

Co. No.

2412215

UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas

CARL J. CRANE,

of

Sacramento,

California,

PRESENTED TO THE COMMISSIONER OF PATENTS A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL IMPROVEMENT IN

SENSITIVE SWITCH CONTROL APPARATUS;

A DESCRIPTION OF WHICH INVENTION IS CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANT IS ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

NOW THEREFORE THESE LETTERS PATENT ARE TO GRANT UNTO THE SAID

Carl J. Crane, his heirs

OR ASSIGNS

FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT

THE EXCLUSIVE RIGHT TO MAKE, USE AND VEND THE SAID INVENTION THROUGHOUT THE UNITED STATES AND THE TERRITORIES THEREOF. Provided however, that the said invention may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

In testimony whereof I have, hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this tenth day of December, in the year of our Lord one thousand nine hundred and forty-six, and of the Independence of the United States of America the one hundred and seventy-first.

Attest:

Law Examiner.

Casper W. Doms
Commissioner of Patents.

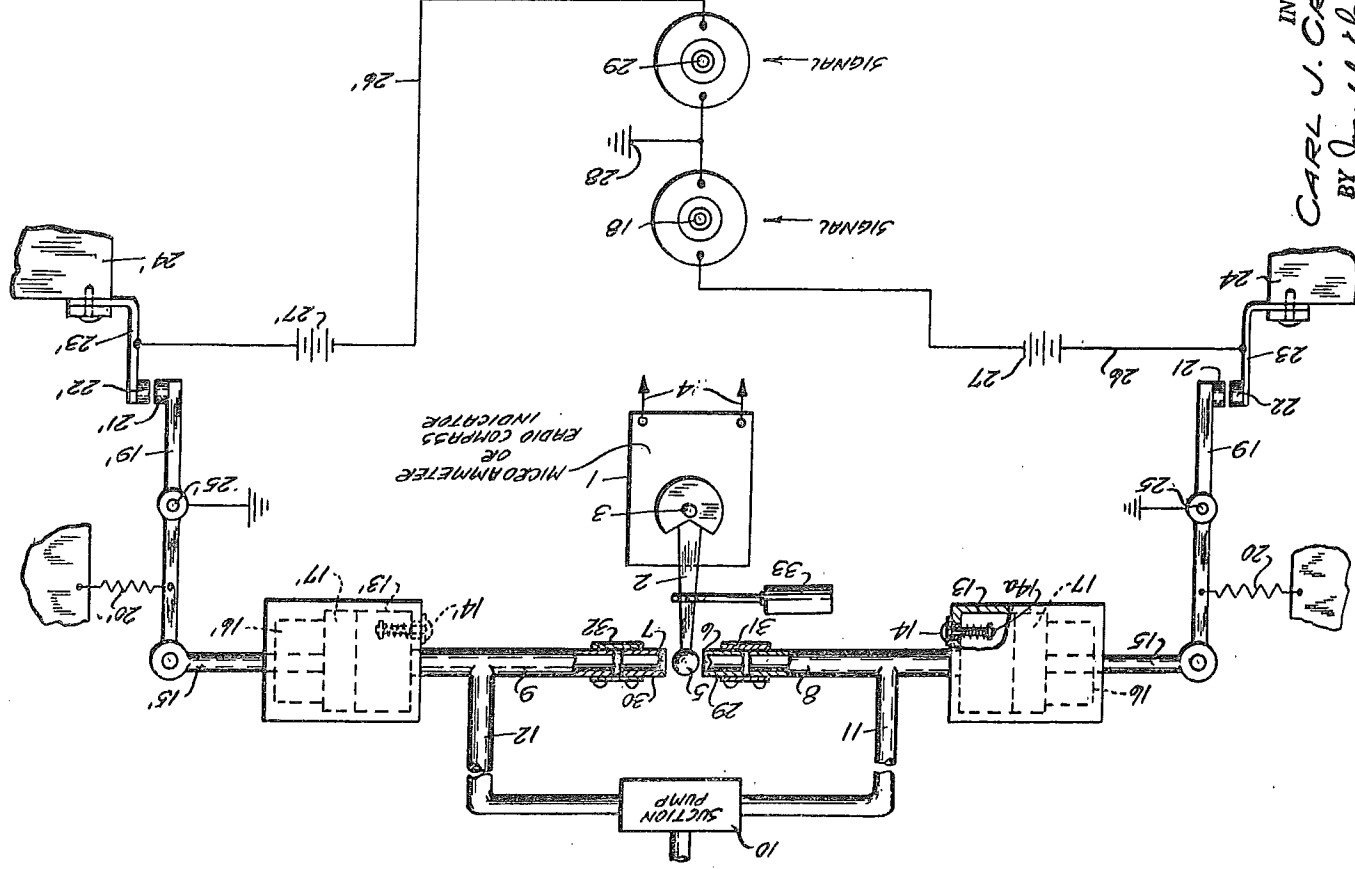
Dec. 10, 1946.

