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SPEED INDICATOR AND VARIABLE SYNCHRONIZER

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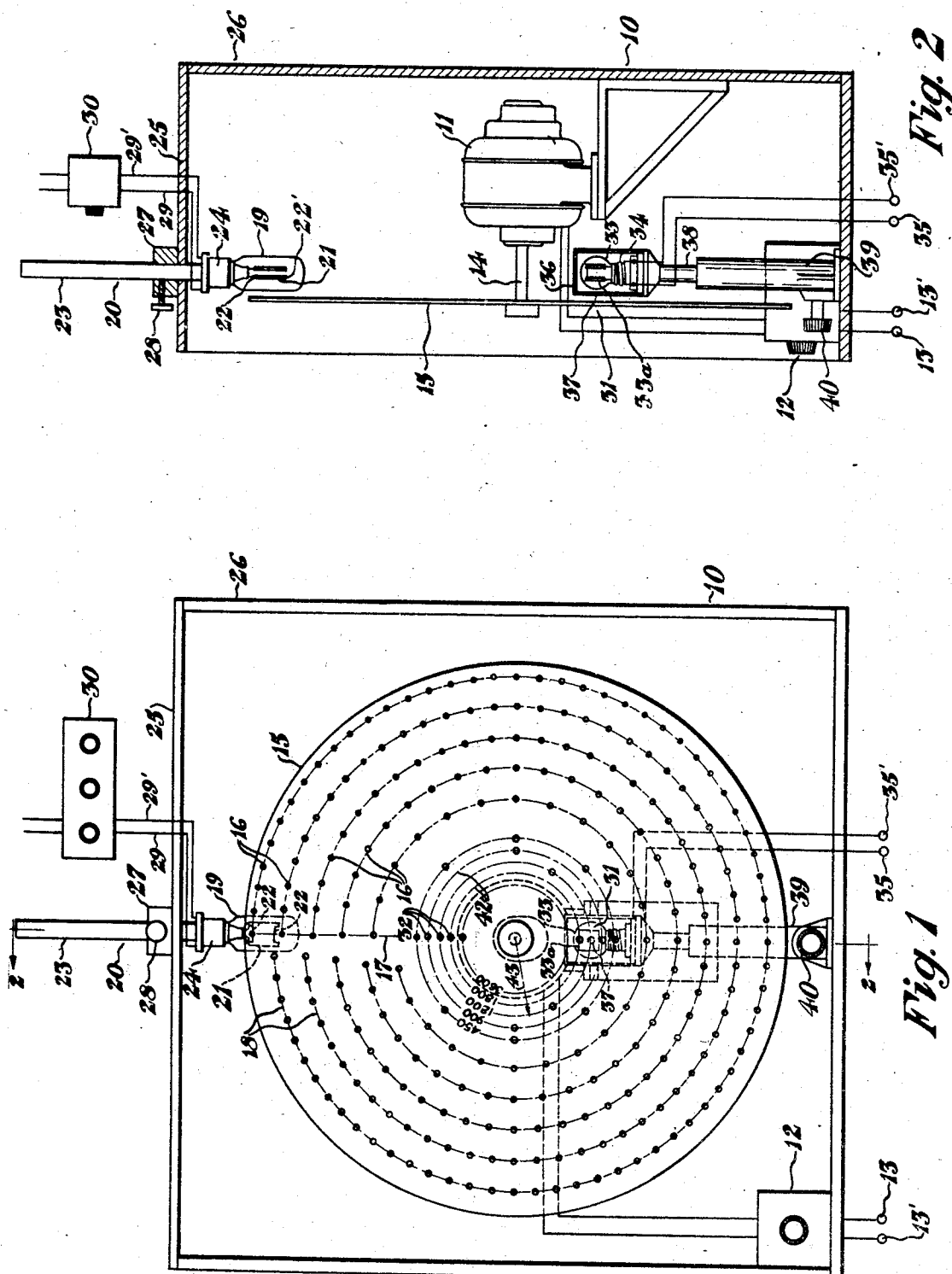


Fig. 1

Fig. 2

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SPEED INDICATOR AND VARIABLE SYNCHRONIZER

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My invention relates to apparatus for variably indicating the speed of the rotary movement of a body, the movement of which is variable, either inherently or under manual control.

