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MAGNETIC SWITCH

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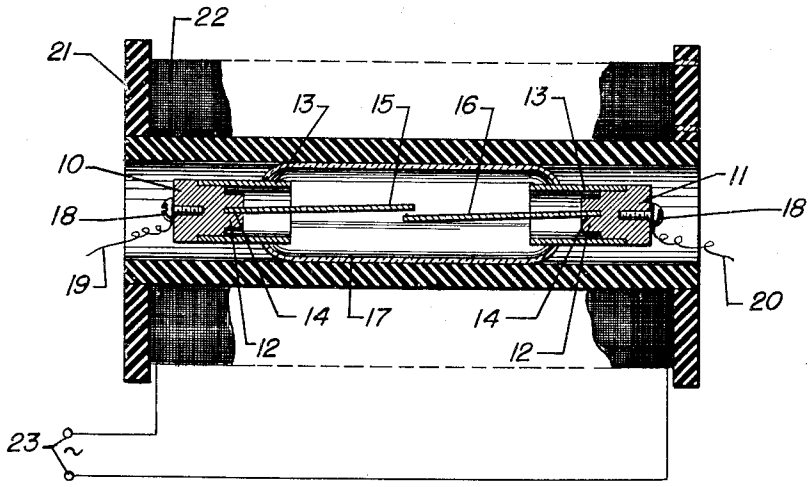

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MAGNETIC SWITCH

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1 Claim. (Cl. 200—87)

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This invention relates generally to magnetic switches, and in particular to such switches of the resonant type which are constructed so as to operate at a particular frequency only.

The general object of the invention is to provide a switch of the class described containing a tuned reed contact member and which will be responsive only when the reed is subjected to a magnetic field of a frequency substantially equal to the natural or resonant frequency of the reed.

A specific object is to provide a magnetic resonant switch containing a pair of overlapped tuned reed contacts which are arranged to be flexed towards each other when subjected to a magnetic field, operation of the switch, i. e., engagement of the contacts, being obtained only when the frequency of the magnetic field is substantially the same as the resonant frequency of the reeds.

Another specific object is to provide an electromagnetic resonant switch including a tuned reed contact mounted within a coil winding and which will be operated to close a circuit only when the winding is so energized that the reed is subjected to periodic magnetization at a rate substantially equal to the resonant frequency of the reed.

A further specific object is to provide an electromagnetic switch of the type employing a tuned reed contact in which the reeds are readily removable whereby they may be readjusted or replaced.

These and other objects of the invention will become more apparent from the detailed description to follow and from the accompanying drawing, the single figure of which is a longitudinal sectional view of a preferred embodiment of the invention.

Referring now to the drawing, the resonant magnetic switch includes a pair of cylindrically shaped end plugs 10 and 11 of metal such as brass. Each of these is provided with a portion 12 of slightly reduced diameter upon which is fitted a sleeve 13 of metal. This latter must have a good metal-to-glass sealing characteristic, and I have found that an alloy sold under the trade-name of Kovar is quite satisfactory.

The rigid plugs 10 and 11 forming a firm foundation are also provided with slots 14 into which are inserted and secured rectangular strips or reeds 15 and 16. These strips are made from magnetizable metal, and I have found that an alloy sold under the trade-name Carpenter #49 works very well. A tubular glass envelope 17 is provided to hermetically seal the reeds 15 and 16,

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the seal being made at the ends of the envelope 17 to the Kovar sleeves 13.

Screws 18, at each end of the plugs 10 andd 11 may serve as binding posts for the leads 19, 20 of an electrical circuit which is to be controlled by switch action. It will be readily understood that maximum resonant effects and therefore greater efficiencies are obtained by securing the reeds 15 and 16 in the rigid mass of plugs 10 and 11.

The components of the switch so far described are carried within the cored center of a spool 21 which is made of non-magnetic material such as Bakelite and, it will be readily seen, are removable therefrom for adjustment or replacement. A coil of wire 22 is wound upon spool 21 and, in the illustrated embodiment, is adapted to be energized from a source of alternating current applied to terminals 23 when a closing operation of the switch is desired.

The switch may be made frequency selective by constructing the reeds 15 and 16 in such a manner that their natural resonant frequency bears a definite relation to the frequency of the electromagnetic field produced by the coil 22 when the latter is energized by alternating current. For example, if the switch is to be so constructed that its contacts (the inner and overlapped ends of reeds (15 and 16) close only when the frequency of the alternating current applied to coil 22 is 60 cycles, the length and cross-sectional area of the cantilever supported reeds 15 and 16 will be so selected that the natural resonant frequency of each of these reeds is 120 cycles per second. Thus when a 60 cycle A. C. current is applied to coil 22, the electromagnetic field produced by this current will reverse itself at a rate of 120 cycles per second. With each reversal of the electromagnetic field, the inner ends of reeds 15 and 16 will attract each other. Since the rate of this mutual attraction is the same as t' e natural resonant frequency of the reeds, t. e amplitude of their vibration will be considerable and will be sufficient to cause them to come into contact with each other and thereby close any electrical circuit which is connected through the switch. In other words, the magnetic flux produced when coil 22 is energized will link the reeds 15 and 16 twice for each cycle of the alternating current, and the reeds will therefore be attracted at a rate of 120 times per second.

It is recognized, of course, that in the referred-to example, current frequencies both lower and higher than 60 cycles (120 reversals of the magnetic field per second) will create a force of

attraction between reeds 15 and 16. However, the initial spacing between the overlapped inner end portions of these reeds and the operating voltage applied to coil 22 can be so selected that although movement of each end portion will occur for any frequency, only a current frequency which causes the reeds to vibrate at substantially their frequency of resonance will be effective to produce an amplitude of motion sufficient to cause the inner ends of the reeds to actually make contact with one another. Accordingly, the switch will close at an alternating current frequency of substantially 60 cycles but will remain open for other current frequencies.

In conclusion, it will be understood that while the invention has been illustrated with respect to its application to an electromagnetic switch adapted to be operated on alternating current, it is evident that the principles of the invention may be applied equally as well to switches of similar construction, but adapted for operation on pulsating direct current or oscillation of a permanent magnetic field. Accordingly, the scope of the invention is indicated by the appended claim rather than by the foregoing description of the alternating current version of the switch.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

A frequency selective electromagnetic switch comprising a sealed vessel, a pair of sleeve members secured in opposite ends of said vessel, respectively, a rigid plug removably mounted on each of said sleeve members, a pair of magnetic reed contact members each having one end rigidly mounted in one of the plugs, said reed members being of such dimensions as to have a preselected resonant frequency, and a coil surrounding said vessel for magnetizing said reed members, said reed members being initially spaced from and overlapping each other in such manner that magnetization thereof only at substantially said resonant frequency will effect closing of the contacts thereof.

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