United States Patent [19]

Gregory

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[54] **POWER PLANT**

[76] Inventor: **Alvin L. Gregory**, 5860 Callister Ave., Sacramento, Calif. 95819

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[51] **Int. Cl.** **F01d 3/00**, F01d 5/08

[58] **Field of Search** 415/103, 56, 80, 187, 101, 415/81, 82, 52, 178

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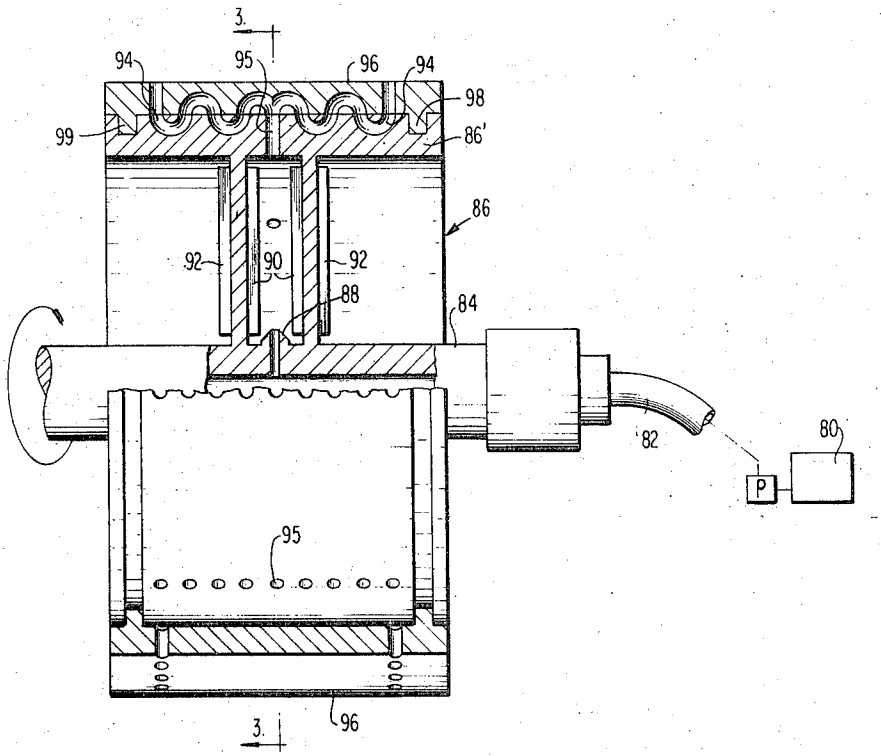
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Primary Examiner—Henry F. Raduazo
Attorney, Agent, or Firm—Edwin E. Greigg

[57] **ABSTRACT**

A prime source of mechanical power comprising an expansion chamber, an inlet into which expansible fluid is injected, and an outlet through which said fluid is exhausted after expansion in said chamber. Expansion of said fluid is achieved by application of a heat source directly to the expansion chamber, which expansion acts through piston means to create useful mechanical motion. The engine may be of a reciprocating type, rotary or novel turbine, while the heat source can be solar, gaseous, petroleum, nuclear, or electrical. In addition, it is conceived that the novel turbine engine can produce motion by either a rotor driven by a stator or a stator driven by a rotor.