The invention further relates to speed indicating apparatus adapted for obtaining approximate synchronism of the rotary movement of the body whose speed is being indicated, as for example, a television receiving scanning disc, with the rotary movement of any of a plurality of other bodies, as for example, television transmitting scanning discs, the two bodies to be synchronized, being separated from each other any desired distance.

In television, both receiving and transmitting scanning discs must first of all be simultaneously rotated at their exact speeds of operation, and then in order that the received image shall be created with the proper clearness and locations of the various parts thereof, the receiving scanning disc must be synchronized with the transmitting scanning disc.

It has been proposed to use the same alternating current to drive a synchronous motor for operating the transmitting scanning disc, and another synchronous motor for driving the receiving scanning disc.

Experiments have been made over large distances for such a connection, and it has been found that the time lag in large power distribution systems makes the use of synchronous motors driven from the same source for television transmitters and receivers, of no practical value.

When the present invention is used for indicating the speed of a television receiving disc, and for synchronizing the same with the speed of a known transmitting disc, approximate synchronism is first attained, in which the percentage of error is so slight that when the correct speed is indicated by the apparatus of the invention, it is possible to look directly towards the receiving tube plate and see the picture framed accurately enough to enable the operator to manually control the speed of the disc directly from the framed picture from that time on.

With ordinary mechanical speed counters, or tachometers, it is very unsatisfactory, and in fact impractical, when compared with the ease of operation of the present apparatus, to bring up the speed of the receiving scanning disc to the proper value, due to the fluctuations of the indicating pointers of the usual mechanical speed counters or tachometers.

On the other hand, apparatus for synchronizing a television receiving scanning disc with a transmitting scanning disc, which includes means for radiating from the television transmitting station a synchronizing wave of fixed frequency and controlled by the rotation of the transmitting scanning disc, and which synchronizing wave is arranged to be received in the television receiving apparatus and utilized to control the rotation of the receiving scanning disc, requires for its successful operation complex and relatively expensive arrangements of electrical and mechanical units, not only at the television transmitting station, but at any receiving station which is to successfully receive the signals transmitted.

The expense and delicacy of operation of such synchronizing apparatus for radiating and receiving a synchronizing wave, practically prohibits a wide-spread distribution and use of television receiving sets, comparable to the distribution and use of radio receiving sets.

Furthermore, none of the present methods of synchronizing television receiving scanning discs with transmitting scanning discs, include means for variably synchronizing any particular receiving disc with any of a number of different sending discs, each of which may have a different speed of rotation.

The objects of the present improvements include accordingly the provision of simple and inexpensive synchronizing apparatus, more particularly adapted for use in television, and which shall not be subject to the deficiencies of mechanical speed counters, and tachometers, and which will be more economical to make and use, than apparatus for radiating and receiving synchronizing waves.

Further objects of the present improvements include the provision of simple and effective variable synchronizing apparatus, more particularly for television receiving scanning discs, by which any particular television receiving scanning disc may be accurately synchronized with any of the possible speeds of rotation of any of the transmitting scanning discs of the several television transmitting stations which may be within the range of the particular television receiving set.

The foregoing and ancillary objects are attained in the present invention, a preferred embodiment of which is hereinafter set forth in detail, and which may be stated in general terms as including the combination with a rotating body such as a scanning disc, of a regulated and preferably visual indicator of time intervals, and one or more means operated by rotation of the scanning disc and co-operating with the time interval indicator for transmitting a characteristic and preferably visual signal when the disc is rotating at a predetermined speed, and transmitting different signals, when the disc is rotating at other speeds, and means for varying the speed of rotation of the disc.

A preferred embodiment of the invention is illustrated in the accompanying drawing forming part hereof, in which

Figure 1 is an elevation view of the improved variable synchronizer hereof, in use in a television receiving apparatus, certain of the electrical parts being illustrated diagrammatically; and

Fig. 2, a vertical sectional view thereof as on line 2—2, Fig. 1.

Similar numerals refer to similar parts throughout the several views.

The improved variable synchronizer hereof, in the illustrated embodiment of the invention, is incorporated in a television receiving apparatus, indicated generally at 10, and includes a variable speed motor 11, which is electrically connected through speed varying means indicated at 12, with the terminals 13 and 13' of a power supply.

Upon the outer end of the shaft 14 of the motor is secured the rotating body 15, which it is desired to synchronize, and in the present embodiment the rotating body is a television receiving scanning disc.

