VIBRATING-BLADE RELAYS WITH ELECTRO-MECHANICAL RESONANCE

Georges Quenouille, Sevres, France, assignor to Compagnie pour la Fabrication des Compteurs et Material d/'Eleves a Gaz, Montrouge, France, a joint-stock company of France

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The present invention relates to improvements in relays with vibrating blades having electro-mechanical resonance and set in operation by the emission of currents which carry distant-control signals at musical frequencies super-imposed on the current of the electricity supply network. Amongst these relays, the invention relates especially to those which are tuned to relatively-low frequencies (for example of the order of 200 cycles). It is known that in order to ensure a suitable propagation of carrier currents at musical frequencies in supply systems in which condensers are connected at various points, it is desirable that the frequency of these carrier currents should be low. By using on 50-cycle networks relays tuned to 175 cycles (or more generally, where F is the industrial frequency of the network, if relays tuned to a frequency of 3.5 F are used) the influence of the harmonics of the industrial frequency is thus eliminated.

These relays are however liable to be affected by disturbing potentials, the frequency of the signal equal to that to which the said relays are tuned or in the vicinity of that frequency, and which may be produced for example as a consequence of an abrupt change in the conditions of use of the network (opening or closing of a circuit-breaker, switching-in or disconnecting condensers, etc.). Although these disturbing potentials are damped, their first oscillations may be of high amplitude, so that the blades of the resonance relays start to vibrate for a sufficient period to permit of the relays causing a premature operation of the apparatus which they control.

The invention has the particular object of providing a remedy for these drawbacks.

The relay in accordance with the invention is characterised in that it comprises, in addition to the vibrating blade tuned to the remote-control frequency F and which by its vibrations causes the rotation of a shaft, a second vibrating blade tuned to a frequency F' which is slightly different from the first frequency (for example F' being equal to F±10 cycles) which locks the said shaft when it is set in vibration. The two vibrating blades may be subjected to the influence of the same excitation circuit tuned to the remote-control frequency.

The locking of the shaft by the blade which is tuned to the frequency F' slightly different from the remote-control frequency, is carried out in an almost instantaneous manner, this blade, when the amplitude of its vibrations is sufficiently great, causing the continuous deflection of a lever having a natural period which is large compared with that of the blade, and one of the extremities of which comes into contact with a ratchet wheel rigidly fixed to the said shaft.

On the other hand, as is current practice in vibrating relays with electro-mechanical resonance, the vibrating blade which is tuned to the remote-control frequency does not cause the execution of the order transmitted until the shaft which it actuates has acquired a sufficiently high speed of rotation for a centrifugal force device, rigidly fixed to the said shaft, to close a contact or to drive a shaft which carries out an electrical or mechanical operation.

On the occurrence of a remote-control emission of frequency F, the blade tuned to this frequency is set in resonance for a sufficient time to cause, by its vibrations, the rotation of the shaft, whilst the other blade only vibrates very slightly and thus its vibrations have no effect on the locking member of the said shaft.

If a disturbing potential having a frequency equal to the remote-control frequency, or in the vicinity of that frequency, and the first oscillations of which are of large amplitude, is applied to the terminals of the tuned circuit of the relay in accordance with the invention, this relay may be excited by electric shock and its two vibrating blades may be set into vibrations. The rotation of the shaft is however very rapidly stopped before the centrifugal force device fixed on the case said shaft can cause an unimpaired operation of the apparatus which is controlled by the relay. In fact, the locking of the shaft by the blade tuned to a frequency close to the remote-control frequency is effected before the blade which is tuned to the remote-control frequency has been able to bring the said shaft to a speed of rotation sufficient to cause operation of the controlled apparatus.

The accompanying drawing shows by way of example and without any implied limitation, one form of embodiment of the object of the invention.

In this drawing, 1 is the energising coil of the magnetic circuit 2 of the relay in accordance with the invention. As is well known, the energising coil is connected in series with a condenser (not shown) to the terminals of the power supply network, this coil and this condenser forming a resonant circuit tuned to the maximum frequency of the remote-control current which is superimposed on the current of the supply network. The magnetic circuit 2 is formed with an air-gap 3 in which are arranged to oscillate the free extremities of two vibrating blades 4 and 5. The other extremities of these blades are fixed to a steel parallelepiped 6. The blades 4 and 5 are polarised by means of a magnet 7, one of the poles of which is fixed to the member 6 and the other pole is fixed on the magnetic circuit 2.