8 Claims, 7 Drawing Figures



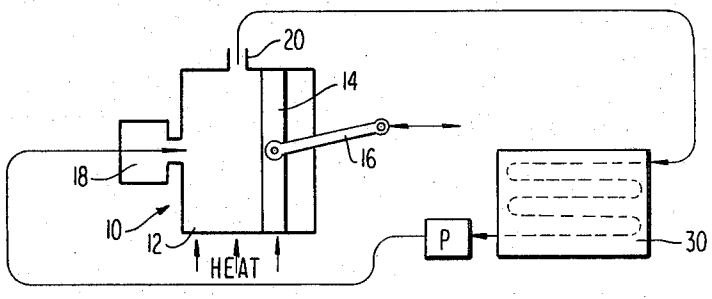


FIG. 1

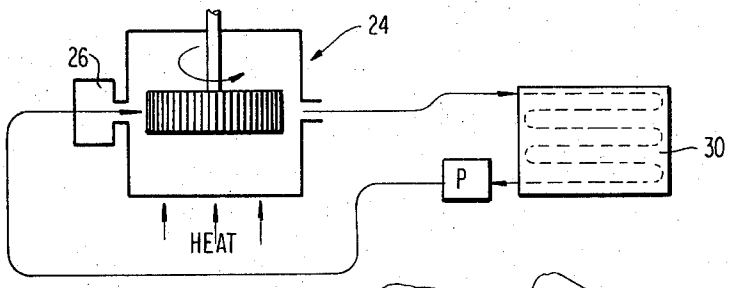
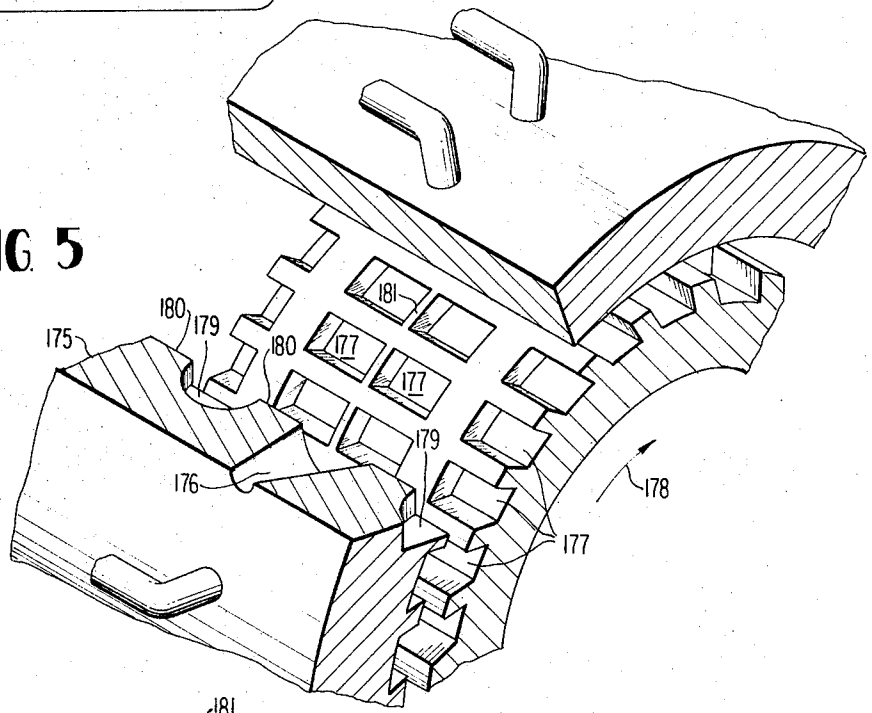


