June 24, 1958 T. F. HUDYMA 2,840,341

TURBINE WITH ACTIVE AND REACTIVE ELEMENTS

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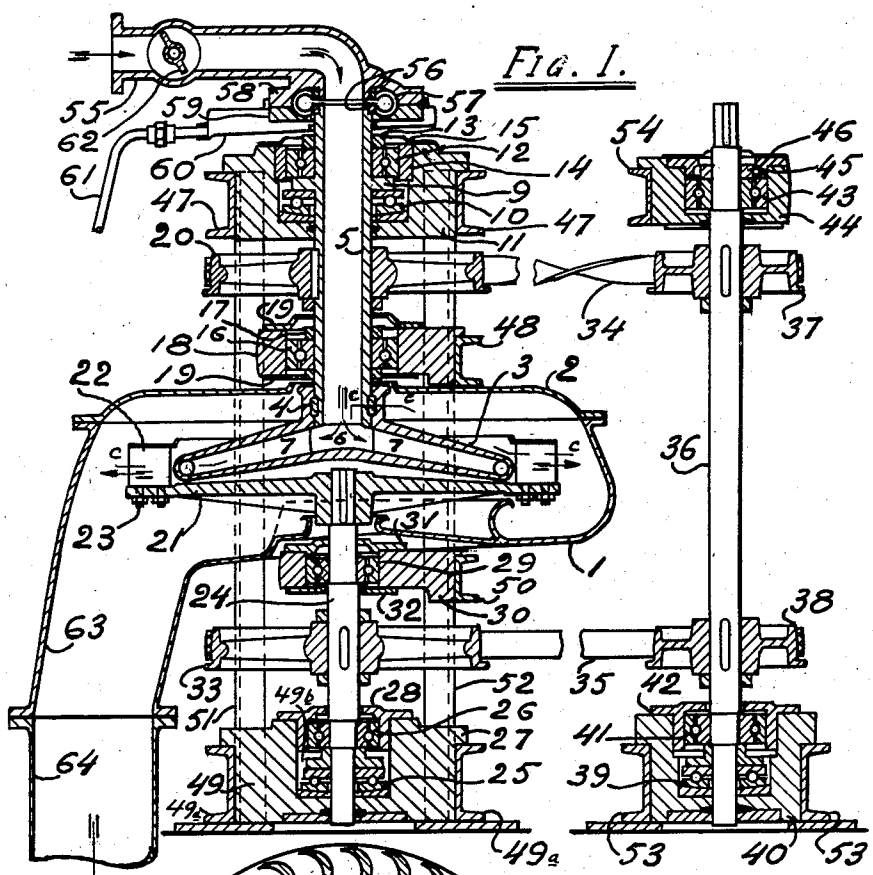
FIG. 1.



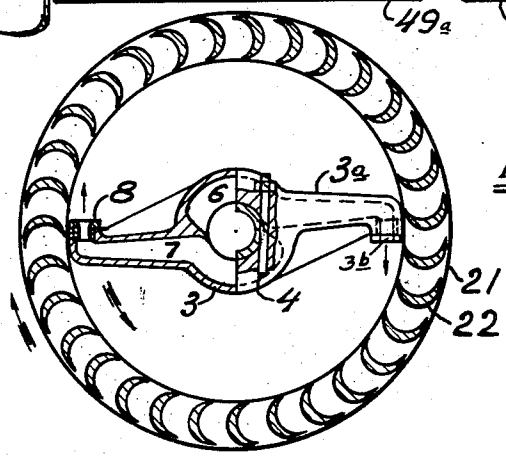


FIG. 2.

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Fig. 3.