C. J. CRANE

2,412,206

SENSITIVE SWITCH CONTROL APPARATUS

Filed Nov. 28, 1944



INVENTOR.
CARL J. CRANE
BY Joseph Ch. Heydel
Charles Rooney
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,412,206

SENSITIVE SWITCH CONTROL APPARATUS

Carl J. Crane, Sacramento, Calif.

Application November 28, 1944, Serial No. 565,557

5 Claims. (Cl. 177-311)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to sensitive switch control apparatus in which a very sensitive indicator is used to accurately control the operation of a second switch control or indicating device for indicating the operation of the former indicator, and more particularly the invention relates to an electrical switch control device, operable by the indicator or pointer member of an extremely sensitive value-indicating instrument, such as a microammeter of a radio compass indicator for aircraft.

An object of my invention is the provision of an electric switch actuator or control device which is positively responsive to the most minute effort of a primary indicator, in accordance with the movement of the primary indicator, from a predetermined position without subjecting the primary indicator to any additional or reactive force that would tend to disturb or reduce the sensitivity of the primary indicator.

Another object of the invention is the provision of a value-indicating device having sensitive pointer means with means associated with the pointer means for operating a second indicating means, incident to limited movement of said pointer means, from a predetermined reference position without affecting a restraint on the movement of the pointer means from said reference position.

Other objects and advantages of the invention will become apparent from the following description, taken in connection with the accompanying drawing, disclosing somewhat diagrammatically in side elevation a sensitive indicating device having my improved switch control apparatus shown in cooperative association therewith, parts being broken away and shown in section.

The reference numeral 1 indicates a microammeter or a radio compass indicator device preferably of conventional construction, having a pointer 2, movable by the meter 1 around a pivotal center 3, current being supplied to the indicator device 1 through the input circuit conductors 4. A ball-shaped closure member 5 is secured to the outer end of the pointer 2 forming a valve closure member for two vent openings 6 and 7 in the ends of a pair of spaced, axially aligned suction conduit pipes 8 and 9.

Suction pressure is maintained in the section conduit pipes 8 and 9 by any suitable means, such as by a suction or vacuum pump 10, communi-

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cating conduits 11 and 12 being provided, connecting the pump 10 with the suction conduits 8 and 9. The suction conduit 8 is connected at one end to a closed cylinder 13 having spring seated venting valve 14 in one end wall thereof and a piston rod 15 extending through the opposite end wall 16 and connected to a piston member 17 which is operable within the cylinder 13. The venting valve 14 has a stem 14a projecting inwardly into the path of movement of the piston 17 when the piston is moved to the right by suction pressure, or a reduction of pressure within the cylinder 13. The piston 15 operates a secondary indicator or signal device 18 through the instrumentality of a circuit-closing switch lever 19, having a spring 20 yieldably holding the electrical contact 21 which is carried by the lever, in spaced relation to a stationary electrical contact 22 carried by a yieldable resilient bracket arm 23 which is insulated from framework 24 of the supporting structure.

