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TURBINE SPEED SENSING DEVICE

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FIG. 1

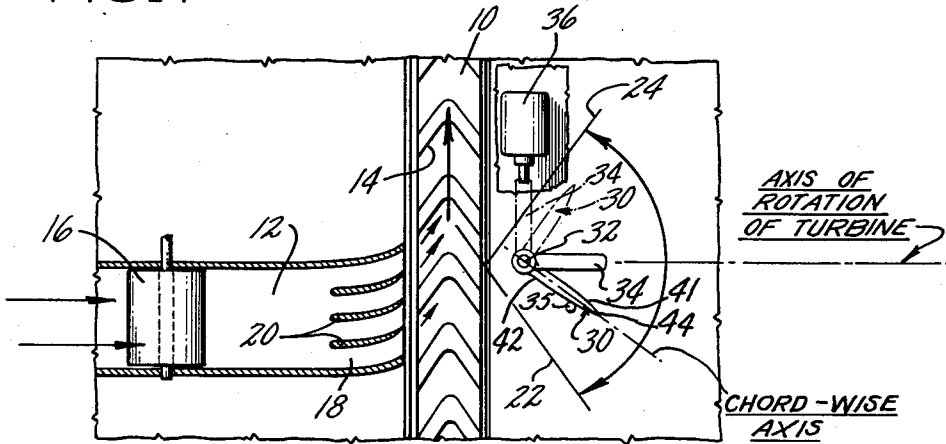
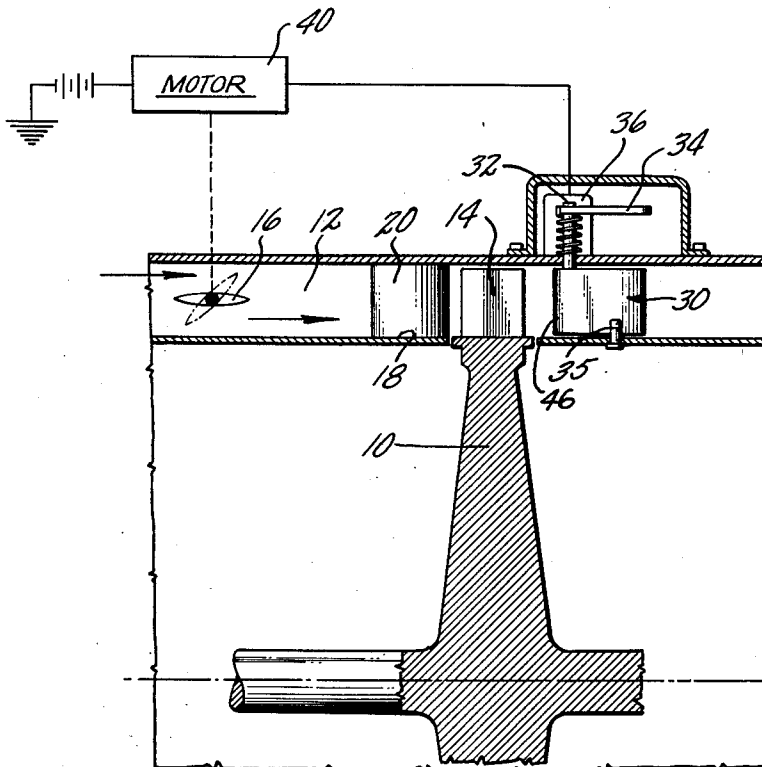


FIG. 2



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1

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TURBINE SPEED SENSING DEVICE

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This invention relates to turbines and particularly to means for sensing the speed of rotation of the turbines.

Turbomachinery of the type used in power conversion devices must be regulated to either provide a desirable speed range for the turbine or to prevent excessive speed thereof to prevent disintegration. Therefore, sensing the speed of rotation of the turbine is an important factor in such devices. Ordinary centrifugal speed sensing devices or electrical or electronic devices are often inadequate in that they lag in their signaling or are entirely too complex for a particular installation.

It is therefore an object of this invention to provide a speed sensing device for turbomachinery which is very simple, lightweight, and inexpensive.

It is a further primary object of this invention to provide a streamlined vane pivotally mounted at the exhaust end of the turbine such that the position of the vane is an indication of the direction of flow of the fluid being emitted from the turbine.

It is known that the angle of efflux of the fluids being exhausted from a rotating turbine varies with the speed of the turbine. In other words, for a given velocity of fluids flowing into the inlet, there will be a particular angle of efflux of the exhaust fluid for every rotational speed of the turbine wheel.

The above objects and advantages of this invention will become readily apparent from the following detailed description of the drawing in which:

FIG. 1 is a partial schematic and cross section of a turbine including the elements of this invention, and

FIG. 2 is a side elevation of FIG. 1 illustrating schematically a motor for driving the valve controlling the fluids flowing to the turbine.