FIG. 1A

FIG. 5



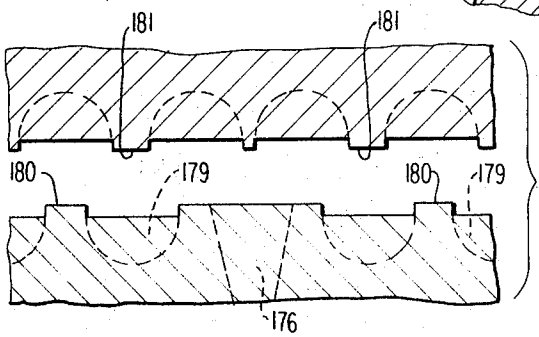


FIG. 6

INVENTOR
ALVIN L. GREGORY

FIG. 2

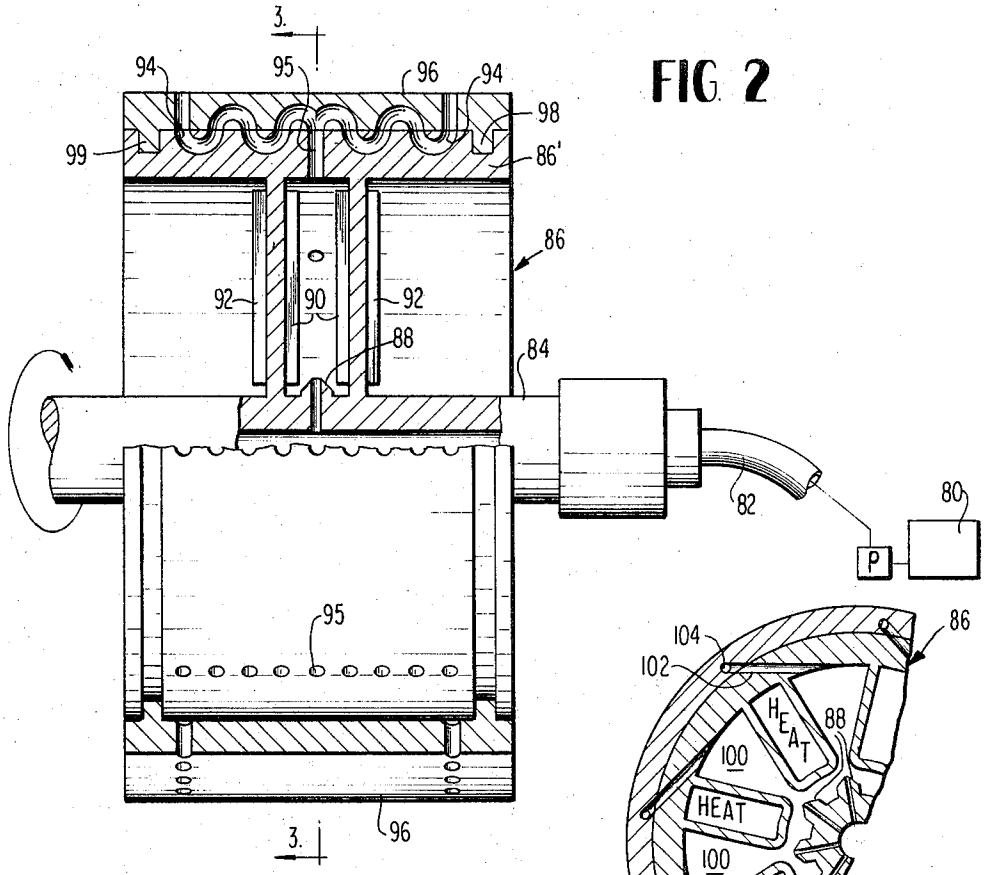


FIG. 3

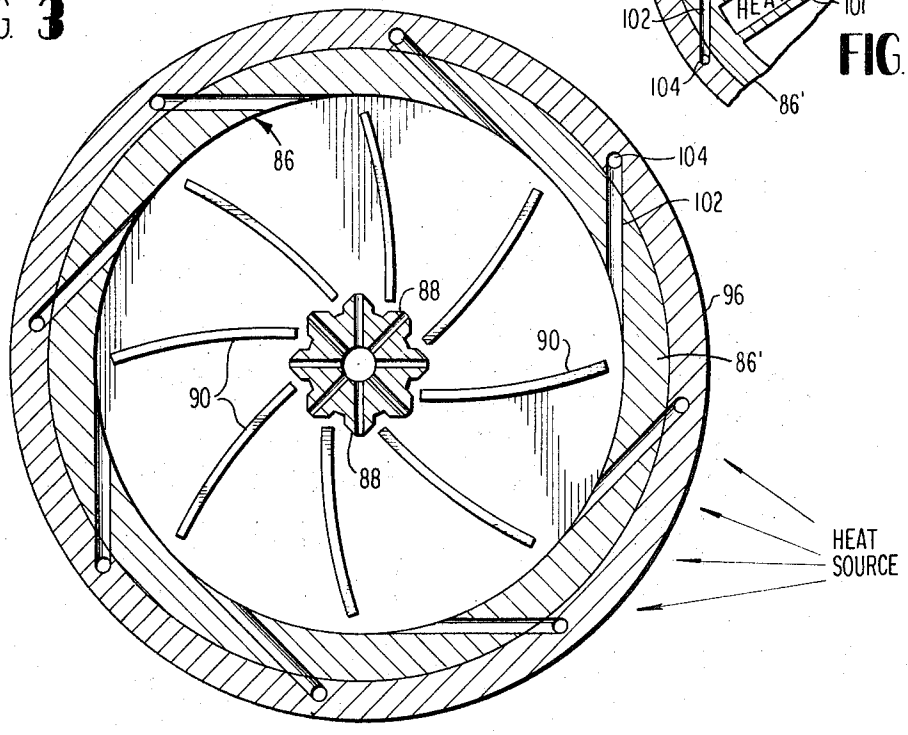


FIG. 4

POWER PLANT

This invention relates to a system in which heat energy is converted into mechanical energy and, more particularly, to a concept wherein the heat source is applied directly to the power plant to achieve mechanical power therefrom.

BACKGROUND OF THE INVENTION

It is well known in some power plants to use an external boiler as a separate component and when a heat source is applied thereto, the expansion fluid, such as steam, which is created in the boiler, is transmitted to the power plant in order to derive mechanical power therefrom.