The circuit-closing switch lever 19 is grounded on the metallic framework of the supporting structure through its pivot connection, as indicated at 25, and a conductor 26, having a battery arm 23 to one pole of the signal-indicating device or lamp 18. The other pole of the signal-indicating device or lamp 18 is grounded to the supporting structure at 28, completing the electrical operating circuit for the signal lamp 18 when the two contacts, 21 and 22, are brought together. The other suction conduit pipe 9 is in communication with a second suction operated cylinder 13', having a spring seated venting valve 14' therein. The cylinder has a movable piston 17' therein having a piston rod 15' for operating a signal device 29 in a manner identical to the operation of the signal device 18. The piston 17' operates the piston rod 15' which is connected to a switch lever 19' having a return spring 20' for holding the circuit-closing lever contact 21' on the lever in spaced relation to a stationary contact 22', carried on a bracket 23', in insulated relation to the metallic supporting structure 24'. The switch lever 19' is grounded to the metallic supporting structure at 25'. An electrical conductor 26' having a battery 27' interconnects its ends, establishing an electrical connection to the yieldable resilient bracket arm 23' and to one pole of the signal device 29 while the other pole of the signal device is connected by a short conductor to the ground terminal 28, as shown in the drawing.

The suction vent openings 6 and 7 are prefer-

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ably disposed in opposed spaced relation at opposite sides of the movable closure member 5 which is carried on the end of pointer 2 and the positions of these vent openings are adjustable preferably with respect to the closure member 5. The end portions 29 and 30 of the venting conduits 8 and 9 which carry the vent openings 6 and 7 are axially adjustable with respect to each other and the closure member 5 and are adapted to be held in their adjusted position by tubular clamp members 31 and 32. This adjustment is provided so that the intermediate control or reference position of the indicator 2 and its closure 5 may be varied.

If desired, a dash-pot 33 may be provided and connected to the pointer 2, to prevent too rapid oscillation of the indicator member 2 when the closure member 5 is released from the vent opening by the venting of the suction conduits, by the venting valves 14' or 14.

In the operation of the device, the end portions 29 and 30 are adjusted with respect to the closure member 5 carried by the pointer 2 of the supersensitive value-indicating instrument 1 so as to position the vent openings 6 and 7 in equally-spaced relation to the closure member 5 at each side thereof when the pointer is in a predetermined value or direction indicating position.

With the suction pump 10 in operation, suction is applied equally to the conduits 8 and 9, but the spaced arrangement of the venting openings 6 and 7 with respect to the closure 5 prevents this suction or vacuum pressure from increasing sufficiently to move the piston member 17, or the piston member 17' inwardly to operate one or the other of the switch levers 19 or 19' to close either of the circuits to the secondary signal devices 18 or 29.

When the pointer 2 moves toward one of the vent openings 6 or 7, sufficiently close to reduce the area of that opening, the closure 5 thereon will be immediately drawn against the vent opening by the suction pressure within the conduit, completely closing the vent opening. The pointer will be positively moved or tensioned in the same direction as it was being moved by the indicating device as it closed off the vent opening. When the vent opening is closed, the suction pressure within the conduit 8 increases and draws the power take-off piston 17 to the right, rocking the switch lever 19 to bring the two electrical contacts 20 and 21 into contacting engagement closing the operating circuit to the electric signal or indicating means 18, or other device that may be controlled by the circuit.

Final movement of the piston 17 toward the suction conduit 8 flexes the contact arm 22 and causes the venting valve 14 to be forced to open position by the piston 17, relieving the suction pressure within the cylinder 13 and within the conduit 8. This reduction in pressure permits the piston to return to its initial non-operative position, and causes the contacts 20 and 21 to be again separated from each other, rendering the signal device 18 non-operative. The venting valve 14 also functions to simultaneously vent the conduit 8, which relieves the suction pressure on the closure member 5 on the pointer 2, permitting the pointer to return freely to its proper indicating or reference position.

When the pointer 2 moves in the opposite direction or to the right, the same operation will take place with respect to the other power take-off or indicating apparatus controlling the other signal 29. Movement of the closure member 5,

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sufficiently near the vent opening 7 to partially close this opening, causes an increase in the vacuum or suction pressure in the conduit 9, and the closure 5 will be tensioned by this suction pressure in the same direction as it moved during its initial indicating movement, completely closing the vent opening 7 and the increase in suction pressure causes the operation of the auxiliary power take-off and indicating mechanism 29.

