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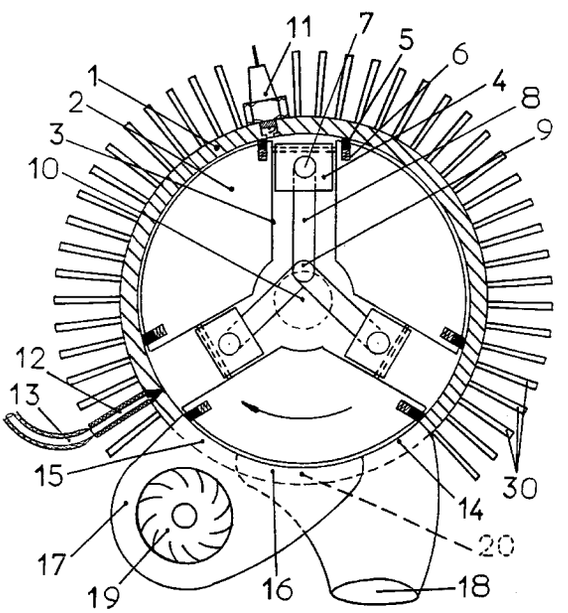
(54) Improvements made in rotative motors.

(57) Improvements made to rotative combustion engines consisting of a cylindrical stator (1) including an inner cylindrical rotor (2). The cylinders (3), mounted in star arrangement in the rotor, have each a piston (4) inside them. Each piston is linked by a connecting rod (8) to a common axis (9) of rotation which is offset with respect to the axis (10) of the rotor (2). The alternative movement of the pistons inside the cylinders forces the rotor to rotate. A spark plug and a fuel injector are also provided in the stator.

FIG.-1



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OBJECT OF THE INVENTION

The invention is related to a series of improvements in rotative motores,being able to increase their efficiency, and allowing a direct conversion from petrol to diesel oil. The motor may be considered an hybrid motor as a direct consecuence of the system of rotation of the motor.

PREVIOUS WORK RELATED TO THE INVENTION

The best known rotative motor is that due to Wankel, although this motor is quite complex and has severe dificulties for its developement. Based in the Wankel motor, there have been many similar developments of rotative motors, among those a characteristic one is an external cilindrical fixed carter and rotating interior one, in these sections the corresponding cilinders are inserted, asociated to their respective cranckshafts.

This motor, althought it is theoretically extremally advantageous due to its few pieces, and its correct theoretical behaviour, has problems with the lubrication of the crankshafts, as these are articulated in diferent points and the whole system includes a gear based starter.

In conclusion, there are no known rotating motors considered optimum in their behaviour and efficiency.

DESCRIPTION OF THE INVENTION

The rotating motor discussed here, based in the above mentioned one, that is one with a external cilindrical stator and internal rotor with conformed cilinders on the inside, has the advantage of having a fixed point articulation for the diferent cilinder cranckshafts, this simplifies the construction of the motor, There is another advantage in that the fixed articulated axis for the cranckshafts is out of phase with respect to the axis of rotation of the motor, so that varying the distance between these axis it is posible to vary the compression ratio of the motor, this allows to transform a petrol motor into a diesel motor easily.

The fised stator includes an inlet and an outlet manifold.

The pistons, mounted inside the corresponding cilinders are placed with isolation sections between the cilindrical stator and the body of the inner rotor.

The motor includes an injector and a spark-plug and its start up will be powered by an electrical starter motor.

As the pistons are mounted over connecting rods to a crankshaft, articulated to a fixed point, they can not be displaced linearly, but will rotate, this will avoid friction and benefit the motor's efficiency.

As the rotor includes its rotating axis in the center of the stator, and due to the displacement between thas axis and the articulation of the cranckshafts, the rotation of the motor will provoque the displacement of the cilinders with respect to the pistons, forcing the compression or expansion of the gases.

The clean up of the combustion gases in the inlet may be done with a volumetric compressor to force enough air flow to eliminate the residual gases and fill the chamber with fresh air.

The advantages of the rotative motor, described here, with respect to conventional motors are the following:

The rotative motor does not have distributor, unlike a conventional motor, that has to include the valves and valve selector.

In the invented rotative motor, the outlet and inlet manifolds may reach up to all the cilinders base surface, in contrast to a conventional motor, which due to the valves, the air flow has to be smaller.

In the invented rotative motor, as the pistons do not move linearly, but rotate, it will never over spin, with the danger in the conventional motors of valve misalignement and possible destruction.

In the invented rotative motor, in each rotation there are as many explosions as cilinders, on the other hand in a conventional four cilinder motor, there are only two explosions for every cranckshaft turn.

In the invented rotative motor vibrations are minimal, in contrast with conventional motors.

In the invented rotative motor there is need for only one sprk-plug and injector, while in a conventional motor there is a need for many more pieces, such as distributor, feeder, start-up, etc.

It is noticeable the reduced weight and size of the rotative motor due to the reduction in the number of elements, this will make repairs much simpler and reduce its cost.

DESCRIPTION OF THE DRAWINGS

To complement the present description of the rotative motor, a set of drawings with its description is included in order to help in the understanding of the invention's characteristics. This is presented as an example and does not limit the developement of the invention.

Figure 1.- Shows a general view of the rotative motor with three cilinders.

