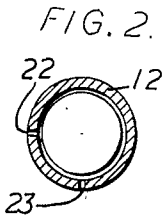
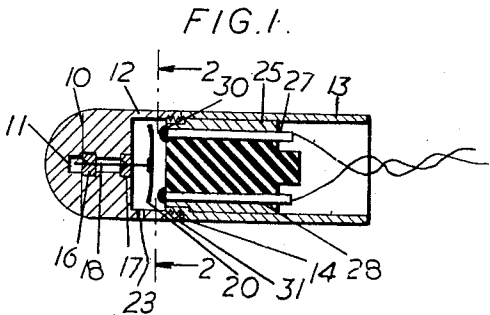


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P. S. SAUNDERS
AERODYNAMIC AND LIKE INSTRUMENTS
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AERODYNAMIC AND LIKE INSTRUMENTS

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9 Claims. (Cl. 200—81.9)

It is a well-known fact that if the direction of airflow impinging on a cylinder normal to its axis is the bisector of the angle between two holes on the cylinder, the pressures at these holes will be equal. As the incidence is higher or lower than in this direction, the pressure difference between the holes will be positive or negative accordingly. If the cylinder is set with the bisector pointing in a set direction representing the incidence of the aircraft for a particular occurrence such as the required margin of stall warning of the wing, then a pressure-operated unit between these two holes will indicate that occurrence.

The object of the present invention is to provide an improved device for indicating and/or controlling the angle of incidence of the cylinder in relation to a fluid stream.

According to the invention the device comprises a hollow cylinder having holes therein offset from each other along the axis of the cylinder, a piston or diaphragm disposed in the cylinder between the holes, said holes being also offset from each other around the axis of the cylinder and means whereby movement of the piston or diaphragm in one direction closes a gap in an electrical circuit for operating an indicating or controlling means.

The invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a sectional view of a device made in accordance with the invention; and

Figure 2 is a sectional view on the line 2—2 on Figure 1.

A cylinder is made in two parts, viz. a part 10 which is solid except for an axial hole 11 and a skirt 12 and a hollow part 13 attached by screw threads at 14 to the skirt 12. Within the hole 11 is a pair of axially spaced jewel bearings 16, 17 which supports a rod 18 for axial movement. This rod carries a disc or piston 20 within the cylinder. The element 20 is shown in the drawing as a disc-shaped piston free to move as a whole along the axis of rod 16. In those forms of the invention where snap action is employed the element 20 may be a diaphragm or disc mounted at its periphery and act to make and break contact at its center, the point of greatest movement. Although in the preferred embodiment shown in Figure 1, disc 20 functions as a piston, the term disc is used as perhaps more apt and also because of its generic significance in equivalent forms the invention may take. Holes 22, 23 are provided in the cylinder and are spaced apart axially so as to be one on either side of the disc and spaced apart circumferentially 90°. The disc is thus urged in opposite directions by the pressure at the two holes. When one pressure is greater than the other the disc or piston moves in one direction and vice versa. The part 13 contains an insulating block 25 through which pass two electric conductors 27, 28 to two spaced terminals 30, 31 which provide a gap in an electric circuit of an indicating or controlling means. These terminals are contacted by the disc 20 when this moves to the right (Figure 1) so as to bridge them and close the gap thereby operating said means. The disc 20 is restrained in one direction by engaging said terminals and in the other direction by the

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rod 18 engaging the end of the hole 11 so that it cannot move out of the space between the holes. The disc has some radial clearance between it and the fixed cylinder and its total axial movement need only be 0.1 inch. The radial clearance should be sufficient to prevent clogging by particles that might enter the pressure holes, and it is further proposed that there should be skewed grooves in the edge of the disc to give a rotation and self-clearing action.

When the vector representing the airstream direction is a bisector of the angle between the holes, the pressures are equal, but if the vector direction points to either side the pressure differential will move the disc either way. The cylinder is turned about its axis so that at the critical incidence the bisector is parallel to the airflow. When the aircraft exceeds this angle, then the disc will begin to move and will make contact with the terminals. This will switch on a suitable warning device such as a lamp or vibrator.

In an alternative construction (not shown) the piston is replaced by a diaphragm, a very small movement of which will operate a contact. With such a device the incidence sensitivity will increase with air speed, an undesirable feature that may be reduced to a minimum by the use of a very flexible diaphragm.

The cylinder may be of small diameter (about ½ inch) which may be mounted with its axis horizontal from the normal pressure head as fitted universally to aircraft. It can be placed sufficiently far behind the static slots (if present) not to disturb the static pressure indication, but still remain in relatively undisturbed airstream round the aircraft.

I claim:

1. An incidence indicating or controlling device comprising a cylinder having holes therein offset from each other along the axis of the cylinder, differential pressure responsive means disposed in the cylinder between the holes and responsive to differences of pressure between said holes, said holes being also offset from each other around the axis of the cylinder and means whereby movement of the said means in one direction closes an electrical circuit for operating an indicating or controlling means whereby the effective vector representing the incidence of said device with respect to a gas stream can be indicated or controlled.

2. A device as claimed in claim 1 wherein the differential pressure responsive means comprises a disc carried by a rod that is mounted for axial movement in jewel bearings.

3. A device as claimed in claim 1 wherein the differential pressure responsive means comprises a disc arranged to have a rotary motion as it moves axially.

4. A device as claimed in claim 2 wherein the cylinder is in two parts detachably connected together, one part being solid except for an axial hole receiving the bearings and the other part carrying an insulating block through which two electrical conductors pass to two terminals adjacent the said means and bridged thereby.

5. In combination, a body member having a chamber, the walls of said chamber having two holes therein offset from each other both axially and angularly with respect to the principal axes of said body member, pressure responsive means movably mounted within said chamber, and circuit means controlled by said movable pressure responsive means whereby the effective vector representing incidence of said device with respect to a gas stream impinging thereon can be indicated or controlled.

6. The combination set forth in claim 5, said chamber being cylindrical and axially aligned with said body member, said holes being substantially radially disposed in the cylindrical wall of said chamber and communicating directly with the atmosphere comprising an impinging gas stream.

7. The combination set forth in claim 6, said movable means comprising a disc mounted for axial movement within said chamber and spaced from said cylindrical wall a distance substantially the diameter of said holes.

8. The combination set forth in claim 7, said disc being 5 rotatably mounted as well as axially movable.

9. The combination set forth in claim 8, said disc being conductive and forming part of said circuit means.

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