One of the principal reasons the steam engine, as applied to the motor vehicle, was never completely successful was because of the safety hazards involved since boilers are likely to explode causing bodily harm and vast destruction. Moreover, external boilers of the design known heretofore require a large mass of fluid separate from the engine which also contains a certain amount of fluid and thus the boiler, together with its heat source, is sizable, and then to this must be added en masse the weight of the power plant, all of which factors must be taken into consideration and eliminated where possible.

OBJECTS OF THE INVENTION

Accordingly, the principal object of the invention is to apply a heat source to an engine which may be of a conventional expansion chamber type including a reciprocating piston, a turbine or a rotary motor.

Another object of the invention is to provide an engine construction wherein an injector valve will inject a definite quantity of fluid under pressure to the expansion chamber of the engine during which time the heat source will not only heat the injector valve, but also the engine and will expand the injected fluid to a high volume to drive the piston and perform the work intended.

Still another object of the invention is to provide a system of turbine operation which utilizes the principles narrated relative to a reciprocating type engine, but which also has the versatility of operation in which the flow of a fluid from the injector to the engine can travel from the stator to the rotor or vice versa to achieve power from the turbine engine.

A still further object of the invention is to provide a new system of producing power which is not only lighter in weight, but much more compact and thus suitable for producing power in less space than that now required from normal conventional type boiler construction.

A still further object of the invention is to provide an engine design in which, on the one hand, the heat source is applied directly to the engine as the fluid is being injected into the expansion chamber thereof or, on the other hand, to a supplemental chamber positioned adjacent to the reciprocating piston and by reason of which the applied heat causes sublimation to drive the piston.

Yet another object of the invention is to provide a turbine construction wherein the fluid traverses a tortuous path through a duct system extending longitudinally between the juxtaposed surfaces of a stator and a rotor; the thus exhausting vapor with its travel therebetween producing an increase in force which gives a powerful turning action on the rotor.

Further objects and advantages will become more apparent from a reading of the following specification taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow chart schematically showing the principle of this invention as applied to a reciprocating piston-type engine;

FIG. 1*a* is a flow chart schematically showing the principle of this invention as applied to a turbine-type engine;

FIG. 2 shows partially in cross section and partially in elevation a turbine engine of one type to which the principle of this invention is applied;

FIG. 3 is a sectional view on line 3—3 of FIG. 2;

FIG. 4 is a further embodiment of the invention showing another type of turbine engine to which the inventive concept is applied;

FIG. 5 is a fragmentary perspective view of a further embodiment of the invention showing a drum type turbine engine with the stator cut away to disclose the surface area of the rotor; and

FIG. 6 is a cross-sectional view through the wall of the rotor and the stator showing the nozzle construction therefor.

DESCRIPTION OF THE EMBODIMENTS

In this application reference is made initially to FIG. 1 which schematically depicts in flow chart form the basic concept of this invention as applied to reciprocating type engines, as well as turbine engines, and is referred to for a more expedient understanding of the principles of the invention which is to be described in greater detail later herein.

A reciprocating type engine, as shown at **10**, includes an expansion chamber **12**, a piston **14** and a piston rod **16** connected thereto. The chamber **12** is provided with a fluid injector nozzle **18** and an exhaust port **20**. For purposes of description throughout the application reference will be made to the "fluid" as being Freon **113** (CCl_2 F – $CClF_2$). A complete circuit of the path of travel of the freon from its gaseous state to its liquid state is also depicted in FIG. **1**. Assuming that fluid has been charged into the heated cylinder through the heated injector valve, it instantly vaporizes into a gas and expands to drive the piston. On exhaust stroke of the piston the gaseous vapors are charged through exit port **20** and if desired to be saved, are re-cycled to a condenser **30** where they are sublimated and then pumped again in another cycle to the injector valve for another stage of driving the piston **14**. It is to be understood that is is not necessary for the expanded fluid which is exhausted from the reciprocating engine to be returned to a condenser for sublimation and then recirculated through a pump back to the injector valve for re-cycling again, but it could instead be exhausted to atmosphere.

It is to be understood that the system disclosed in the flow chart is arranged through suitable timing mechanism to charge cyclical pulses of a gaseous fluid into the heated injector valve where it is introduced into the expansion chamber of the heated motor and its volume is increased by expansion.

To those skilled in the art it will be apparent that any suitable heat source to heat the engine may be utilized,

e.g. gas, electricity, petroleum, nuclear power, as well as solar power is also contemplated.