Figure 2.- Shows a diametral section of the motor shown in fig. 1 with its lid ready to be fixed on the stator.

Figure 3.- Shows a transect of a nine cilinder rotative motor with direction reversal.

Figure 4.- Shows another diametral secion of a petrol-diesel five cilinder motor.

Figure 5.- Shows the required element, mounted on the fixed conecting rod axis, needed to convert a petrol motor into a diesel motor.

Figure 6.- Shows the inlet and outlet manifolds for

air and exaust gases.

Figure 7.- Shows the shape of the piston head.

Figure 8.- Shows the lubrication conduits of the isolation segment between the rotor and the stator.

Figure 9.- Shows the lubrication-cooling sistem of the motor with its cilinders and pistons.

PREFERRED DESIGN OF THE INVENTION

As may be seen in the above mentioned figures, the motor includes an external stator (1) of cilindrical shape, and inside there is a rotor (2) also cilindrical, with the cilinders inserted in it (3), with their respective pistons (4), together with isolation segmets (5) pressed by springs (6) in order to obtain the isolation of the stator (1) and the rotor (2), there are also segments in the cilinders (3) and the pistons (4).

Each of the pistons has its bulon (4) which articulates each of the extremes of the connecting rod, while the free extreme of each, articulates on a fixed and common axis (10), which is excentric with respect to the rotor axis (2) on the stator (1) there is a spark-plug (11) and an injector (12), with a tube (13) for the fuel inlet.

The motor also includes the exit (14) and (20) and inlet (15) and (16)manifolds, shown in figure 6.

As has been described, the motor has a volumetric compressor (17). When the motor is started by means of an electric motor, clockwise as indicated by the arrow in figure 1, the pistons (4), as are fixed by their cranckshasfts to a fixed point can only rotate, while the compresion and expansion of the gases is produced by the sliding of the cilinders over the pistons as the motor rotates due to the excentricity between the rotor centre and the crancshaft articulation.

When piston (4) is at its maximum position, as indicated in figure 1 the combustion chamber will be filled by the combustion mixture and as the spark-plug (11) ignites, forces the rotation of the rotor untill the outlet is reached and the combustion gases exit.

Next, cilinder (3) is displaced to the inlet area, where inlet (16) and outlet (20) manifolds are paralell to the cilinder motion, as seen in fig.6.

Through the inlet (16) there is a flow of clean air that forces the residual combustion gases out through the outlet (20).

Once the cilinder (3) is clean, and following its displacement, it reaches the inlet (15) with no exit, and is compressed, thus allowing to increase the efficiency.

The cilinder continues to rotate until it surpasses the inlet (15), whereby reaching the injector area (12), as the inlet (15) closes, fuel is injected (12) from the injection pump. Then the cilinder is filled of fuel and comburent and starts to compress untill it reaches the top section where the spark-plug is. It then re-ignites and the cicle is repeated.

In figure 7 the shape of the piston head is seen, note its concavity in order to facilitate the exaust gas outlet.

The injection of fuel and the ignition, will be made in the petrol motor in each of the existing ways, been able to use pletings or electronic ignitions, and to have the injection mechanical or electronic, while if the motor would be diesel, the injector will be located at spak-plug position (11).

In figure 2, Besides the mentioned elements, the lid (22) may be observed, held by screws (23) to the stator (1). In this figure the axis (10) of the rotor (2) and the respective bearings (21) for positioning and rotation for that axis (10).

Regarding the versatility of the motor, it has been said that it may have any number of cilinders, havig show and describe a rotative motor with three cilinders as a convinience form. It is also possible to build a motor with nine cilinders with a turning converter as it is swoh on fig.3, in which the motor itslf includes the stator (1), rotor (2), cilinders (3), pistons (4), connecting rods (8), having a master cranckshaft (26) and having all of them articulated at the same axis (9).

This motor has nine cilinders and includes a reversal system, with a posible application at the navy industry, it uses a valve (24), when the outlet and inlet manifolds are interchanged, we may obtain a motor capable of both rotation directions.

It is assumed that this type of motor will have double injection and will use each of them depending on the sense of rotation.

The motor shown in figure 3 will need a starter with double rotation directions, acording to its behaviour working in either rotation direction.

Finally, in figure 4 a hibrid motor is shown, petrol-diesel, with its sprck-plug (11), injector (12) for petrol and (25) for gasoil, the rotor (2) and the stator (1), the cilinders (3) and the corresponding pistons (4), considering the openings for outlet (14) and inlet (15).

In this motor, of five cilinders, it is possible to use both petrol and gasoil, with the many applications for their combination.

The change will be done so that if the motor is working with petrol, the injecto (12) will feed the petrol and the spark-plug (11) will ignite the mixture, having the fixed axel (9) for the connecting rods (8) in the closest position to the rotor axis (10).

To change to petrol, there will be a 180 degree turn in the excentric piece (29) represented in figure 5.- and placed in the rotor (2) lid (22) so that the rotative motion will force the conecting rod (8) axel (9) to displace itself from the rotor axis (10), this forces the pistons (4) to approach the injector (25) of gasoil, thus increasing the compresion ratio and the motor capacity, as the length of piston (4) traverse is increased.

