

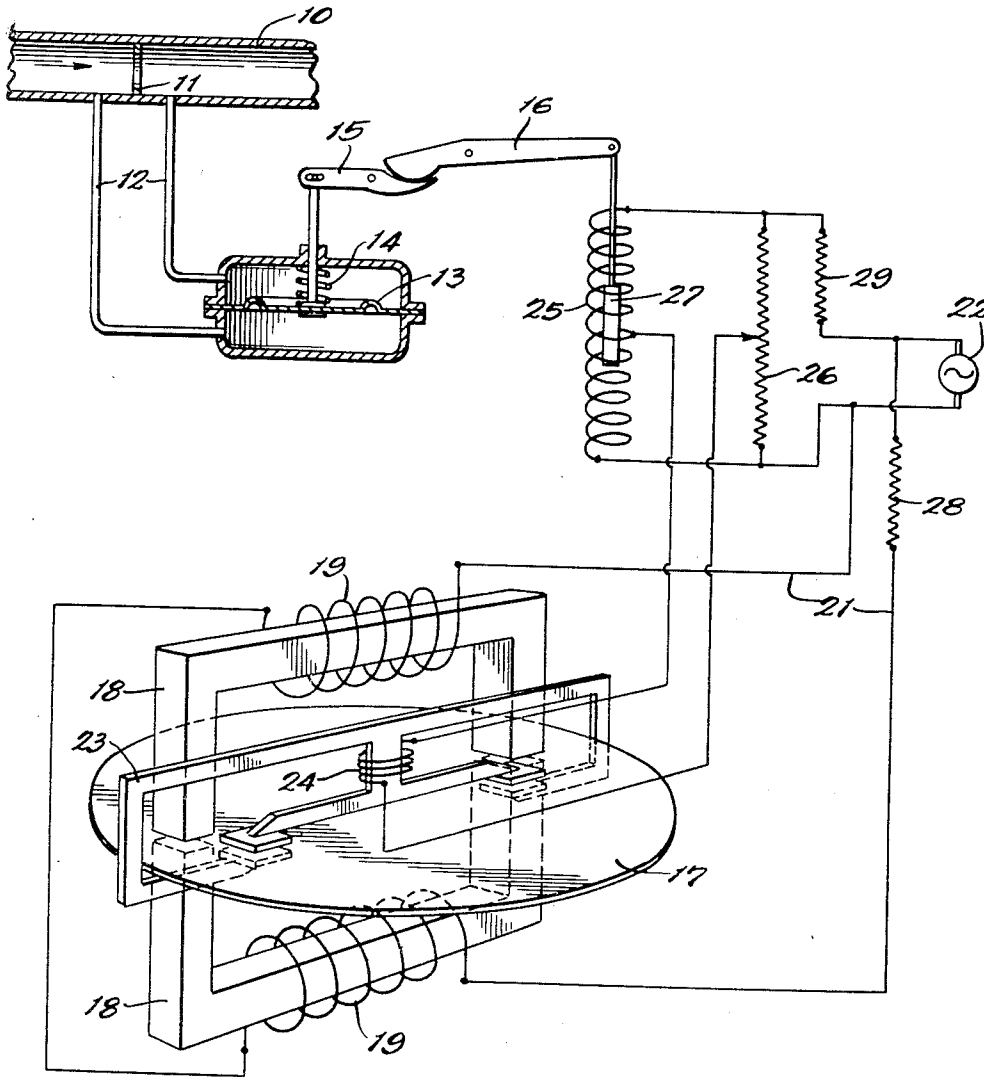
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ELECTRIC INTEGRATING APPARATUS

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ELECTRIC INTEGRATING APPARATUS

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3 Claims. (Cl. 177—351)

1 This invention relates to electric integrating apparatus and more particularly to apparatus for electrically integrating changes in a physical condition such as flow, pressure, temperature, and the like.

One of the objects of the invention is to provide electric integrating apparatus which is ordinarily compensation for changes in both voltage and frequency.

Another object is to provide electric integrating apparatus in which frequency compensation is accomplished by connecting a simple resistor in series with one of the electromagnets of the apparatus. The resistance is of such value as to produce equal shifts in flux phase positions in the two magnets of the apparatus in response to frequency changes so that the relative flux phase positions remain constant at all times.

Still another object is to provide electric integrating apparatus in which the supply paths to the two magnets have equal impedances so that voltage changes will be ordinarily compensated.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which

The single figure is a diagrammatic view of an electric integrating apparatus embodying the invention.

