutilated gear 40*b* until they are positioned in the position shown in the accompanying drawing, at which time electromagnet 31 is energized, and totalizing register 18 is driven.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. Switch operating mechanism including in combination a shaft, a plurality of mutilated gears thereon, said mutilated gears having their mutilated portions staggered relative to each other, driving gears meshing with the mutilated gears, and means for selectively operating the driving gears, whereby the shaft is brought to a definite position by operation of a driving gear and is moved from that position only by operation of another of the driving gears.

2. Switch operating mechanism including in combination a shaft, a plurality of mutilated gears thereon, said mutilated gears having their mutilated portions staggered relative to each other, driving gears meshing with the mutilated gears and resonant reed mechanisms, selectively responsive to different actuating frequencies for operating the driving gears, whereby actuation by each of said frequencies rotates the shaft to a different position, and the shaft is rotated therefrom only by actuation at a different frequency.

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