Once done this, the injection pumps will be ex-

changed and the motor may continue to work with petrol.

As has been shown, this type of motor, may be considered as hibrid, it will need two injection pumps, one of petrol and one of gasoil its behaviour will depend on the type of fuel used.

In figures 8 and 9 we may observe the form of cooling and lubricating the cilinders and the isolation segments (5) through the oil injectors (28), placed in the fixed axis (9) in the lid (22) and in the stator (1), this is continously feeding oil to the carter, which with all other pieces will be covered in oil.

Each time the piston is elevated it frees the oil conduit, which allows a small quantity of oil to lubricate the segments (5) and returning trough a cooling radiator pump which feeds back and compleating the cooling cicle.

The coling of the stator can take place by means of fins cooled by air or by a secondary water flow in a chamber.

It is not considered necessary to extend this description as it is clear to any expert in the subject the reach of the invention and the advantages it may have.

The materials, shape, size and disposition of the elements will be able to change, as long as the esence of the invention is not altered. The terms described here have to be considered extensive and do not limit possible modifications.

MOTOR PIECES

1 STATOR
2 ROTOR
3 CILINDERS
4 PISTONS
5 SEGMENTS
6 SEGMENT SPRINGS
7 BULON PISTON
8 CRANCKSHAFTS
9 FIXED AXIS OF CRANCKSHAFTS
10 ROTATING AXIS
11 SPARK-PLUG
12 INJECTOR OF PETROL
13 INJECTOR TUBE
14 MAXIMUM OUTLET MANIFOLD
15 TOTAL INLET
16 INLET
17 VOLUMETRIC COMPRESSOR
18 EXAUST GAS TUBE
19 COMPRESSED AIR INLET
20 SCAPE OUTLET
21 ROTOR BEARINGS
22 STATOR LID
23 LID HOLDING SCREWS
24 INVERSION VALVE
25 GASOIL INJECTOR
26 MASTER CRANCKSHAFT
27 OIL CONDUITS
28 OIL INJECTORS
29 EXCENTRIC PIECE FOR FUEL AND CILINDER CHANGE
30 COOLING FINS
31 OIL OUTLET

Claims

1.- Improvements made on rotative motors, which are applicable to motors consisting on a cilindrical fixed stator (1), and a rotating inner rotor (2), also of cilindrical shape, with its corresponding lid (22), fixed on the stator (1).

The cilinders (3) are mounted on the inner rotor, with their pistons (4) linked trough the coonecting rods (8), characterized by the fixed articulation (9) of the connecting rods (8) emerging from the bulon (7) of the pistons (4), the axis is displaced from the articulation, thus avoiding the linear displacement of the pistons and forcing a rotative motion. In the stator (1) there are also a spark-plug (11) and a fuel injector (12).

2.- Improvements made on rotative motors characterized by the concave shape or the pistons which greatly enhances the gas exaust.

3.- Improvements made on rotative motors, according to previous statements, characterized by the inclusion of isolation segments (5) between the rotor (2) and the stator (1), compressed by their respective load springs (6).

4.- Improvements made on rotative motors, so that the inlet (15) (16) and outlet (14) (20) sections may have different area and distribution from a conventional motor, allowing to use asymetric inlets and outlets, depending on the use of the motor.

5.- Improvements made on rotative motors, as mentioned above, characterized by the dual use of fuels, when gasoil is used, there is a fixed number of cilinders, nine as an example, with a master conecting rod (26) from one of the pistons (4), using the motor inversion valves, associated to the corresponding inlet and outlet manifolds in order to fix the gas flux though each section, depending on the direction of rotation.

6.- Improvements made on rotative motors, characterized by the use of a single spark-plug (11), a fuel injector of petrol (12) or gasoil (25), conforming a hybrid motor petrol-gasoil, whose conecting rod (9) respect to the rotor axis (8) is placed excentrically (29). Allowing to displace the rotor (2) axis (10) with respect to the fixed connecting rod link axel (9) and thus producing an increase in the compression ratio and on the capacity of the motor.

7.- Improvements made on rotative motors.