While I have described my invention in connection with a simple embodiment for illustrating an operative structure for carrying out the invention, it is obvious that various changes may be made therein, without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In an indicating device of the class described, a supersensitive value indicator having pointer closure means movable in opposite directions, a suction conduit having vent openings at opposite sides of the pointer closure means, means for creating a suction pressure in said conduit to be selectively closed by said pointer closure means upon movement thereof toward said vent openings from a predetermined reference position between said vent openings to cause said pointer to be held by said suction pressure, closing said vent openings, suction operated secondary indicating means disposed in communication with said suction conduit, operable by a predetermined degree of increased suction pressure in said conduit when said venting means is closed by said pointer closure means, and means operable by said secondary indicating means incident to movement thereof by said increased suction to relieve the suction therein, to free the pointer closure means from said suction pressure operable thereon when the same is disposed to close the said vent means and to simultaneously render said secondary suction operated indicating means non-operative.

2. In an indicating device of the class described, a pair of open-ended fixed suction conduits disposed with their ends facing each other in spaced relation, a closure member movable from a normal intermediate spaced position between the ends of said conduits toward one or the other suction conduit ends to close one or the other of said suction conduits, suction producing means in communication with said conduits to increase the suction pressure therein when closed by said closure member, suction operated indicating means in communication with each of said suction conduits operable by a predetermined increase in the suction pressure within said conduit, venting means for each of said suction conduits movable to venting position by said suction operated indicating means incident to operation thereof by said predetermined increase in suction pressure, to vent the suction conduit and relieve the suction pressure on said last-mentioned suction operated indicating means, and to relieve the suction pressure on said closure member to release the same, and on said last-mentioned suction operated indicating means to normalize the same.

3. In an indicating device of the class described, a pair of suction conduits having vent openings therein, disposed adjacent each other in spaced opposed relation for venting said conduits to relieve the suction therein, a vent closure member movably disposed between said vent openings to close one or the other of said

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vent openings upon movement thereof in one direction or the opposite direction to increase the suction in one or the other of said conduits to render the conduit suction pressure operable upon said vent closure member to tension said vent closure member toward the vent opening, sensitive actuating means for operating said vent closure member, secondary venting means for each of said conduits, suction operated power means in communication with each of said conduits, operable by predetermined suction pressure within each of said conduits to actuate said secondary venting means, to relieve the suction pressure within said conduit acting on said vent closure member when the same is in its vent closing position and relieve the suction pressure on said suction pressure operated power means.

4. Apparatus as claimed in claim 3 in which signal means are provided, operable by said power means incident to movement thereof by an in-

crease in the suction pressure within said suction conduit, and means for rendering said signal means non-operative when said suction pressure conduits are vented by said secondary venting means.

5. Apparatus as claimed in claim 3 in which said power means comprises a closed cylinder having a piston therein operable by predetermined suction pressure within said cylinder, and said secondary venting means comprises a venting valve movably disposed in the path of movement of said piston, to be operated thereby, to vent said cylinder when said piston is operated by said suction pressure, to relieve the suction pressure in the cylinder and in the communicating suction conduits, and power take-off means which is connected to said piston to be operated thereby.

CARL J. CRANE.

UNITED STATES PATENT OFFICE

2,396,687

AIRPLANE TURN INDICATOR

Carl J. Crane, Sacramento, Calif.

Application December 19, 1944, Serial No. 568,911

10 Claims. (Cl. 33—204)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to turn indicating devices for airplanes, and more particularly, to devices having means for presenting an optical illusion to a pilot, of a universe comprising the surrounding sky and terrain moving relative to an airplane turning about a vertical axis.

In my prior United States Patent No. 2,283,190 there are disclosed several mechanisms for presenting an illusory effect to an airplane pilot to indicate to him relative motion of sky and terrain when his airplane is turning about a vertical axis. The structures of the prior patent comprise variously a plurality of rollers, or a plurality of revolving screens, on which appear miniature sky and terrain panoramas. The panorama-carrying members are normally stationary but adapted to revolve when the airplane starts to turn, in a direction opposite to the direction of turning of the airplane in order to simulate the effect of actual visibility of the relatively moving surrounding universe. In the construction just described the direction of rotation of the rotary members is physically reversed when the plane turns about its vertical axis from the left to the right directions, or vice versa, relative to the true line of flight, and, accordingly, the inertia of the moving parts of the mechanism in thus changing direction produces a delay or lag in the response of the panorama-carrying members.

The invention now to be disclosed constitutes an improvement of the system just described and has for its object the provision of a simple mechanism wherein the moving parts do not change direction when the airplane turns from the left to the right, or vice versa, relative to its true line of flight, but are kept continuously in motion, the change of direction effect being obtained by means of selectively illuminating one or the other of the continuously moving elements to indicate a right or left direction of turn. Another object of the invention is to provide means whereby the rate of motion of the continuously moving element may be varied to correspond to the rate of turning of the airplane about its vertical axis.