The blade 4 is mechanically tuned to the remote-control frequency F. Its free end carries a pawl 8 which serves to drive a wheel 9; this wheel drives, by its shaft 10, the mechanism which executes the distant-control order. This mechanism is not shown and may be of any known type. A stop 11 limits the amplitude of the vibrations of the vibrating blade 4.

The blade 5 is mechanically tuned to a frequency F' which is slightly different from the remote-control frequency F (F'=F±10 cycles). The free extremity of this blade is fitted with a finger 12 on which is supported a bent elastic lever 13 when the said blade 5 is in the position of rest. The extremity of this lever is directly opposite a ratchet wheel 14 fixed on the shaft 10 in the same way as the wheel 9. The other extremity of this lever is rigidly fixed to the magnetic core 2 by means of a member 15. The natural period of the lever 13 is large as compared with that of the vibrating blade 5, so that the vibrations of the blade 5 produce a continuous displacement of the lever 13 in the direction of the ratchet wheel 14. If the vibrations of the blade 5 are of large amplitude, the extremity of the lever 13 then moves to lock the ratchet wheel 14 for the period of duration of these vibrations.

The operation of this relay is as follows:

On the occurrence of a remote-control emission having a frequency F corresponding to the tuned frequency of the vibrating blade 4 and of the tuned circuit of the relay, the blade 4 is set in resonance, and, through the medium of the pawl 8, sets the wheel 9 in rotation and thus drives...
the shaft 10. When this latter has reached a rotational speed which is sufficiently high, it causes the execution of the remote-control order through the intermediary of the centrifugal force device. On the other hand, the blade 5 vibrates only very feebly, so that the permanent displacement of the lever 13 is insufficient for its free extremity to come into contact with and lock the ratchet wheel 14.

If a disturbing potential having a frequency equal to or in the vicinity of the remote-control frequency and the first oscillations of which are of large amplitude, is applied to the terminals of the tuned circuit of the relay, the two vibrating blades are set in oscillation. The amplitude of vibration of the blade 5 is then sufficient to cause the lever 13 to be displaced very rapidly, so that its free extremity locks the ratchet wheel 14. The shaft 10, which has begun to rotate as a result of the action of the pawl 8, driven by the vibrations of the blade 4, on the wheel 9, is stopped well before its speed of rotation has reached a value sufficient for the centrifugal force device which is driven by it to cause the actuation of the remote-control device. This actuation cannot thus take place as a result of a disturbing potential having a frequency equal to the remote-control frequency or to a frequency in the vicinity of that of the remote-control system, and the first oscillations of which have an amplitude sufficient to cause the blade tuned to the remote-control frequency to vibrate.

I claim:

1. In combination, a rotatable member having driving-means and locking means, means resonant under the action of a potential of constant amplitude and of a determined frequency for actuating said driving-means of said rotatable member, in order to cause the latter to rotate at a predetermined speed, and means resonant under the action of disturbing potentials of a higher amplitude than that of said constant potential, but quickly damping, and of a frequency equal to, or near, that of said constant potential for actuating said locking means of said rotatable member, said locking means operating before said rotatable member has reached its predetermined speed.

2. The combination according to claim 1, wherein the means resonant under the action of the potential of con-

stant amplitude and determined frequency for rotating said rotatable member, comprises a vibrating blade tuned to said determined frequency.

3. The combination, according to claim 1, wherein the means resonant under the action of said disturbing potentials comprises a vibrating blade tuned to a frequency slightly different from that of said determined frequency.

4. The combination according to claim 1, wherein the driving means of the rotating member actuated by said means resonant under the action of a potential of constant amplitude and a determined frequency comprises a wheel keyed to said rotatable member, and said locking means of the rotating member actuated by said means resonant under the action of disturbing potentials, comprises a ratchet wheel keyed to said rotatable member.

5. For use with a remote-control emission device having a predetermined frequency, a control axle and a wheel fixed on said axle, a relay comprising a resonant circuit including a first vibrating blade and a second vibrating blade, said first blade adapted to be tuned to the predetermined frequency and operatively associated with the wheel to rotate the control axle, said second blade adapted to be tuned to a frequency different from the predetermined frequency, a ratchet wheel adapted to be fixed on the control axle, and a lever operatively associated with said second blade and said ratchet wheel and having a relatively large period with respect to that of the second blade so that when the second blade is vibrated by the resonant circuit the shifting of the lever induced by the vibrations of the second blade is not sufficient to engage the lever with the ratchet wheel but when the second blade is actuated by a source of said different frequency the amplitude of its vibrations is increased so that the lever is shifted into locking engagement with said ratchet wheel to prevent rotation of the control axle.

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