FIG.-1

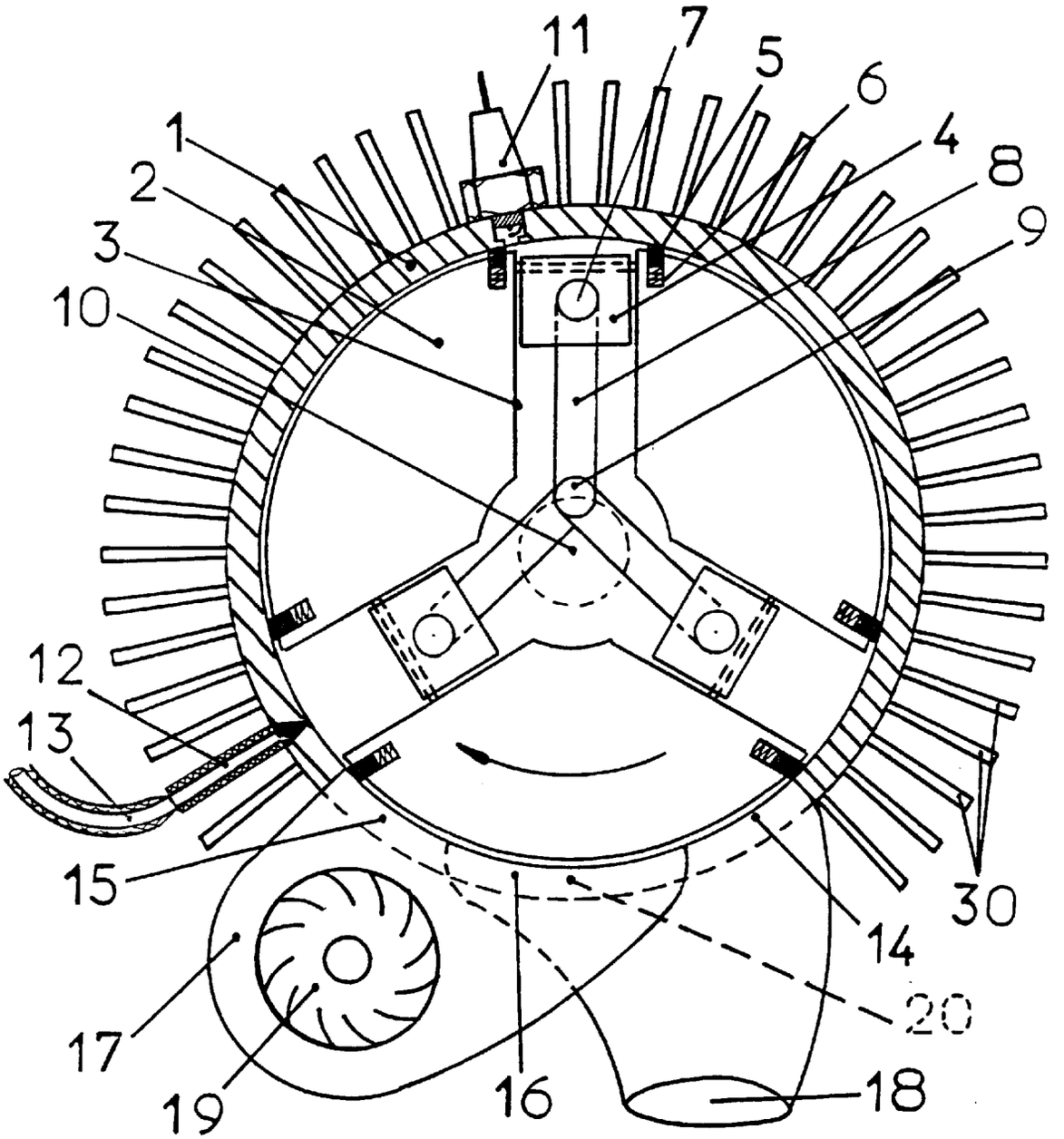


FIG.-2