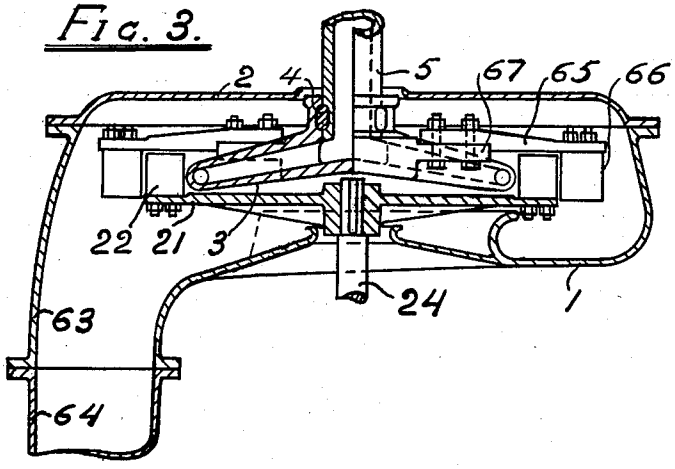
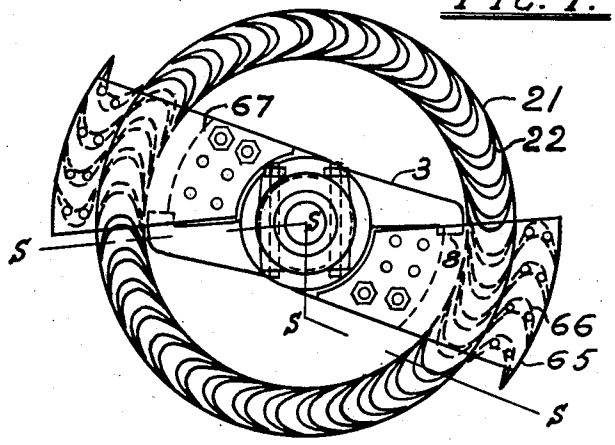


Fig. 4.



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TURBINE WITH ACTIVE AND REACTIVE ELEMENTS

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Application May 19, 1954, Serial No. 430,885

2 Claims. (Cl. 253—16.5)

This invention relates to a turbine having active and reactive elements.

One important object of the invention is to provide a novel form of turbine wherein a rotor is driven by the reactive force of fluid issuing from substantially tangential nozzles and wherein issuing fluid reacts against a second rotor to cause rotation thereof.

Another important object of the invention is to provide a novel device of this description wherein each of said rotors drives the same transmitting shaft.

Another object of the invention is to provide novel means for supporting several rotors in a common frame.

A still further object of the invention is to provide a novel construction of such a device wherein certain of the rotors will revolve in opposite directions and act with uniformly directed torque on a single shaft.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings, and particularly claimed.

In the drawings:

Fig. 1 is a vertical section through the axes of the rotors and the axis of the driven shaft,

Fig. 2 is a detail horizontal section showing the relationship of the two rotors used herein,

Fig. 3 is a detail vertical section showing the utilization of a three-rotor arrangement, and

Fig. 4 is a detail horizontal section showing the three-rotor arrangement.

In the forms of the invention as herein shown, there is provided a frame of vertical members as indicated at 52. In this frame there is supported a housing having a top, or cap, 2. Within this housing is mounted a rotor 3 having radial arms 3*a* terminating in nozzles 3*b* arranged in opposite directions at the substantially right angles to the arms 3*a*. This rotor is secured by a key 4 to an intake pipe 5. At its lower end the intake pipe 5 communicates with passages 7 leading to outlet nozzles 8. The passages 7 extend outwardly and downwardly from an enlarged portion 6 of the rotor. At the upper end of the frame there is provided a sleeve 9 extending circumferentially around the pipe 5. Below this sleeve 9 is located a thrust bearing 10 and above the member 9 there is located a peripheral bearing 12, these bearings being of the anti-friction type. Above the bearing 12 there is provided a flange 13 which engages the inner race of the bearing 12. The outer race of the bearing 12 is held in the sleeve 14 which is supported by the casting 11, located between the channel members 47. At 18 is a casting, supported by the channel member 48 below the casting 11, and within this casting 18 there is supported an anti-friction bearing 16, the inner race of which is indicated at 17. Washers 19 are carried by the casting 18 for prevention of oil leakage from the bearing 18.

Fixed on the intake 5 between the upper and lower bearings is a belt pulley 20 which is connected by a

crossed belt 34 with a belt pulley 37 mounted on a driven shaft 36 from which power may be taken.

Located in axial alignment below the intake 5 is a shaft 24 whereon is mounted a disk 21 of greater diameter than the rotor 3 and this disk carries on its periphery upstanding vanes 22 secured to the disk by bolts 23. The frame members 51 and 52 extend upward from a base plate 49 and are supported adjacent the base plate between channels 49*a*. A bottom casting 27 is mounted between these channels and rests on the base plate 49. In the upper part of this casting there is provided an opening 49*b*, the upper end of which is closed by a cap 28. In this cap 28 is held a bearing 26, which surrounds and supports the shaft 24. At the bottom of the opening 49*b* is a further bearing 25 of the thrust-bearing type. Beneath the bottom of the housing 1, there is provided a casting 30 supported from the housing and from a channel 50. In this casting 30 is mounted an anti-friction bearing 29, which is held in position between washers 31 and 32. Mounted fixedly on the shaft 24 between the bearings 29 and 26 is a belt pulley 33 which is connected by a belt 35 with a belt pulley 38 keyed on the shaft 36. At the lower end of the shaft 36 there is provided a thrust-bearing 39 which seats in a pocket formed in the casting 40 supported by channels 53. Above the thrust bearing 29 there is also provided in the casing 40 a bearing 41 held in position by a cap 42. At the upper end of the shaft 36 there is provided a bearing 43, which is held in the casting 44 and also includes a thrust bearing 45 held in position by a cap or closure 46. The casting 44 is supported in suitable manner by a channel 54.

