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RESONANT SWITCH SYSTEM

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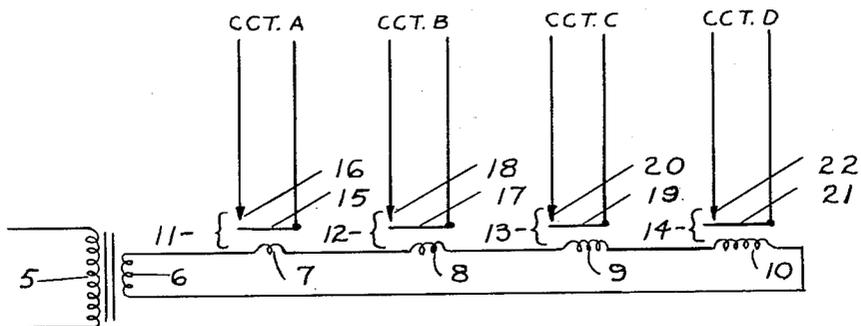


FIG. 1

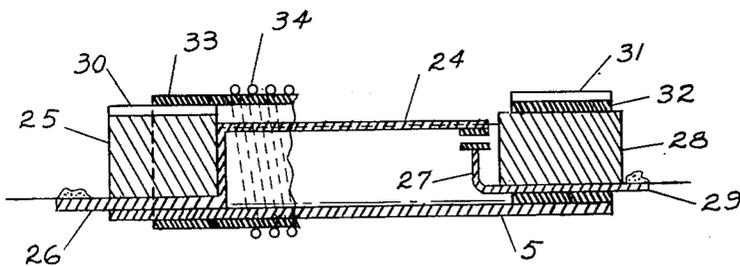


FIG. 2

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RESONANT SWITCH SYSTEM

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4 Claims. (Cl. 175-320)

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This invention relates to electric switches having resonant armatures which close electric circuits when alternating currents having the frequencies to which their armatures are resonant, are supplied through their energizing coils, and which are known generally as resonant switches.

Resonant switch systems each having plurality of switches resonant at different frequencies, and energized from a variable frequency, electric current source, have been proposed for communications and other purposes. Disadvantages of such systems have been that the switches resonant at different frequencies have not had the same sensitivity, and they have not operated efficiently.

This invention provides a resonant switch system having a plurality of switches resonant at different frequencies, the energizing coils being connected in series with the secondary of a transformer having its primary connected to a variable frequency, electric current source.

A feature of the invention is that the switches resonant at the higher frequencies have more turns of wire in their energizing coils for maintaining the same sensitivity in all of the switches.

Another feature of the invention is that the contacts of the switches resonant at the higher frequencies, are more closely spaced for reducing the power required for maintaining the same sensitivity in all of the switches.

Another feature of the invention is that the transformer to the secondary of which, the energizing coils of the switches are connected, is a step-down transformer whereby the current through the coils is increased and their number of turns is reduced.

Another feature of the invention is that the coils of all of the switches of the system, have the same resistance whereby switches having different resonant frequencies can be substituted without changing the resistance of the system.

An object of the invention is to increase the efficiency of resonant switch systems.

Another object of the invention is to maintain the same sensitivity in all of the switches in a resonant switch system.

Another object of the invention is to provide a resonant switch system adapted to receive a variety of switches resonant at different frequencies without loss in sensitivity or efficiency.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a circuit schematic illustrating a resonant switch system embodying this invention, and

Fig. 2 is a side elevation, in section, illustrating

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one form of resonant switch which may be used in the system of Fig. 1.

Referring first to Fig. 1, the transformer primary winding 5 is adapted to be connected to a source of variable frequency current. The secondary winding 6 is connected in series with the energizing coils 7, 8, 9 and 10 of the resonant switches 11, 12, 13 and 14 respectively.

The armature 15 of the switch 11 may be resonant at 100 cycles per second, for example, and when a current having that frequency is supplied to the primary winding 5 of the transformer, the current through the coil 7 will cause the armature 15 to strike the contact 16 closing circuit A. Likewise the armatures 17, 19 and 21 of the switches 12, 13 and 14 respectively, may be resonant at 200, 300 and 400 cycles per second, for example, and when a current of 200 cycles per second is applied to the transformer primary, the current through the coil 8 will cause the armature 17 to strike the contact 18 closing the circuit B. When a current having a frequency of 300 cycles per second is applied to the transformer primary, the current through the coil 9 will cause the armature 19 to strike the contact 20 closing the circuit C. When a current having a frequency of 400 cycles per second is applied to the transformer primary, the current through the coil 10 will cause the armature 21 to strike the contact 22 closing the circuit D.

Referring now to Fig. 2 which illustrates a preferred form of resonant switch which may be used, the reed armature 24 of magnetic metal is supported as a cantilever beam with one end between the metal block 25 and the base 26, and with its other end spaced from the contact strip 27 which is supported between the permanent magnet 28 and the insulating strip 29 which is held against the base 26. The channel extension lips 30 and 31 extend over the block 25 and the insulating strip 32 on the magnet 28 and hold the described assembly in position.

The cylindrical coil form 33 extends around the armature 24 and has wound thereon, the wire 34 forming the energizing coil of the switch. For different resonant frequencies, the armature 24 would have different lengths.

When alternating current having the frequency to which the armature 24 is resonant, is passed through the coil, the armature 24 is magnetized and is attracted to and repelled by the contact strip 27 which is magnetized by the magnet 28, and strikes the strip 27 closing a circuit in which the armature and the contact strip are connected.

More power is required for operating the switches that are resonant at the higher frequencies, and to maintain the same sensitivity in all the switches, the number of turns in the coil 8 of the switch 12 is larger than the number of turns in the coil 7 of the switch 11; the number of turns in the coil 9 of the switch 13 is larger than the number of turns in the coil 8 of the switch 12, and the number of turns in the coil 10 of the switch 14 is larger than the number of turns in the coil 9 of the switch 12.

The power required for operating the resonant switches when they have the same contact spacing, varies with the cube of the frequency to which they are resonant. This power may be reduced by decreasing the contact gap, and accordingly for reducing the number of energizing coil turns for maintaining the same sensitivity in all of the switches; the spacing of the armature 17 from the contact 18 is less than that between the armature 15 and the contact 16; the spacing of the armature 19 from the contact 20 is less than that between the armature 17 and the contact 18, and the spacing between the armature 21 and the contact 22 is less than that between the armature 19 and the contact 20.

The coils having fewer turns are wound with smaller diameter wire whereby the resistance of all coils is the same. Thus switches having different resonant frequencies can be substituted for other switches without changing the resistance of the system.

For reducing the number of energizing coil turns required, a step-down transformer is used for providing increased current.

A particular advantage of this invention is that different switches having different resonant frequencies can be substituted for other switches having other resonant frequencies without affecting the sensitivity or the efficiency of the system.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not

limited to the exact apparatus and arrangement of apparatus illustrated, as modifications thereof may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. A resonant switch system comprising a first resonant armature, a first contact touched by said armature when it is vibrated at its resonant frequency, a second armature resonant at a frequency higher than that to which said first armature is resonant, a second contact touched by said second armature when it is vibrated at its resonant frequency, a first energizing winding for said first armature, and a second energizing winding for said second armature connected in series with said first winding, said second winding having more turns than said first winding.

2. A resonant switch system as claimed in claim 1 in which the first and second windings have substantially the same resistance.

3. A resonant switch system as claimed in claim 1 in which the spacing between the second contact and the second armature is less than that between the first contact and the first armature.

4. A resonant switch system as claimed in claim 3 in which the first and second windings have substantially the same resistance.

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