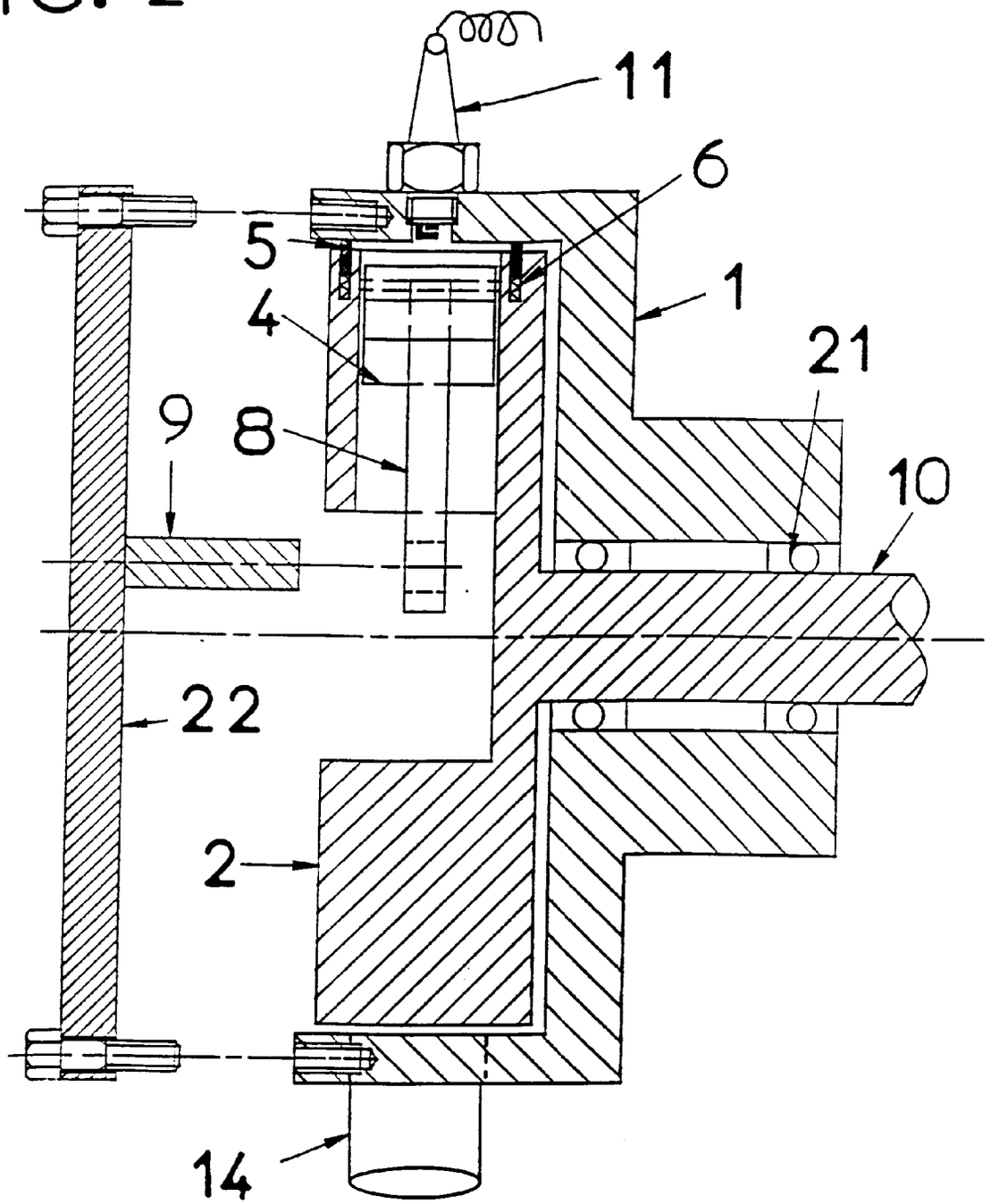


FIG.-3

