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APPARATUS FOR MAINTAINING SYNCHRONISM

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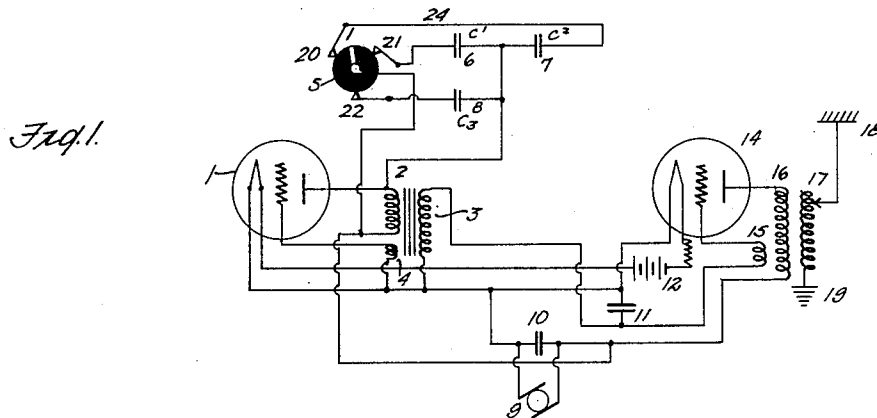


Fig. 2.

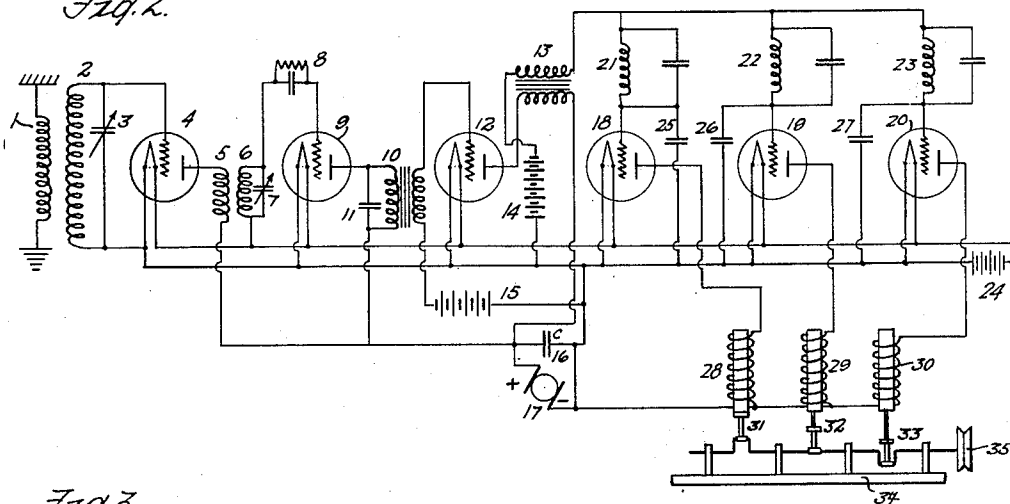
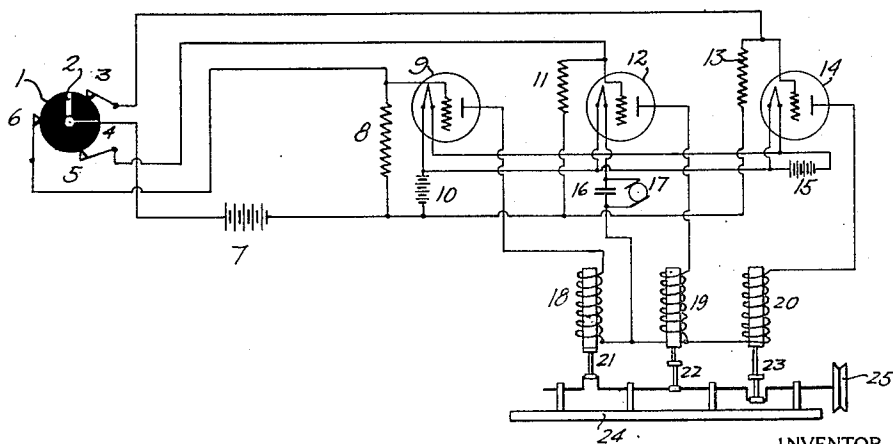


Fig. 3.