The rotating body or scanning disc 15, for the purposes of television receiving, is provided with one or more sets of spirally arranged scanning apertures 16, terminal apertures of each set being located on a radius line 17 of the disc, and the apertures usually being spaced at equal intervals along a spiral line 18 which may be traced between the terminal apertures.

A receiving neon-electric glow tube 19 is supported by adjustable mounting means indicated generally at 20 at one side of the

scanning disc 15, and the plane of the plate 21 of the receiving tube 19 is preferably located parallel with the plane of the scanning disc, and the vertical median axis of the plate is usually parallel with a radius of the scanning disc, and passes through the axis of rotation of the scanning disc, in conformity with the like arrangement of the image plane of the television transmitting apparatus.

The adjustable receiving tube mounting means 20, is adapted for permitting movement of the receiving tube radially towards or away from the axis of rotation of the scanning disc 15 to such positions that the upper and lower edges 22 and 22' of the plate 21, are properly located with respect to any of the sets of the spiral scanning apertures 16.

The mounting means 20 illustrated, includes a vertically extending slide bar 23 at the lower end of which a receptacle 24 for the neon-electric receiving glow tube 19 is secured, and the upper end of the slide bar extends through an aperture in the upper wall 25 of the case 26 in which the television receiving apparatus may be mounted, and through a collar 27 secured on the upper wall 25.

A set screw 28 is screwed in a transversely extending aperture in the collar 27, so that after the bar 23 with the neon-electric glow tube 19 depending from its lower end, has been slid through the collar to the proper position of vertical adjustment of the tube plate 21, the set screw 28 may be tightened to maintain the bar and tube at the desired position.

The receiving neon-electric glow tube 19 is connected by conductors 29 and 29' with the output of a television wave detecting and amplifying apparatus indicated generally at 30, which may be of any desired arrangement and design.

The usual method of transmitting or broadcasting a television wave, includes means for directing light from the image to be broadcast through a set of spirally arranged scanning apertures in a rotating transmitting scanning disc. The transmitting scanning disc rotates at a fixed speed, which may be maintained by means of a synchronizer embodying the present invention, or by the use of a synchronous motor, and the speed of rotation of the transmitting scanning disc may be for example exactly 1200 R. P. M.

The scanning apertures of the transmitting scanning disc are usually arranged in a spiral, and each set of scanning apertures on the receiving disc 15 is geometrically arranged to exactly correspond with the spiral arrangement of the disc of a particular transmitting station.

The rotating transmitting scanning disc reflects light waves of varying intensities from the image through the scanning aper-

tures one or more photo-electric transmitting tubes, wherein the light waves of varying intensities set up currents of similarly varying intensities which are broadcast as a television wave by the use of well known means employed in radio.

The detector and amplifier 30 of the television receiving apparatus detects this television wave and amplifies the same, and the varying current output thereof is carried by means of the conductors 29 and 29' through the receiving neon-electric glow tube 19, which is usually filled with a gas which may be neon, and which gas when subject to the current of varying intensity, glows with a corresponding varying intensity, so that if the receiving scanning disc 15 is rotated in the same direction and in exact synchronism with the speed of the transmitting scanning disc, the image transmitted will be reconstructed on the plate 21 when viewed through the rotating scanning apertures.

In other words, if the broadcast disc is rotating as aforesaid at 1200 R. P. M., the receiving disc 15 must also rotate at exactly 1200 R. P. M., a variation of even one-half revolution either way, causing the received image to be imperfect.

On the other hand, the transmitting scanning disc of another television transmitting station may be rotated at 900 R. P. M., and the transmitting disc of still another station may be rotated at 450 R. P. M.

All of the different transmitting discs may have spirally arranged scanning apertures of the same or different geometrical arrangements, and as illustrated the receiving disc 15 is provided with a plurality of sets of spirally arranged scanning apertures 16, each set geometrically corresponding with the set of a particular transmitting disc.

For synchronizing the rotary movement of the disc 15 for any particular set of scanning apertures at the particular speed of a particular transmitting disc, which may be for example 1200 R. P. M., a regulated preferably visual indicator of time intervals indicated generally at 31 is associated with means on the scanning disc which may be one of a plurality of sets of circumferentially arranged synchronizing apertures 32, for transmitting or emitting a preferably visual characteristic signal when the desired speed of rotation of the scanning disc 15 is attained, and for transmitting or emitting preferably visual and different characteristic signals when the speed of rotation is below or above the desired speed.