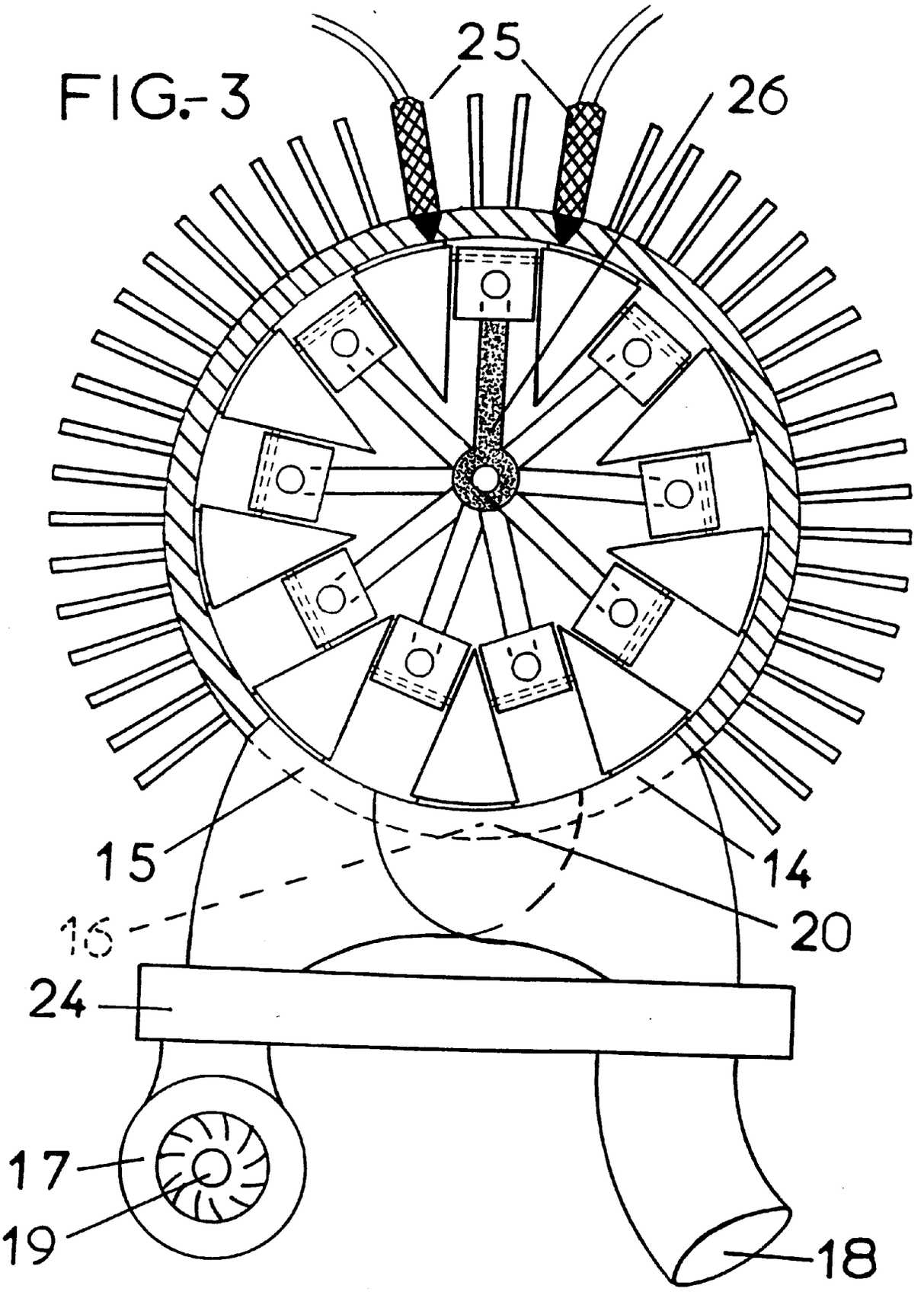


FIG.-4

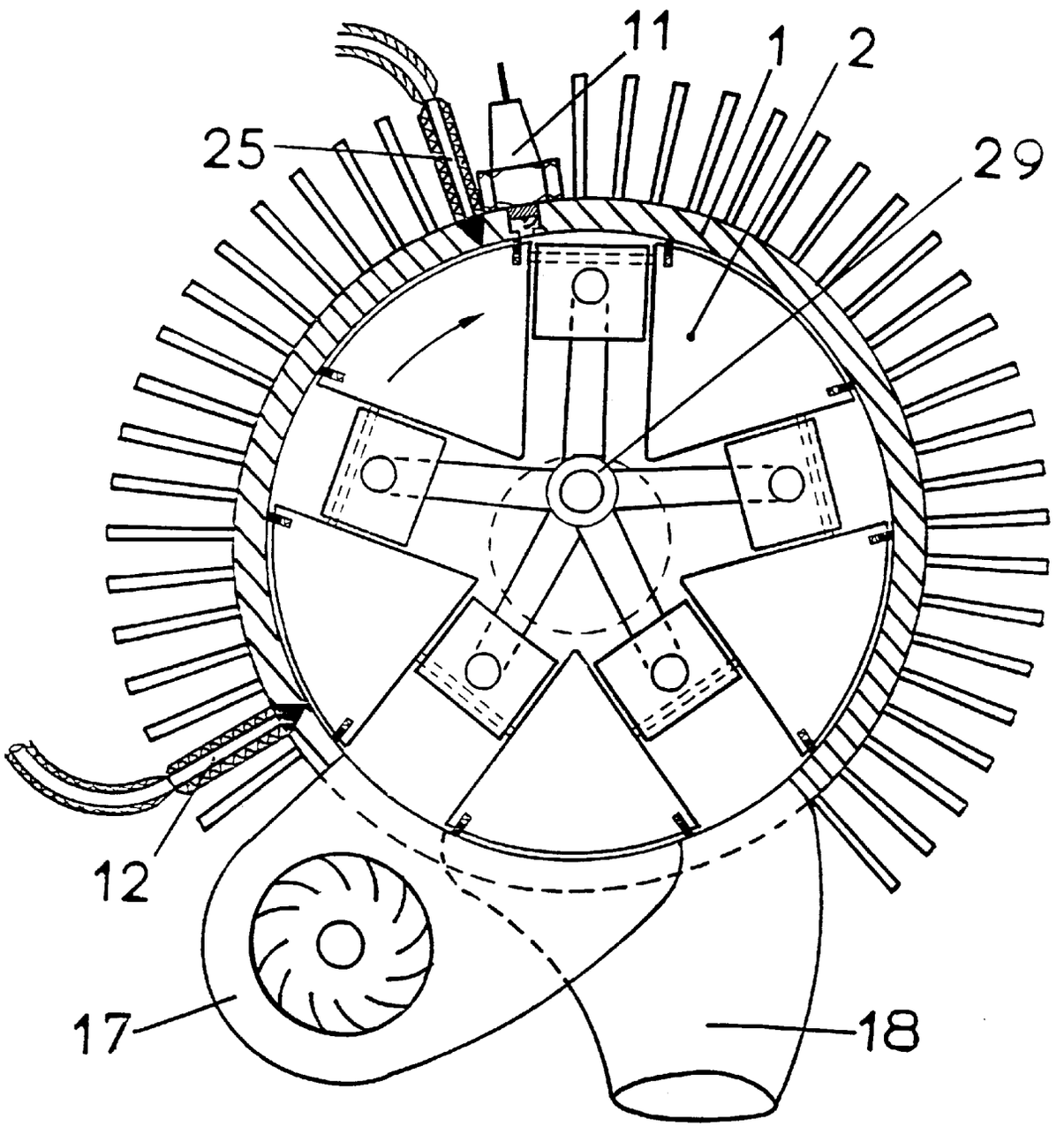