In order to accomplish the objects of the invention I utilize a pair of translucent tubular cylinders, in one form of the invention, which are mounted for rotation in opposite directions and rotate continuously, carrying on their surfaces colored miniature representations of sky and terrain. Each cylinder encloses an electric lamp, the

lamp in neither cylinder being lit when the airplane follows its true longitudinal course. However, should the airplane turn about the vertical axis, one or the other of the lamps will light, depending on the direction of turn of the airplane. An illusory effect is thus created by virtue of the rotation of the interiorly illuminated cylinder which creates the sensation of seeing an actual relative movement of the universe in the proper direction. Besides providing a suitable mechanism for obtaining the effect just described my device also incorporates means whereby the rate of rotation of the cylinders is varied to correspond to the rate of turn of the airplane, thus effectively realizing an integrating function.

For a more complete understanding of my invention reference will now be had to the accompanying drawing, in which

Fig. 1 represents a front view of the rotating cylinders and the control mechanism therefor;

Fig. 2 is a side view thereof; and

Fig. 3 shows a modification of the rotating cylinders.

With reference to Figs. 1 and 2, a pair of translucent tubular members 1 and 2 are disclosed carrying thereon central dividing markings 3 and 4, respectively. Above the markings are miniature colored representations of clouds 8 and below the markings are miniature colored representations of terrain 9. The cylinders may be mounted as shown on a pair of intermeshing gears 10 and 11, having bearing means in a plate 12. Gear 10 has an extended shaft 16 adapted to be driven by the electric motor 18.

A pair of lamps 21 and 22 are secured interiorly of the cylinders 1 and 2 in any suitable manner, as by being suspended from a support member 24. The cylinders may be spaced apart a sufficient distance to permit the supporting shaft 30 of an airplane index member 31 to extend therethrough from index control means represented generally by M, for a purpose and effect well known in the prior art and fully disclosed in my prior patent referred to hereinabove. The index 31 cooperates with centrally disposed markings 3 and 4 which represent the horizon line between the sky and terrain representations, as will be understood by reference to my prior patent. If desired, a ground glass or diffusing screen 34 may be interposed in front of the cylinders 1 and 2.

The motor 18 may be energized as shown by a battery 35 through a resistance 36 acting in conjunction with a pivoted member 37, in a manner to be described, and the lamps 21 and 22 may be energized in the manner shown by batteries 41

and 42, respectively, through contact members 51 and 52, respectively, acting in conjunction with the pivoted member 37 in a manner to be described, it being noted that contact members 51 and 52 are themselves pivoted at their lower portions at 51a and 52a, respectively, and are provided with springs 53 and 54, respectively, for bias toward the member 37.

Particular attention is now called to the member 37 which is pivoted at its central portion 56, as shown, and has at one end thereof a brush 60 adapted to slidably contact the arcuately arranged resistance coils 36. The other end of member 37 is provided with a contact button 63 which is adapted to engage either of the adjacent surfaces of contact members 51 and 52, dependent on the direction of rotation of member 37 about its pivot. A force tending to rotate 37 in either direction, as indicated by arrows designated "Right turn" and "Left turn," responsive to turning of an associated aircraft about its vertical axis may be provided by a turn gyroscope (not shown) installed in the associated aircraft. The turn gyroscope may be coupled to member 37 in any suitable manner such as by a mechanical linkage or by the use of Autosyns, as disclosed in the prior art, the specific means not forming part of the present invention.

It will be noted that the resistance 36 is short-circuited, the short-circuiting connection being connected to motor 18 which is connected through the battery 35 to ground. Since the member 37 likewise is grounded, it will be understood that current is continuously supplied to the motor 18 whereby a continuous rotation of cylinders 1 and 2 is provided in opposite directions by virtue of the gears 10 and 11. However, a pivotal displacement of member 37 will cause the brush 60 to move clockwise or counterclockwise from the centrally disposed position shown on Fig. 1, thus reducing the amount of resistance 60 in the motor circuit whereby the motor 18 will speed up. This effect occurs regardless of the direction of rotation of member 37 from the central position, the speed increase obviously depending on the degree of displacement of member 37.