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APPARATUS FOR MAINTAINING SYNCHRONISM

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This invention relates to a method and apparatus for maintaining synchronism between a transmitting and receiving station; it relates particularly to a distant controlled motor for use in a synchronous maintaining system as used in "radio vision", so called, and in wired transmission.

An object of the invention is to provide a means for automatically maintaining synchronism between a radio transmitting station and a receiving station for such uses as telephotograph transmission, television and other radio transmissions.

A further object is to provide a method and apparatus for automatically maintaining a synchronism between transmitter and receiver where the control currents are conducted by a wire line.

Another object is to provide a motor for maintaining synchronism which motor is controlled either by wire or wired line control currents.

Generally, the objects include a system and apparatus for automatically synchronizing the transmission and reception of any type of picture, printed matter, etc. Other objects will be apparent from the disclosure.

In the transmission of pictures, printed matter, etc. by radio or wire heretofore, considerable difficulty has been experienced in automatically maintaining a synchronism between the transmitting and receiving ends, with resultant blur and imperfection in detail.

By my invention, I obtain as absolute a synchronism as is desired by the following method: When radio transmission is used, I provide in the receiving end, a motor having its field divided into several sections and having its actuating current for the said fields, independently controlled by a series of vacuum tubes, one for each field. In association, in the receiving end, is a radio receiving apparatus of the usual type, such as one having radio frequency, detector and audio frequency stages, these being ahead of the tubes controlling the various fields of the motor. The output of these motor field control tubes is in turn controlled by a synchronizing commutator at the transmitting sta-

tion. At the transmitting station is the usual radio frequency oscillator and an audio frequency modulator. In order to obtain synchronism by having the response motor follow a transmission control contactor, several audio frequencies are transmitted and the response device of the invention, the vacuum control tubes in the receiving circuit, are tuned to the various audio frequencies which correspond to the different portions of the control device.

Where a line wire is used for transmitting the current, the control current can be direct current but when radiation antennae is employed, or for radio television uses, the control current is an audio frequency modulated radio frequency current.

In order to more specifically describe the invention, reference is made to the accompanying drawing showing desirable arrangements, one for use in radio transmission and one for use in wired transmission.

In Fig. 1 showing the transmitting apparatus, (1) is an audio frequency oscillator tube; (2), (3) and (4) are inductances; (5) is an insulating holder or disc; (6), (7) and (8) are condensers for varying the natural period of the tube output circuit; (9) is a source of plate potential; (10) and (11) are filter condensers; (12) is a source of potential for cathode or filaments; (13) is a rheostat for controlling the filament current in radio frequency oscillator tube (14); (15), (16) and (17) are inductances comprising part of radio frequency oscillator system; (18) is the antennae from which the radio frequency oscillations are radiated; (19) is the ground; (20), (21) and (22) are contacts which connect condensers (6), (7) and (8) to the circuit and which are engaged by rotating segment (24); (23) is an axle or support for segment (24).

In Fig. 2 showing the receiver circuit with distant motor control, inductances (1) and (2) and variable condenser (3) are used to tune the circuit to resonance with the transmitted radio frequency; tube (4) is a radio frequency amplifier; (5) and (6) are inductances and (7) is a tuning condenser; (8) is grid condenser and leak; (9) is the rectifier