Referring once again to the flow chart, there is also shown a turbine engine **24** into which is charged through the injector valve **26** a predetermined quantity of vapor, the volume of which is instantly increased by expansion by the heat source applied to the turbine injector valve chamber therefor as well as the engine thereby driving the rotor to the turbine to achieve a source of energy output.

The foregoing explanation is believed to better familiarize the reader with several of the fields in which the inventive concept is considered to be applicable.

As described earlier in connection with FIG. **1**, a condenser and pump system is an optional arrangement and is so arranged that the products exhausted from the piston chambers are combined and transferred to a condenser where they are evaporated and then forwarded to a pump to drive the fluid through another cycle of operation. Numerous arrangements of injection valves can be utilized and the type shown is only illustrative of one that will assure that fluid is injected under pessure into the convector of the heated expansion chamber.

It should be noted that the heat source is applied after the fluid is injected into the expansion chamber. The heat source may be applied directly to the cylinder wall within which the piston operates or in the alternative, as shown in the drawings to an open chamber which leads into the cylinder would also provide the same effect. This expansion chamber should be restricted in overall area because the volume of expanded gases that remain in it do not do any work.

Referring now to FIG. **2** there is disclosed one type of turbine engine which is adapted to function in the manner disclosed earlier herein.

In this construction the evaporated Freon may be pumped from the condenser **80**, an optional feature if available, through the conduit **82** and into the hollow shaft or hub portion **84** of the rotor **86** where it will be injected by the radially arranged nozzles **88** between the opposed curved heat convector fins **90** carried by the spaced discs **92** to which is secured the annulus of or rim portion **86'** the rotor **86.**

The nozzles **88** are spaced equidistantly around the circumference of the hollow shaft **84** (FIG. **3**) and upon initial start up sublimation of the Freon into gaseous vapors causes the rotor **86** to begin to rotate.

It is also to be noted that the Freon emitted from the nozzles carried by the rotor cooperate with exhaust ports **95** that are positioned medially of the length thereof and in this manner the gaseous vapors will be made to travel longitudinally in opposite directions through the tortuous channel path formed between the juxtaposed surfaces of the rotor **86** and the stator **96** and reversed 180° in its direction of travel each time it travels from the rotor to the stator and back again. This series of reversals can be continued to any number of reversals, each being similar to a separate stage of the turbine in which the exhausted pressure is used in aiding the turning power of the turbine over and over until it is exhausted to the desired pressure level. The stator and rotor are provided adjacent their end walls, as shown, with suitable seals at **98** and **99**, respectively, to prevent leakage of the sublimated Freon.

It is also contemplated that under certain conditions it is required to apply heat to the stator, since heat having been applied to the rotor in starting of the machine, its temperature consequently will be higher than the stator and the expansion of the rotor may cause it to drag against the stator. Thus, to overcome the possibility of drag, optional heat may be applied at the same time to the stator of the machine causing it to expand in direct time relationship with the rotor in order to provide proper clearance between the respective elements.

In the fragmentary view in FIG. **4** there is shown still another embodiment of the concept of this invention as applied to turbines wherein the jet nozzles **88** charge the fluid spray into plural radiating chambers **100.** The radiating chambers generally approximate the spokes of a wagon wheel, which being hollow and heated causes them to function as heat convectors as explained before in connection with the other embodiments of this invention. The gaseous vapors expand in the hollow spokes and are emitted through the tangentially disposed exhaust nozzles **102** and into the ports **104** in the stator whence it can return to the condenser for the next cycle of operation.

It is to be understood also from the foregoing that either of the types of turbine engines disclosed can be mounted on a common shaft and that a multiple-stage operation can be achieved from such an assembly by applying the heat in separate stages or by progressively increasing the heat to each stage over the full extent or length of the multiple stages.

As is now understood, in the design of the second turbine engine, the hollow chambers **100** within the spoke portion have openings in which heat is forced to flow through the spoke drums thereby conducting heat through the walls of the spokes and into the interior chamber in which the expansion occurs. Fluid under pressure is forced through the hollow shaft into the interior of the spoke drums **101** through the jet nozzles **88.** These nozzles spray a quantity of fluid within each of the hollow chambers and the heat which is transmitted inside causes the fluid to vaporize creating an increased pressure within the rotor spokes. The expanded fluid will flow out of the exhaust nozzle or jet **102.** Its force is exhausted into means defining openings **104** in the stator and thence its flow is fluid and because of the channels its path of travel is reversed by 180°. This reversal of the fluid coming out of the exhaust jet creates a force on the rotor causing it to rotate in the direction shown by the arrows on the power take-off shaft. Thus, the vapors are forced back and forth through the rotor and stator, being reversed 180° each time as vapors continue throughout the length of the drum with each interchange of the exhausting fluid between the rotating rotor and the stationary stator producing an increase in force which gives a powerful turning force upon the rotor and finally at the last stage the reduced pressure of the exhaust fluid coming from the last output section may be exhausted to the atmosphere or can be collected and transmitted to an evaporating condenser.