From consideration of the central position of member 37 in Fig. 1, it will be seen that contact button 63 is intermediate the contact members 51 and 52 no contact being made between 63 and either of the contact members 51 and 52 at this time.

In operation, should a pivotal displacement be brought to bear on the member 37 by gyroscopic action in the event that the airplane begins to turn about its vertical axis, contact will be made between contact button 63 and one or the other of the contact members 51 and 52, depending on the direction of torque exerted on member 37 which is, of course, dependent upon the direction of turn of the airplane. Simultaneously the brush 60 will be displaced from its centrally disposed position and will cause a decreasing resistance to current flow as it approaches either of the terminals of the resistance 36 depending on the degree of displacement of member 37, whereby the speed of motor 18 will increase correspondingly.

Owing to the pivotal support provided members 51 and 52 and to the spring bias provided these members, contact engagement between button 63 and contact member 51 or 52 will be maintained throughout the entire arc of travel of member 37 whereby one or the other of lamps

21 and 22 will be lit as long as member 37 is displaced from its central position, by virtue of current from the battery 41 or 42, respectively, through a circuit clearly understandable from consideration of Fig. 1 and depending on the direction of rotation of member 37.

Assuming that the aircraft on which the device is mounted is beginning to turn to the left and that the pilot is viewing the cylinders 1 and 2 from the reader's viewpoint, the force exerted on member 37 will then be such as to cause a counterclockwise motion thereof, indicated by the "Left turn" arrow, and contact of button 63 with contact member 52 is effected almost immediately, any time delay being dependent, as a design matter, on the closeness arranged for between the aforesaid elements. Accordingly, lamp 22 will be lit while lamp 21 remains unlit. The cylinder 2, which has been continuously rotating in the direction of the associated arrow, is now interiorly illuminated and the pilot watching the rotation thereof experiences the illusory effect of seeing the surrounding universe moving relative the airplane to the right whereby he senses the fact that the airplane is moving to the left.

As the rate of turn increases the pivotal displacement of member 37 likewise increases, more current flowing in the circuit of motor 18 as brush 60 approaches the left terminal of resistance 36, thereby speeding up the rate of rotation of the cylinders 1 and 2 whereby the pilot becomes visually cognizant of the rate of turning of the illuminated cylinder corresponding to the rate of turning of the aircraft. In the event that the airplane turns toward the right about its vertical axis the device operates in a similar manner, cylinder 1 then being illuminated while cylinder 2 is dark since the member 37 carrying the contact button 63 then moves clockwise to establish contact with contact member 51 to light lamp 21, the rate of rotation of cylinders 1 and 2 being simultaneously varied the same as before except that contact brush 60 now approaches the right terminal of resistance 36.

In the modification of Fig. 3, cloud effects are produced by perforations 65 in the walls of the cylinders which are composed of opaque material. The rays of light from the lamps pass through perforations 65 and are permitted to impinge directly on the screen 34 and appear as illuminated cloud shapes moving to the right or the left depending on whether the lamp 21 or 22 is lit.

It will be seen that I have provided a device of the class described wherein inertia effects of certain mechanical members have been substantially eliminated and I seek the protection of United States Letters Patent within the scope of the claims herein appended.

I claim:

1. In a flight indicator for aircraft, a pair of oppositely rotating tubular translucent members having a cloud and terrain pattern disposed thereon, means for providing illumination in the interior of one or the other of said members in response to turning of an associated aircraft depending on the direction of turn, and means for controlling the speed of rotation of said members to correspond to the rate of turn of said associated aircraft for the purpose of creating an optical effect simulating actual visibility of sky and terrain during turning motion of said aircraft.

2. In a flight indicator for aircraft, a pair of normally deenergized illumination sources, means

for energizing one of said sources responsive to turning motion of an associated aircraft depending upon the direction of turn, a pair of members, each of which is adapted to be illuminated by one of said sources, means providing continuous motion of said members at a rate depending upon the rate of turn of said aircraft, and means associated with said members for creating an optical effect of turning motion of said aircraft when one of said members is illuminated by an energized illumination source.