The visual indicator of time intervals indicated generally at 31 includes preferably a neon electric glow light 33 which is mounted in a suitable receptacle 34 and connected through suitable conductors with the terminals 35 and 35' of a source of regulated periodic current, which may be a regulated

110 volt 60 cycle alternating current supply, or any other alternating current of any other frequency.

The neon glow light 33 is located at the same side of the disc 15 as the receiving tube 19, and one plate 33^a of the light 33 is positioned adjacent the disc. A shield 36 preferably encloses the light, and the shield has preferably formed therein a relatively small signalling aperture 37, the center of which is preferably in the vertical median plane passing through the axis of the motor shaft 14, and the vertical median of the plate 21.

The receptacle 34, the neon glow light 33 and the shield 36 are preferably mounted at the upper end of the raising and lowering member 38 of a jack 39 which may be provided with an actuating knob 40 located below the disc 15, so that the aperture 37 of the shield 36 may be raised or lowered to horizontally aline with the apertures 32 of any particular circumferentially arranged set thereof, preferably as each aperture reaches the vertical 2-2 passing through the axis of rotation of the disc 15.

The gas surrounding each plate of the neon glow light 33, when connected with the regulated 60 cycle power supply, is caused to be illuminated and extinguished 60 times per second or 3600 times per minute, due to the cyclic variations of the impressed voltage which cause similar cyclic variations in the luminosity of the neon gas about each plate.

This change in luminosity of the neon glow light about each plate from zero intensity or darkness to maximum intensity 3600 times per minute is ordinarily imperceptible to the human eye, although it may be observed if the neon glow light is oscillated back and forth rapidly before the eye.

Any particular set of synchronizing apertures 32 has a circular path of movement 42, and the neon glow light 33 and the aperture 37 of the shield 36 is raised or lowered so that the aperture 36 of its shield is located normally from the axis of rotation of the disc 15, a distance equal to the radius 43 of the particular circular path, and if the particular set of apertures 32 includes three apertures equally circumferentially spaced from each other on the circle 42, which is likewise the path of movement of each aperture, then when the rotary speed of the disc 15 is brought up from zero to 1200 R. P. M., a visual black signal of zero intensity or darkness will be emitted through the synchronizing apertures 32, as they successively pass across the aperture 37 of the shield, when the speed of the disc is exactly 1200 R. P. M., the light being operated by a 60 cycle current.

The rotary speed of the disc 15 during the speed indicating and synchronizing operation is controlled as by means of the speed varying means 12, or any similar means, and

after the exact desired speed of rotation for the disc is indicated as aforesaid, the image framed on the plate 21 of the receiving glow tube 19, is clear enough to enable the operator to control the speed of the scanning disc and obtain exact synchronism by looking directly at the framed picture.

Other speed indicating and approximate synchronizing means heretofore used do not obtain the initial synchronism with sufficient exactitude to permit exact synchronism to be obtained easily by watching the framed picture.

It is of course possible with a great deal of effort and skillful manipulation to frame a picture with an ordinary tachometer, but the result is a matter of chance, whereas the present apparatus permits the desired result to be obtained with absolute certainty in a very few seconds.

For speeds of rotation of the disc 15 slower or faster than 1200 R. P. M., a visual signal comprising dots of light appearing to climb towards or away from the vertical 2—2 will be emitted, depending upon the direction of rotation of the disc, and whether the speed is slower or faster than 1200 R. P. M.

If the particular set of scanning apertures includes four equally circumferentially spaced apertures and the neon light is properly positioned with respect thereto, so that the scanning apertures will traverse the signalling aperture, the first characteristic signal of zero intensity or darkness will be emitted when the rotary speed of the disc has been brought up to exactly 900 R. P. M., if 60 cycle current is used.

Similarly, for two equally circumferentially spaced synchronizing apertures in a set, the first characteristic synchronizing signal of zero intensity or darkness, will be emitted when the disk 15 is rotating at exactly 1800 R. P. M.; and if there is only one synchronizing aperture in the set, the characteristic synchronizing signal will be first emitted when the disc is rotating at exactly 3600 R. P. M., if 60 cycle current is used.