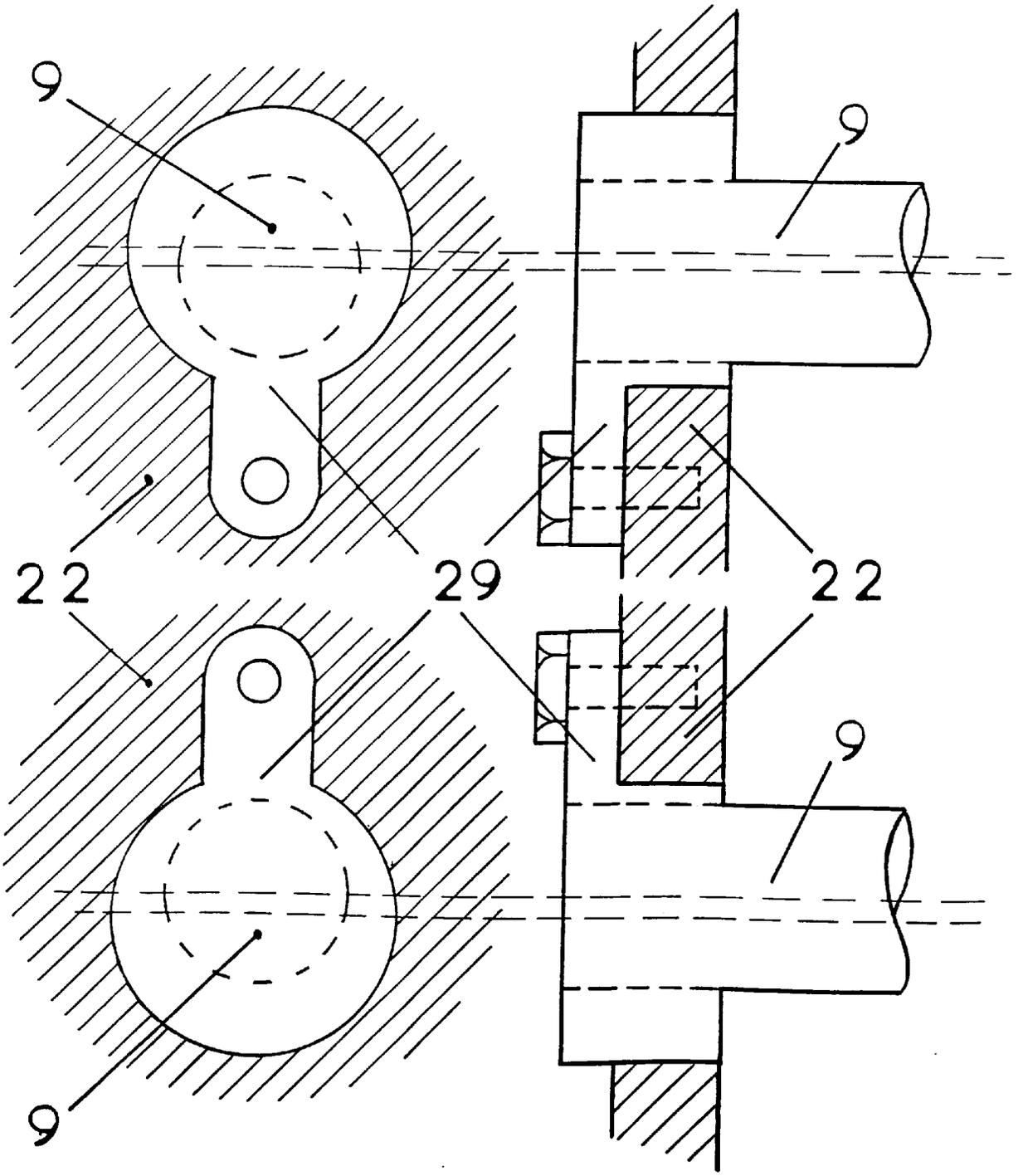