In FIG. **5** there is disclosed another type of new turbine engine which may be driven by any suitable fluid as explained hereinbefore, including steam. The stator **175,** which is shown fragmentarily in this view, includes a nozzle **176** in the stator and through which the driving fluid is emitted to the tangentially arranged rotor pockets **177** to drive it in the direction of the arrow **178.**

By now referring to FIG. 6 it will be seen that the nozzle 176 is positioned in the wall of the stator in lieu of the construction shown in FIG. 2 where the nozzle is shown as radially arranged relative to the hollow shaft 84.

It is believed to be clear from a study of FIGS. 5 and 6 that the semi-circular or arcuate cavities 179 in the stator are arranged in spaced relation by partitions 180, these partitions being disposed so as to straddle the partitions 181 in the rotor which separate the corresponding arcuate cavities 177 provided in the rotor.

Thus, it is apparent that if a fluid is introduced to the nozzle 176 in the stator, it will not only cause the rotor to turn faster and faster by reason of the tangentially disposed pockets since the respective pockets 177 will be brought up into a position where the fluid can gain access thereto, but also that, as explained earlier herein in connection with FIG. 2, the fluid will be caused to travel longitudinally of the rotor and stator in opposite directions through the complementally formed arcuate passages therein whereby the turbine speed will be further increased and the spent fluid dissipated to atmosphere in a direction normal to the surface of the stator. The advantage of such an arrangement will be apparent to those skilled in the art who will also understand that forces applied to the rotor will be equalized by reason of the equal and opposite flow of the fluid through the respective passages.

Although the drawings do not show such an arrangement it is also contemplated that where desirable the nozzle 176 may be positioned in the rotor and the fluid flow can be from the rotor to the stator all of which was explained herein. Moreover, it is to be understood that this is possible particularly since the slots in both the rotor and stator are tangentially disposed, this being well shown in FIGS. 3 and 4.

That which is claimed is:

1. A turbine engine comprising: a rotor element; and a juxtaposed stator element surrounding said rotor element, said rotor element including a hub portion provided with at least one nozzle, an annular rim portion having an outer surface containing a series of alternating pockets, and means defining at least one passage in alignment with said nozzle and extending between said hub portion and said rim portion, said passage defining means including heat transfer means, said stator element including an inner surface formed complementally with the outer surface of said rotor element and also containing a series of alternating pockets, said nozzle means being arranged to discharge fluid under pressure into said passage, past said heat transfer means and through said series of alternating pockets in each of said complementally formed surfaces, whereby fluid flow through said nozzle will traverse a tortuous path in divergent directions to drive said rotor element.

2. A turbine engine as claimed in claim 1, wherein the entire surface area of said surfaces of each of said juxtaposed elements are provided with pockets.

3. A turbine engine as claimed in claim 1, wherein each of said pockets are formed by circumferentially disposed laterally spaced partitions.

4. A turbine engine as claimed in claim 3, wherein the partitions in one element are disposed medially of the pockets of the complementally formed adjacent element.

5. A turbine engine as claimed in claim 1, wherein the pockets are tangentially disposed relative to the surfaces of the juxtaposed elements.

6. A turbine engine as claimed in claim 1, wherein said passage defining means comprises spaced discs, and wherein said heat transfer means comprises at least one pair of opposed generally radially extending heat convector fins, with each fin of said pair being mounted on a respective one of said discs.

7. A turbine engine as claimed in claim 1, wherein said passage defining means comprises spaced discs, and wherein said heat transfer means comprises a plurality of pairs of opposed generally radially extending heat convector fins, with each fin of said pairs being mounted on a respective one of said discs, and with adjacent pairs of said fins effecting a division of said passage into a plurality of passage portions each having a nozzle operatively associated therewith.

8. A turbine engine as claimed in claim 1, wherein said heat transfer means comprises a plurality of heat convector fins connected to said rim portion and extending radially inwardly toward said hub portion.

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