Referring to FIG. 1 a partial top view of an impulse turbine wheel 10 is illustrated. The turbine wheel 10 is adapted to rotate about some predetermined axis. The gases flowing through the duct 12 impinge on the bucket surfaces 14. The duct 12 may include a butterfly-type valve 16 which can regulate the flow of fluid passing through the turbine nozzles 18. The turbine nozzles 18 are formed in any desirable manner, but as shown herein, are formed by a plurality of airfoil shaped members 20 spaced transversely on the duct 12.

Over a range of rotational speeds of the turbine the angle of efflux of fluid from the turbine may vary between the reference line 22 at low speeds of the turbine to an angle indicated by the reference line 24 at extremely high speeds of the turbine. In order to sense the angle of efflux of the fluids from the turbine, a vane 30 is provided and is pivotally mounted at 32. Preferably vane 30 is made symmetrical about its chordwise axis but need not be limited thereto. However, the prime importance is making the body aerodynamically shaped to afford the minimal resistance to the gaseous stream. Vane 30 comprises a body portion having a convex top surface 41 and a convex bottom surface 42 each terminating to form trailing edge 44 and leading edge 46. The vane is placed in a position with respect to the turbine such that the gas discharging therefrom first contacts the leading edge of vane 30. The vane 30 may carry an upstanding arm 34 which when moved to the dotted line position illustrated can trip a switch 36. The switch 36 may be utilized to energize a light or any other suitable device

2

which will indicate that a predetermined maximum speed of the turbine has been reached.

As shown in FIG. 2 the turbine 10 may have the flow controlled thereto by the butterfly valve 16 and the vane 30 may have its arm 34 trip a suitable switch or other suitable electrical positioning device such that a signal is directed to a motor schematically illustrated at 40. The motor 40 then may be utilized to completely shut off the duct 12 by moving the butterfly valve 16 to its closed position. On the other hand, the butterfly valve 16 may be controlled to any desirable position such that the turbine 10 could be held at some predetermined constant speed.

A suitable stop 35 may be provided to prevent over travel of the vane 30.

As a result of this invention it is readily apparent that an extremely simple mechanism has been provided for sensing and/or controlling the rotational speed of the turbine.

Although only one embodiment of this invention has been illustrated and described herein, it will be apparent that various changes may be made in the construction and arrangement of the various parts without departing from the scope of the novel concept.

What it is desired to obtain by Letters Patent is:

1. A turbine, means for sensing the speed of said turbine, the direction of discharge of the exhaust stream from said turbine varying with the speed thereof, a vane located in the exhaust flow from the turbine, and means for substantially freely pivotally mounting said vane downstream of said turbine whereby the vane assumes a position parallel to the direction of exhaust flow from the turbine, said means for mounting including a pivotal axis extending transversely of the axis of rotation of the turbine, switch means responsive to a predetermined position of said vane providing a signal commensurate with a predetermined speed of the turbine, and means responsive to said signal for controlling an operating variable of said turbine.

2. A turbine, a housing rotatably supporting said turbine having an inlet for receiving the flow of fluid and an outlet for discharging said fluid, the angle of efflux of the discharging fluid varying with the speed of the turbine, in combination with means for sensing the speed of said turbine, said means including a vane in the outlet having generally convex shaped top and bottom faces defining an aerodynamically shaped body with leading and trailing edges, means for freely pivotally mounting said vane so that the leading edge faces said turbine and receives the discharging fluid, whereby the vane assumes a position in coincidence with said angle of efflux, and signal means responsive to the position of said vane for regulating the speed of said turbine.

3. A turbine, in combination, a housing rotatably supporting said turbine having an inlet for receiving flow of fluid to rotate said turbine and an outlet discharging the fluid from thereof, the exhaust stream of said turbine varying with the speed of the turbine, a substantially symmetrical airfoil shaped body having leading and trailing edges disposed in said outlet adjacent the turbine with the leading edge facing the direction of the discharged fluid, means for substantially freely pivotally mounting said symmetrical airfoil shaped body whereby said body assumes a position parallel to the exhaust flow of the turbine, means for controlling the flow of fluid to the turbine including valve means in said inlet upstream of the turbine, and means responsive to the position of said symmetrical airfoil shaped body for regulating said controlling means.

4. A turbine, a housing rotatably supporting said turbine and having an inlet receiving flow of fluid and an

3

outlet discharging said fluid, the direction of discharge of the exhaust stream of said turbine varying with the speed thereof, in combination with means for sensing the speed of said turbine, said means including a vane in the outlet having convexed top and bottom surfaces defining an aerodynamic shaped body with a leading and trailing edge, means in the outlet for substantially freely pivotally mounting said vane so that the leading edge is adjacent said turbine and being disposed so that the vane assumes a position parallel to the direction of the discharge stream from the turbine, and means connected to said vane responsive to the position thereof.

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