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IMPULSE CONTROL DEVICE

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Fig 1

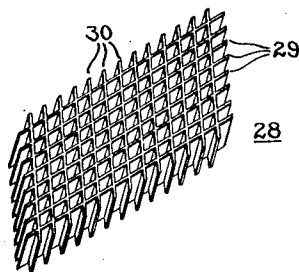
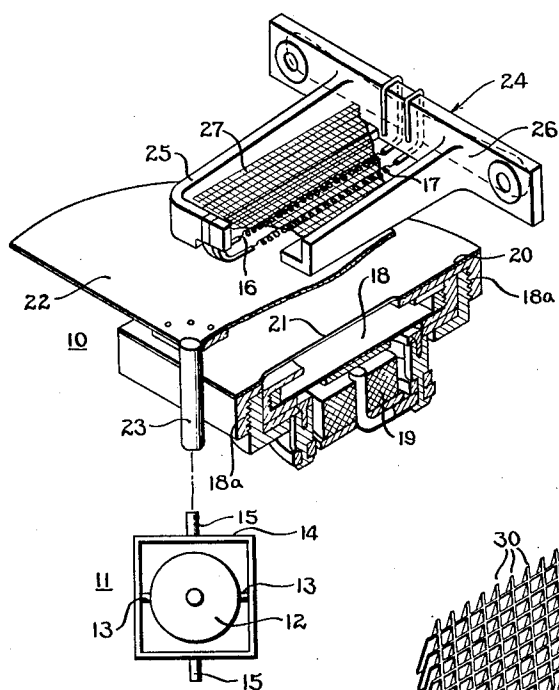


Fig 2

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IMPULSE CONTROL DEVICE

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4 Claims. (Cl. 201—48)

This invention relates to impulse control devices, and more particularly to means for directing a fluid flow in apparatus of this character.

One of the objects of the present invention is to provide means for increasing the accuracy of such control devices.

Another object of the invention is to provide novel means for use in combination with an impulse control device for preventing fluid eddy currents from occurring adjacent the filaments or conductors of the control device.

An additional object of the invention is to provide novel means for preventing undesired current fluctuations in impulse control devices.

The above and further objects and novel features of the invention will more fully appear when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for purposes of illustration only and is not intended as a definition of the limits of the invention, reference for the latter purpose being had to the appended claims.

In the drawing wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a perspective view partly in section and with parts broken away showing one embodiment of the invention; and

Fig. 2 is a perspective view of baffle means which comprise, in combination with an impulse control device, a second embodiment of the invention.

The forms of the invention illustrated in the accompanying drawing comprise novel means for use in combination with impulse control devices, which may be of the type disclosed in the patent to Eduard Fischel, No. 2,137,974 for preventing fluctuations in the current which flows in a circuit controlled by the control device, a part of said circuit comprising a portion of the control device. In apparatus of this character means are provided for producing currents of unheated air, or of some suitable fluid substance, which currents are directed by a nozzle towards filaments or wires which are heated by electric current. The air currents vary the temperature, and hence the resistance of the filaments, and consequently govern, within certain limits, the flow of electric current therein. In devices of this type heretofore proposed the filaments have been fully exposed to the fluid flow or to the air currents and have been so associated with the remainder of the apparatus that fluid or air eddy currents develop directly behind the filaments

thereby causing resistance and current fluctuations in the filaments. Such fluctuations have an especially disadvantageous effect if the control device is coupled with, for example, a relay which controls the current to a device to be governed. These drawbacks are eliminated by novelly combining with the control device suitable baffle means or flow directing means which direct the air currents in such a manner that eddy currents are prevented from forming.

In the form shown in Fig. 1 a control device 10 is employed with a suitable governing apparatus, for example, a gyro device 11 comprising a direction indicator which is constituted by a rotor (not shown) in a housing 12 having trunnions 13. The latter are supported in suitable bearings in a gimbal frame 14 having outer trunnions 15, one of which is operatively connected to the control device in a manner to later appear.

The control device 10 here comprises an air pump or means for producing a current of air to impinge upon temperature responsive resistors or filaments 16, 17, said means being constituted, for example, by an oscillatable diaphragm or membrane 18 which is vibrated by an electromagnet 19, the latter being energized by periodically fluctuating current. Above the membrane 18 upon a suitable cylindrical diaphragm housing 18a is a disc 20 which forms therewith an air chamber from which the air is expelled when membrane 18 vibrates. In disc 20 is a nozzle for directing said current toward the filaments comprising a slot 21.