At 55 is a delivery pipe receiving fluid under pressure and this delivery pipe has a downwardly bent end axially aligned with the intake 5. The downwardly bent end of the delivery pipe is provided with a peripheral flange 58 and on the upward end of the intake 5 there is provided a flange 59, which cooperates with the flange 58 to form the halves of a coacting groove 56 wherein is held a suitable packing 57, this arrangement permitting free revolution of the intake 5 relative to the supply pipe 55. At 60 is a lubricant injector communicating with the above-mentioned groove and this lubricant injector is supplied with lubricant by any suitable means through a pipe 61. In the supply pipe 55 there is arranged a manually operable valve 62 to control the flow of fluid through the pipe 5. The housing 1 has at one side a discharge pipe 63 which communicates with an exhaust 64.

In the form of the invention shown in Figs. 3 and 4, the construction of the several shafts and the parts previously described is identical, except that secured to the arms 3*a* there is provided a plate 65 having a centrally disposed opening surrounding the head 4 and bolted onto a flange or bosses 67 formed on the arms 3. Depending downwardly from the peripheral portion of the plate 65 is a series of vanes 66 and it will be observed from Fig. 4 that these vanes are concave in the opposite direction to the vanes 22.

In the operation of the device as shown in Figs. 1 and 2, fluid under pressure passes down the intake 5 and through the radial arms 3*a* and outwardly through nozzles 3*b*, thus producing a fluid reaction tending to rotate the intake 5. The fluid issuing from these nozzles strikes the vanes 22, and produces impulse action on these vanes so that the disk 21 is caused to rotate in a clockwise direction opposite to the rotation effected by the nozzles. Since the belt 34 is crossed and the belt 35 is a straight belt, both the reactants due to the nozzles and the impulse actuation due to the striking of the rapidly flowing fluid against the vanes, are communicated to the shaft 36. The term relative speeds is used to denote the summation of the speeds of both of the rotor 3 and the disk 21. This will obviously be equal to twice the speed of either

of the rotor 3 or the disk 21 since they are rotating at the same speed in opposite directions.

The same effect is obtained in Figs. 3 and 4, except that the exhaust from the vanes 22 is then directed against the vane 66 so that the plates carrying these vanes rotate in the same manner as the arm 3. Thus, when the fluid issues in the first form from the vanes 22, and in the last form from the vane 66, practically all of its potential energy has been utilized.

What is claimed as new is:

1. In a device of the kind described, a pair of vertically aligned rotatable shafts, a pair of opposed radially extending hollow fluid actuated reaction elements fixed on the lower end of the upper one of said pair of shafts and having tangentially directed fluid discharge nozzles fixed at their outer ends, means including an inlet passage through said upper shaft to said hollow reaction elements to provide said elements with fluid under pressure and causing said elements to turn said one shaft in one direction, an impulse actuated element fixed on the upper end of the lower one of said pair of shafts and having peripherally spaced vanes for receiving exhaust fluid from the reaction elements and to turn said second shaft in the opposite direction, a third vertical rotor shaft spaced from said aligned shafts, and separate belt drive means connecting each of the pair of aligned shafts with the third rotor shaft including pulleys on the vertically aligned

shafts and reduced pulleys on the third rotor shaft for turning it in the direction of the shaft bearing said impulse actuated element at a speed at least equal to the relative speed of said aligned shafts, whereby the torque on the third rotor shaft is not greater than that of either one of said aligned shafts.

2. In a horizontally rotating fluid pressure impulse reaction turbine as defined in claim 1, said reduced pulleys on the third vertical rotor shaft being half the diameter of the corresponding pulleys on said aligned shafts respectively, so that for a desired speed of operation of said aligned shafts, the relative speed of rotation of said aligned shafts would substantially equal said rotor shaft speed, whereby the torque on said rotor shaft would be substantially the same as that on said aligned shafts.

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