Likewise if there are eight equally circumferentially spaced synchronizing apertures in the set, the characteristic synchronizing signal will be first emitted when the disc 15 is rotating at exactly 450 R. P. M., if 60 cycle current is used.

The foregoing range of speeds from 450 R. P. M. to 3600 R. P. M. meets the major requirements of television as it exists at present.

It is obvious however that any speed of rotation for the disc 15 may be signalled by varying the length of the time intervals indicated by the visual indicator 31, as by means of a frequency changer, not shown, and/or by further increasing the number of synchronizing apertures in a set.

If the particular transmitting scanning

disc is provided with a similar synchronizer, exact synchronism is attained the instant the characteristic synchronizing signal is emitted at the receiver.

If, however, some other means is utilized for regulating the speed of the transmitting scanning disc, the improved synchronizer hereof on any particular television receiving apparatus, serves to indicate the speed of the receiving scanning disc 15, and exact synchronization is attained by instantaneously decreasing and increasing the speed of the disc for short intervals until the televised image is properly apparent on the plate 21.

I claim:

1. A variable speed indicator and synchronizer including a rotating body, an indicator of time intervals adjacent the body, and a plurality of means on the body each adapted for cooperating with the indicator for emitting a characteristic signal when the body is rotating at a desired speed, and for emitting different signals when the body is rotating at speeds above or below the desired speed, and each cooperating means on the rotating body including a set of apertures therein, the apertures of each set being adapted for traversing the indicator.

2. A variable speed indicator and synchronizer including a rotating body, an indicator of time intervals adjacent the body, and a plurality of means on the body each adapted for cooperating with the indicator for emitting a characteristic signal when the body is rotating at a desired speed, and for emitting different signals when the body is rotating at speeds above or below the desired speed, and each cooperating means on the rotating body including a set of apertures therein, the apertures of each set being adapted for traversing the indicator, and means for positioning the indicator for being selectively traversed by any one set of apertures.

3. In combination, a disk having formed therein a set of scanning apertures and a set of one or more speed and synchronizing signaling apertures, a television tube arranged to be traversed by the scanning apertures, and a periodically illuminated and extinguished light arranged to be traversed by the set of signaling apertures.

4. In combination, a disk having formed therein a plurality of different sets of scanning apertures and a plurality of different sets of speed and synchronizing signaling apertures, each set of signaling apertures corresponding to one of the sets of scanning apertures, a television tube arranged to be selectively traversed by one of the sets of scanning apertures, and a periodically illuminated and extinguished light arranged to be selectively traversed by the set of signaling apertures corresponding to the selected set of scanning apertures traversing the television tube.

5. A variable speed indicator and synchronizer including a rotating body, means for varying the speed of rotation of the body, an indicator of time intervals adjacent the body, and a plurality of means on the body each adapted for cooperating with the indicator for emitting a characteristic signal when the body is rotating at a desired speed, and for emitting different signals when the body is rotating at speeds above or below the desired speed, and each cooperating means on the rotating body including a set of apertures therein, the apertures of each set being adapted for traversing the indicator.

6. A variable speed indicator and synchronizer including a rotating body, means for varying the speed of rotation of the body, an indicator of time intervals adjacent the body, and a plurality of means on the body each adapted for cooperating with the indicator for emitting a characteristic signal when the body is rotating at a desired speed, and for emitting different signals when the body is rotating at speeds above or below the desired speed, and each cooperating means on the rotating body including a set of apertures therein, the apertures of each set being adapted for traversing the indicator, and means for positioning the indicator for being selectively traversed by any one set of apertures.

7. In combination, a disk having formed therein a set of scanning apertures and a set of one or more speed and synchronizing signaling apertures, a television tube arranged to be traversed by the scanning apertures, a periodically illuminated and extinguished light arranged to be traversed by the set of signaling apertures, and means for rotating the disc at varying speeds.

8. In combination, a disk having formed therein a plurality of different sets of scanning apertures and a plurality of different sets of speed and synchronizing signaling apertures, each set of signaling apertures corresponding to one of the sets of scanning apertures, a television tube arranged to be selectively traversed by one of the sets of scanning apertures, a periodically illuminated and extinguished light arranged to be selectively traversed by the set of signaling apertures corresponding to the selected set of scanning apertures traversing the television tube, and means for rotating the disc at varying speeds.

In testimony that I claim the above, I have hereunto subscribed my name.

ROBERT H. BAHNEY.