or detector tube; (10) is an audio frequency transformer so designed as to have a uniform amplification throughout the audio frequency range used; (11) is by pass condenser; (12) is the audio frequency power tube; (13) is transformer capable of being tuned to the various audio frequency oscillations discharged through it; (14) is potential for supplying a C bias or negative grid potential to the motor control tubes; (15) is potential to maintain audio frequency amplifier at desired negative grid potential; (16) is filter condenser connected across (17) which is source of potential for plate energy supply; (18), (19) and (20) are the relay control tubes which selectively respond to the audio frequencies transmitted; reactance combinations (21), (22) and (23) comprise an inductance and capacitance of such a value that in combination with transformer (13), they will apply a resonant potential to tubes (18), (19) and (20) at audio frequencies corresponding to the transmitted audio frequencies which selectively respond to the audio frequencies transmitted; (24) is filament potential for tubes (18), (19) and (20); (25), (26) and (27) are condensers for shunting grid filament circuit; (28), (29) and (30) are the three sections or fields of a motor, the armatures of which are designated as (31), (32) and (33); (34) is the crank shaft of this motor. (35) is wheel or disc which is rotated at the same speed as rotating disc (5) in Fig. 1.

Fig. 3 shows the system of the invention in use where line or wired transmission is used instead of radiation; (1) is rotating disc which is rotated at the speed of the device with which it is desired to maintain synchronism and to which it can be mechanically or otherwise connected; (2) is the contact making segment attached to (1); (3), (4) and (5) are contactors which are alternately contacted by (2) which is connected by means of brush (6) to neutralizing battery (7); (8), (11) and (13) are resistances in series with respective grid circuits or power tubes (9), (12) and (14); (10) is source of negative grid potential; (15) is the source of filament supply current; (16) is a filter condenser and (17) is the source of plate potential; (18), (19) and (20) are the three sections of a motor, the armatures of which are designated as (21), (22) and (23); (24) is the crank shaft of the motor and (25) is the wheel or disc which is rotated at the speed of (1).

In operation, referring now to Fig. 1, when the radiofrequency oscillator comprising tube (14), inductances (15), (16) and (17) is energized by potential from (12) and (9) for their respective circuits, a radiofrequency oscillation is radiated from antennae (18). The functions of the component parts herein described for both audio and radiofrequency

oscillation are well known to the art and require no further explanation.

The radiofrequency oscillation so generated is modulated at audio frequency by audio frequency oscillator comprising tube (1), inductances (2), (3) and (4) and the natural period of the circuit varies by means of condensers (6), (7) and (8), which devices are connected to the circuit by means of contacts (20), (21) and (22), which are engaged by rotating segment (24). This segment is molded in an insulating holder or disc (5) which is rotated by the device to which it is desired to maintain synchronism with. As the disc (5) is rotated and segment (24) alternately makes contact with the brushes on the peripheral contact, the transmitter radiates radiofrequency oscillations modulated at audio frequency, corresponding to the various condensers contacted with by segment (24).

These radiations are absorbed in the distant receiver circuit (shown in Fig. 2) which is tuned to resonance with the transmitted radiofrequency by means of inductances (1) and (2) and variable condenser (3). Tube (4) allows a radiofrequency amplification and inductances (5) and (6) with condenser (7) allow a resonant and amplified potential to be applied to rectifier or detector tube (9); audio frequency transformer (10) steps up the potential and applies it to audio frequency power tube (12). Transformer (10) is so designed as to have a uniform amplification throughout the audio frequency range used. The output of power tube (12) is applied to transformer (13) which device is capable of being tuned to the various audio frequency oscillations discharged through it by reactance combination (21), (22) and (23). These reactance combinations comprise an inductance and capacitance of such a value that in combination with transformer (13), they will apply a resonant potential to the respective tubes they are connected with; (18), (19) and (20) at audio frequencies corresponding to the transmitted audio frequencies, so that each of the relay tubes (18), (19) and (20) will selectively respond to the audio frequencies transmitted. Potential (14) supplies a C bias or negative grid potential, which reduces the normal plate current in tubes (18), (19) and (20) to a value incapable of sufficiently energizing motor fields (28), (29) and (30) to which they are respectively connected. The armatures (31), (32) and (33) connected to crank shaft (34) are attracted only when the sufficient power output is obtained from the tubes (18), (19) and (20) to which their fields are connected. The tube circuits such as heater and plate supply are energized by sources of potential (17) and (24). Potential (15) is used to maintain audio frequency amplifier at desired negative grid potential.

