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RECORDER

Original Filed Nov. 22, 1940

FIG. 1.

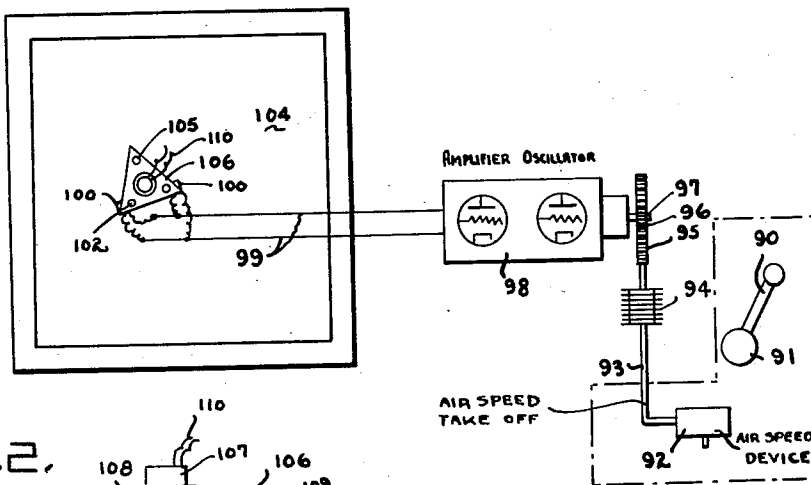
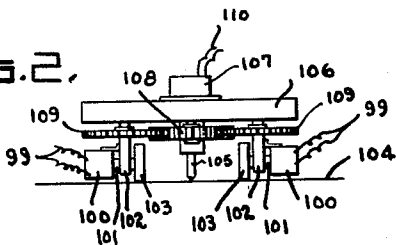


FIG. 2.



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RECORDER

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Original application November 22, 1940, Serial No.
366,524. Divided and this application July 2,
1941, Serial No. 400,872

3 Claims. (Cl. 35—12)

The present invention relates to synchronizing devices and systems and more particularly to the art of changing or controlling the speed of rotary elements in unison.

The present application is a division of my prior application Serial No. 366,524 filed Nov. 22, 1940.

There has arisen in the arts, particularly in the field of electrically driven rotary devices, the necessity for changing the speed of the devices in a simultaneous and simplified manner.

The primary object of the present invention is to provide an improved synchronizing system or device in which the speed of rotary electrical elements may be altered, either greater or less speed and the changes in speeds of the individual devices are all of the same amount or in the same percentage.

In general, my invention contemplates the use of a relatively small oscillation generator, preferably in the form of a tube oscillator which provides a source of readily changeable frequency currents for a group of rotary electrical devices including the synchronous motors. The tube oscillation generator is of a type which gives a smooth and gradual control of the change from one frequency to another and the generator may be employed either as a source permanently connected to the rotary devices or temporarily connected thereto through a double throw switch which can also selectively connect supply mains of standard frequency to the devices.

The invention will be better understood when reference is made to the drawing in which:

Figure 1 shows in diagram, the application of the improved system to control the speed at which the recorder employed in connection with the training of airplane pilots travels with relation to the simulated air speed on devices like the Link trainer. This recorder will hereinafter be known as the "bug."

Figure 2 is an elevational view in enlarged form of the "bug" as used with the Link aviation trainer shown in Figure 1.

In Figure 1, I have shown the application of my invention to a flight trainer similar to or like a Link trainer. As is well known, the function of such a device is to simulate on the ground the operations performed by a pilot in blind flying conditions. The pilot enters a cockpit and has before him controls which he is required to operate to simulate flying conditions. In the flight trainer there is an instrument 92 of any suitable and well known character which indicates imaginary air speed—not unlike real air-

craft. The air speed is a function of the position in which the craft is flying with relation to the horizon but is as well, affected by the amount of imaginary horse-power the engine is developing. The instrument 92 is controlled by a "joy stick" 90 operating through suitable mechanism indicated at 91. The air speed device may be considered to operate as a variable valve for controlling air under pressure which enters the device through a suitably positioned conduit and leaves by the conduit 93. These variations in air pressure are transmitted to a bellows 94. A rack 95 is connected to the movable wall of the bellows and this rack engages a pinion 97. Upon rotation of the latter, the frequency of the oscillations generated and amplified in the unit 98 is changed in accordance with the angular movement of the pinion. These variations in frequency are transmitted through conductors 99 to the synchronous motors of the "bug" of the Link trainer, which bug will be described presently.

These synchronous motors drive shafts 101 journaled in the vertical shaft 102 and carrying wheels 103 which bear against a sheet of paper 104 on top of a flat surface, on which the graphical movement of the theoretical course of the craft is plotted by a pencil 105. This pencil, also the bearings 102 are carried on a triangular plate 106 which is commonly called the "bug." At the center of the triangular plate there is a Selsyn motor 107 mounted on a shaft (not shown) which is provided with a gear 108. This gear meshes with gears 109, the latter being mounted on the shafts 102 in such a way that as the gears 109 are rotated the wheels 103 will be moved through a circular path of which the shafts 102 constitute a center. Consequently the action of the Selsyn motor 107 is to move the wheels 103 about a vertical axis passing through the shafts 102 and the action of the synchronous motor 100 is to rotate the wheels 103 about an axis passing through these motors.

The oscillation generator arrangement is particularly useful in this connection as the motors 100 may be quite small and therefore draw only a little current from the variable frequency supply. These motors may be of the 60 cycle type, the speed of rotation being readily controlled by the range of frequency developed at the oscillation generator.

While I have shown and described my improved synchronizing system in connection with an aviation trainer like or similar to a Link trainer in Figure 1, it will be understood that the improved

apparatus has a large number of uses other than those specifically mentioned. In fact, the improved system can be advantageously employed in any place where a large number of operations take place simultaneously in any time sequence and it is desired to speed up or slow down these operations simultaneously either by a given amount of speed change or a given percentage of speed change.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent, is:

1. In combination, a flight training device for simulating the speed of a plane in terms of graphically indicated movements by a recorder whose movements over a graph are controlled by conditions set up in the trainer, means including a motor for changing the rate of movement of the recorder over said graph in accordance with the changes in air speed simulated by the trainer, an oscillation generator of controllable frequency for energizing said motor and means for changing the frequency of said oscillation generator in accordance with changes in the simulated air speed of the trainer in order to control the movement of said motor which actuates the recorder.

2. In combination, a flight training device for simulating the speed of a plane in terms of

graphically indicated movements by a recorder whose movements over a graph are controlled by conditions set up in the trainer, means including a motor for changing the rate of movement of the recorder over said graph in accordance with the changes in air speed simulated by the trainer, an oscillation generator of controllable frequency for energizing said motor and means including said generator for supplying the motor with alternating current at a frequency which has a direct relation with the simulated air speed of the trainer.

3. In combination, a flight training device for simulating the speed of a plane in terms of graphically indicated movements by a recorder whose movements over a graph are controlled by conditions set up in the trainer, means including a motor for changing the rate of movement of the recorder over said graph in accordance with the changes in air speed simulated by the trainer, an oscillation generator of controllable frequency and having input and output circuits, said output circuit being connected effectively to the trainer motor, and means including said generator for supplying the motor with alternating current at a frequency which has a direct relation with the simulated air speed of the trainer, said last mentioned means including a frequency determining network connected to said input circuit of the oscillation generator.

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