The apparatus, as shown, is adapted to integrate a flow of fluid through a conduit 10 which is provided with a restriction 11. The opposite sides of the restriction are connected through pipes 12 to the opposite sides of a flexible diaphragm 13 which is urged in one direction by a spring 14. With this construction, which is intended to be illustrative only of any type of condition measuring device, the diaphragm will take a position which is indicative of the square of the flow through the conduit. The diaphragm may operate a cam lever 15 which engages a second lever 16 through cam surfaces shaped so that the end of the lever 16 will move in direct proportion to changes of flow through the conduit.

The integrating apparatus comprises an electric totalizing mechanism of the type more particularly described and claimed in the patent to Freeman No. 1,768,553. This apparatus includes a rotatable mounting disc 17 of conducting material which is symmetrically mounted between the poles of electromagnet cores 18 carrying series connected windings 19. The windings 19 may be connected by wires 21 to an alternating current source 22.

A second magnet core 23 is mounted adjacent

2 the disc and is formed with poles on the opposite sides of the disc closely adjacent the poles of the cores 18. The core 23 carries a winding 24 which may be variably energized from the source 22 to control rotation of the disc.

As explained in the Freeman Patent No. 1,768,553, the disc 17 is accelerated by the force produced by both the cores 18 and the core 23 and is retarded in response to the flux produced by the cores 18 only. The speed of rotation of the disc will, therefore, depend entirely upon variations in the fluxation in the core 23 in response to changes in the current in the winding 24.

15 The current in the winding 24 is controlled by a bridge circuit including a center tapped inductance coil 25 and a center tapped resistance 26 connected in parallel to the source 22. The center taps are connected to the winding 24 and may be adjustable for initially calibrating the bridge. The bridge output is varied by a core 27 moveable longitudinally in the winding 25 and connected to the lever 16 to be moved thereby. As the core shifts to one side or another of a central position, 25 the voltage supplied to the winding 24 will be varied so that the current in this winding will be substantially directly proportional to the flow through the conduit 10 and the disc 17 will have a speed which is also directly proportional to the flow through the conduit. The source 22 may be an ordinary commercial source of alternating current and is subject to fluctuations in both frequency and voltage. In the circuit as so far described changes in frequency will cause a phase shift in the winding 24 and will produce very little phase shift in the windings 19. To compensate for this effect, a resistor 28 is connected in series with one of the wires 21 and is of such a value relative to the inductance of the winding 24 that it will cause a phase shift in the winding 24 in response to frequency changes, which is the same as the phase shift in the windings 19. With this construction, the relative phase positions of the currents flowing in the windings 19 and 24 and consequently of the fluxes produced by these windings will remain constant.

Voltage changes in the source will react equally on the two windings so that they will cancel assuming that the impedances in the two circuits are equal. Any inequality in the total circuit impedances resulting from inclusion of the resistor 28 in circuit with the winding 24 may be balanced by a resistor 29 in series between the bridge circuit and the source. This resistor may have a

value such as to balance the circuit impedances so that voltage fluctuations will cancel out and will not affect the speed of rotation of the disc 17.

While one embodiment of the invention has been shown and described in detail, it will be understood that it is illustrative only and is not intended to be a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. Electric integrating apparatus comprising a plurality of electromagnets, a rotor arranged to move through the fields of the magnets, means variable in response to a condition to be integrated to connect one of the magnets to an alternating current source, said means varying the voltage supplied to said one of the magnets thereby to vary rotation of the disc in response to changes in the condition, a circuit connecting another of the magnets to the source, a compensating resistor in series in the circuit to compensate the apparatus for frequency changes in the source, and a balancing resistor in series between the source and the variable means to balance the effect of voltage changes on the magnets.

2. Electric integrating apparatus comprising a plurality of electromagnets, a rotor arranged to move through the fields of the magnets, one of the magnets being supplied with a variable volt-

age to vary rotation of the disc and the other magnet being supplied from the same source with a substantially constant voltage, and a compensating resistor in series with said other magnet to compensate the apparatus for changes in frequency in the source.

3. Electric integrating apparatus comprising a plurality of electromagnets, a rotor arranged to move through the fields of the magnets, a circuit to connect one of the magnets to an alternating current source, a second circuit connecting another of the magnets to the source, a compensating resistor in series in the second circuit to compensate the apparatus for frequency changes in the source, and a balancing resistor in series in the first named circuit to balance the effect of voltage changes on the magnets.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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