3. In a flight indicator for aircraft, a pair of normally deenergized illumination sources, means for energizing one of said sources to provide illumination therefrom responsive to turning motion of an associated aircraft depending upon the direction of turn, continuously moving means having an optical pattern thereon of which a portion is adapted to represent turning of said aircraft in one direction and another portion is adapted to represent turning of said aircraft in the opposite direction, one of said portions being illuminated by one of said illumination sources when said aircraft is turning in one direction and the other of said portions being illuminated by the other of said illumination sources when said aircraft is turning in the opposite direction, thereby creating an optical effect simulating actual visibility of the surrounding universe during turning motion of said aircraft.

4. A device as set forth in claim 3 including means for controlling the rate of motion of said continuously moving means to correspond to the rate of turn of said aircraft.

5. A device as set forth in claim 3 including a motor for providing mechanical power to maintain motion of said continuously moving means and rate control means for controlling the speed of said motor comprising means adapted to be gyroscopically actuated responsive to turning motion of said aircraft to a degree depending on the rate of turning thereof, and illumination control means adapted to be gyroscopically actuated to energize one or the other of said illumination sources depending on the direction of turn of said aircraft.

6. In a flight indicator for aircraft, a pair of normally deenergized illumination sources, means for energizing one of said sources to provide illumination therefrom responsive to turning motion of an associated aircraft depending upon the direction of turn, continuously moving means having an optical pattern thereon of which a portion is adapted to represent turning of said aircraft in one direction and another portion is adapted to represent turning of said aircraft in the opposite direction, one of said portions being illuminated by one of said illumination sources when said aircraft is turning in one direction and the other of said portions being illuminated by the other of said illumination sources when said aircraft is turning in the opposite direction, thereby creating an optical effect simulating actual visibility of the surrounding universe during turning motion of said aircraft, including a motor for providing mechanical power to maintain motion of said continuously moving means and rate control means for controlling the speed of said motor comprising means adapted to be actuated by a gyroscopic device installed in said aircraft responsive to turning thereof and to a degree depending on the rate of turning thereof

and illumination control means adapted to be actuated by a gyroscopic device installed in said aircraft and adapted to energize one or the other of said illumination sources depending on the direction of turn of said aircraft, said rate control means and said illumination control means comprising a normally centrally positioned member mounted for motion in one direction or the other by gyroscopic action depending upon the direction of turn of said aircraft to a degree corresponding to the rate thereof, and means disposed at one end of said member and cooperative therewith to vary the speed of said motor corresponding to the degree of motion of said member and means disposed at the opposite end of said member to energize one or the other of said illumination sources upon motion of said member from said central position and to maintain said energization during the time for which said member is displaced from the normal central position thereof.

7. A device as set forth in claim 3 including an electric motor providing mechanical power to maintain the position of said continuously moving means, said illumination sources comprising electrical lamps and means for varying the speed of said motor and for simultaneously energizing one or the other of said lamps comprising a normally centrally disposed member pivoted for rotary displacement and adapted to be rotatably displaced in clockwise or counterclockwise direction from said central position by a gyroscopic device installed in said aircraft and to a degree dependent upon the rate of turn of said aircraft and means disposed for coaction with said member and comprising a variable impedance for controlling the speed of said motor to a degree corresponding to the degree of rotary motion of said member, and contact means disposed to coact with said member and operable by rotary displacement thereof from said central position to energize one or the other of said lamps depending on the turn direction of said aircraft and to maintain said energization while said member is displaced from said central position.

8. A device as set forth in claim 1 wherein said tubular members are disposed in axially parallel side-by-side relation and spaced apart sufficiently to permit passage therebetween of an index supporting means, and gear means at corresponding ends of said tubular members and secured thereto and adapted for engagement whereby rotary actuation of said gear means is operative to rotate said tubular members in opposite directions.

9. A device as set forth in claim 1, wherein said illumination means comprises elongated electric lamps disposed coaxially with and extending substantially the length of said tubular members in the interior thereof.

10. In a flight indicator for aircraft a pair of continuously moving members of opaque material having cloud patterns perforated therethrough, means disposed at one side of said members providing illumination therethrough responsive to direction of turn of an associated aircraft, and a diffusing screen means on the opposite side of said members and adapted to be viewed by the operator of said aircraft whereby said patterns will appear as illuminated areas in motion on said diffusing screen responsive to turning of said aircraft.

CARL J. CRANE.