A rotatably mounted vane 22 is interposed between the filaments and nozzle in order to control the fluid flow to said filaments. Vane 22 is preferably secured to a shaft 23 which is rotatably mounted in suitable bearings (not shown), and which is operatively connected to one of the trunnions 15, for example, by means of a clamped collar (not shown).

A mounting 24 is provided for the filaments 16, 17 comprising a frame 25 and a supporting bracket 26 preferably integral therewith. The filaments, in the form shown, are parallel to the slot 21 and their cross-section may be of any desired dimension. A second control device of the type disclosed in the patent to Buchting 2,056,769 may be employed in combination with the one shown, in a conventional manner for use as an amplifier device for a control magnitude. The filaments in the two control devices may be arranged in bridge connection.

In accordance with the invention novel means are provided for directing the flow of air which

passes the filaments in such a manner that the air currents are "smoothed" or caused to flow in a straight path thereby eliminating eddy currents. In the embodiment of Fig. 1 a wire mesh 5 27 is employed for this purpose, and is mounted transversely to the air current behind the filaments.

Instead of the wire mesh, a baffle arrangement as shown in Fig. 2 may be used which comprises 10 a honeycomb baffle 28 constituted by a plurality of parallel channels, the latter being formed between plates 29 and 30. The baffle arrangement 28 is preferably mounted behind the filaments 16, 17 with the longitudinal axes of 15 the channels extending in the direction of the air currents.

There is thus provided novel means for increasing the sensitiveness and reducing the errors of impulse control devices by preventing the formation of eddy currents of the fluid which is forced 20 past the filaments. The novel control device may be novelly combined with gyroscopic navigation or control means for aircraft.

Although only two embodiments of the invention have been illustrated and described in detail it is to be expressly understood that the invention is not limited thereto, for example, the baffle arrangement or flow directing means may be 25 mounted between the fluid pump and the filaments instead of the filaments being between the baffle arrangement and the air pump. Various changes in the design and arrangement of the parts may be made without departing from the spirit and scope of the invention as the same 30 will now be understood by those skilled in the art. For a definition of the limits of the invention reference will be had primarily to the appended claims.

What is claimed is:

40 1. In apparatus of the class described, means for producing a fluid flow, one or more temperature responsive resistors for conducting current arranged in the path of said flow, a temperature 45 differential existing between the fluid of said flow and the resistors, means for controlling said flow to one or the other of said resistors whereby the temperature of the effected resistor is varied thereby varying the amount of current conducted by said effected resistor, and flow directing sur- 50 faces mounted in said path for directing the flow passing over the effected resistor away therefrom thereby preventing the formation of fluid eddy currents adjacent said resistors.

2. In apparatus of the class described, a gyro

rotor having a gimbal ring suspension, a fluid pump, means for directing a fluid flow from said pump in a predetermined path, means comprising a plurality of temperature responsive resistors adapted for conducting electrical current and ar- 5 ranged in said path, a vane interposed between said fluid pump and said resistors for variably controlling said flow to said resistors whereby the temperature of a portion of said resistors is varied thereby varying the amount of current 10 conducted by the effected resistors, said vane being operatively connected to said gimbal suspension, and directive flow means in said path adjacent said resistors for directing the fluid flow passing over the effected resistors away from the 15 resistors.

3. In apparatus of the class described, means comprising a vibratable membrane for producing a fluid flow, a pair of temperature responsive re- 20 sistors for conducting electrical current arranged in the path of said flow, a temperature differential existing between the fluid of said flow and the resistors, means for controlling said flow to one of said resistors whereby the temperature of 25 the last-named resistor is varied thereby varying the amount of current conducted by said last-named resistor, and directive flow means comprising a baffle arrangement in said path adjacent said resistors for directing the fluid flow 30 passing over said last-named resistor away from said resistors thereby preventing formation of fluid eddy currents adjacent said resistors.

4. In apparatus of the class described, a gyro rotor in gimbal ring suspension, a fluid pump, 35 means for directing a fluid flow from said pump in a predetermined path, means comprising a plurality of temperature responsive resistors adapted for conducting current and arranged in said path, a vane interposed between said fluid 40 pump and one side of said resistors for variably directing said flow to one or the other of said resistors whereby the temperature of the effected resistor is varied thereby varying the amount of current conducted by the effected resistor, said 45 vane being operatively connected to said suspension, and directive flow means in said path comprising a wire mesh member mounted transversely of said path on the opposite side of said resistors for directing the flow passing over the 50 effected resistor away therefrom thereby preventing the formation of fluid eddy currents on said opposite side of said resistors.

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