In view of the fact that the radio frequency oscillation received and amplified and modulated at various audio frequencies corresponding to the position of the rotating segment (5) in transmitter of Fig. 1, and the power tubes (18), (19) and (20) are tuned to these various frequencies, the armatures (31), (32) and (33) are attracted in a manner dependent upon position of segment (25) of transmitter (Fig. 1). The crank shaft rotates at a speed and at a position corresponding to that of disc (5), (Fig. 1). The output of the tubes (18), (19) and (20) is obtained only at the resonant frequency to which their respective input circuit is tuned to, because the resonant potential is only adequate to neutralize the effect of the static negative grid potential supplied by source of potential (14).

In Fig. 3, where line or wire transmission is used instead of radiation, the power tubes (9), (12) and (14) have their grids supplied with a negative potential from source (10) which reduces their respective plate currents to a value inadequate to energize the motor fields (18), (19) and (20). This potential is discharged through a resistance in series with these respective grid circuits namely (8), (11) and (13).

The grids are also connected to the contactors (3), (4) and (5) which are alternately connected to rotating segment (2) to which element is connected the positive terminal of battery (7). When segment (2) contacts with a contactor or brush, a positive potential is applied to the grid circuit, neutralizing the negative potential from source (10) and allows the normal plate current to be discharged through the tube and the corresponding field is energized attracting its armature and the crank shaft is moved to a position corresponding to the tube control and in turn to the position of the segment. The armatures (21), (22) and (23) are alternately attracted in a manner or position corresponding to the contacting of contactors (3), (4) and (5) by segment (2), which segment is connected by means of brush (6) to neutralizing battery (7).

It will be seen, that both in the radio and wired systems, each of the three motor field control tubes has a resonance circuit to their respective grids so that a resonance potential is applied only to these tubes at the frequency to which their input grid circuits are tuned.

The degree of synchronism desired can be controlled by the number of contacts used which in the case of radio transmission, also means the number of audio frequencies transmitted and the corresponding number of tuned audio frequencies. Obviously, the motor will have as many sections or fields as there are contacts.

What is claimed is:

1. A system for obtaining remote control

which comprises a transmitter for generating audio frequency oscillations at various frequencies, a rotating segment connected to and controlling the output of said transmitter, and a receiver means comprising a vacuum tube amplifier, the tubes in said amplifier system being selectively tuned to the respective frequencies generated in the transmitter, the outputs of said tubes being connected to and controlling the fields of a motor, the respective armatures of which are thereby actuated, so as to rotate a shaft of said motor to a position corresponding to that of the rotor segment controlling said transmitter.

2. A system for obtaining remote control which comprises a transmitter having connected thereto a contact-making rotary segment, each contact modulating at a different frequency the oscillations of said transmitter, a vacuum tube amplifier receiving means having a number of tubes corresponding to the number of different frequencies generated by said transmitter, and each of its tubes being respectively tuned to said different frequencies, the outputs of said tubes being connected to and respectively energizing the fields of a motor, the armatures of said fields being actuated as the plate current is discharged through said tubes so as to rotate a shaft of said motor to a position corresponding to that of the rotor segment controlling said transmitter.

3. A system for maintaining synchronism which comprises a control transmitter for generating electrical oscillations at various frequencies, a motor having its field divided into several sections and having the actuating current for each of said sections independently controlled by electron discharge valves, one for each section, said valves constituting part of a receiver and being individually tuned to frequencies corresponding to those transmitted from the control transmitter.

Signed at New York in the county of New York and State of New York this 23rd day of October A. D. 1929.

SAMUEL RUBEN.