FIG.- 5



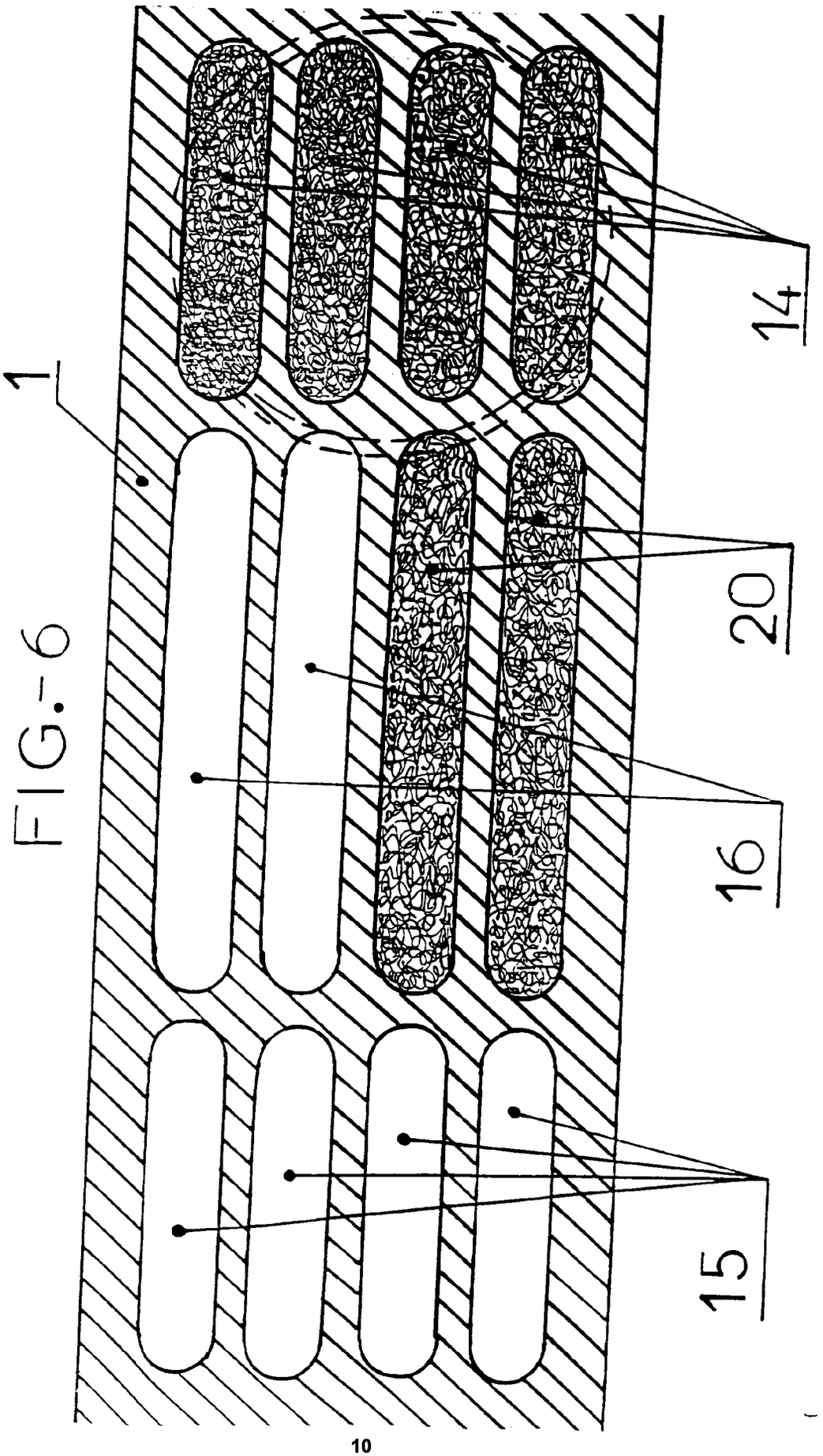


FIG.-6

FIG.- 7

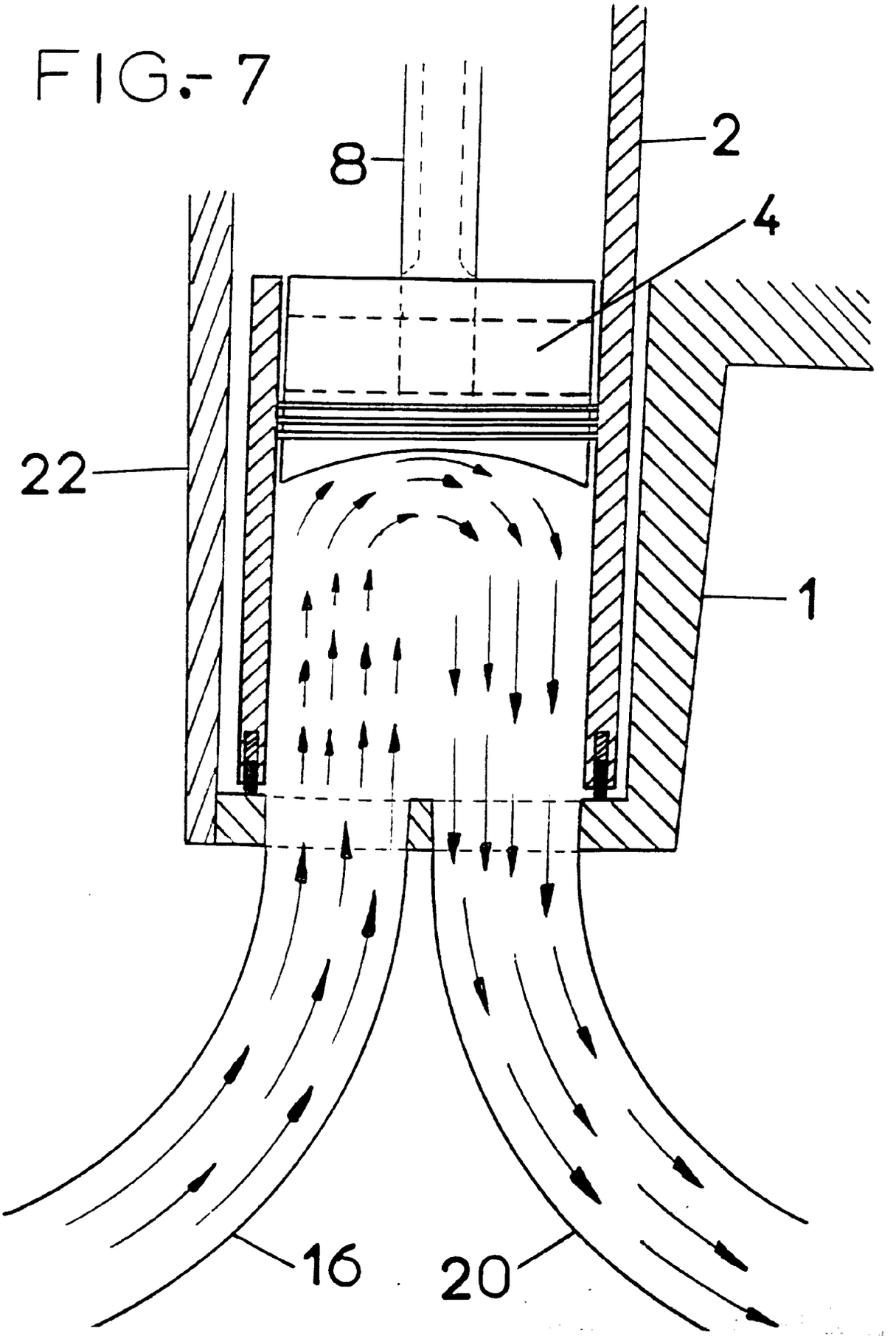


FIG.-8

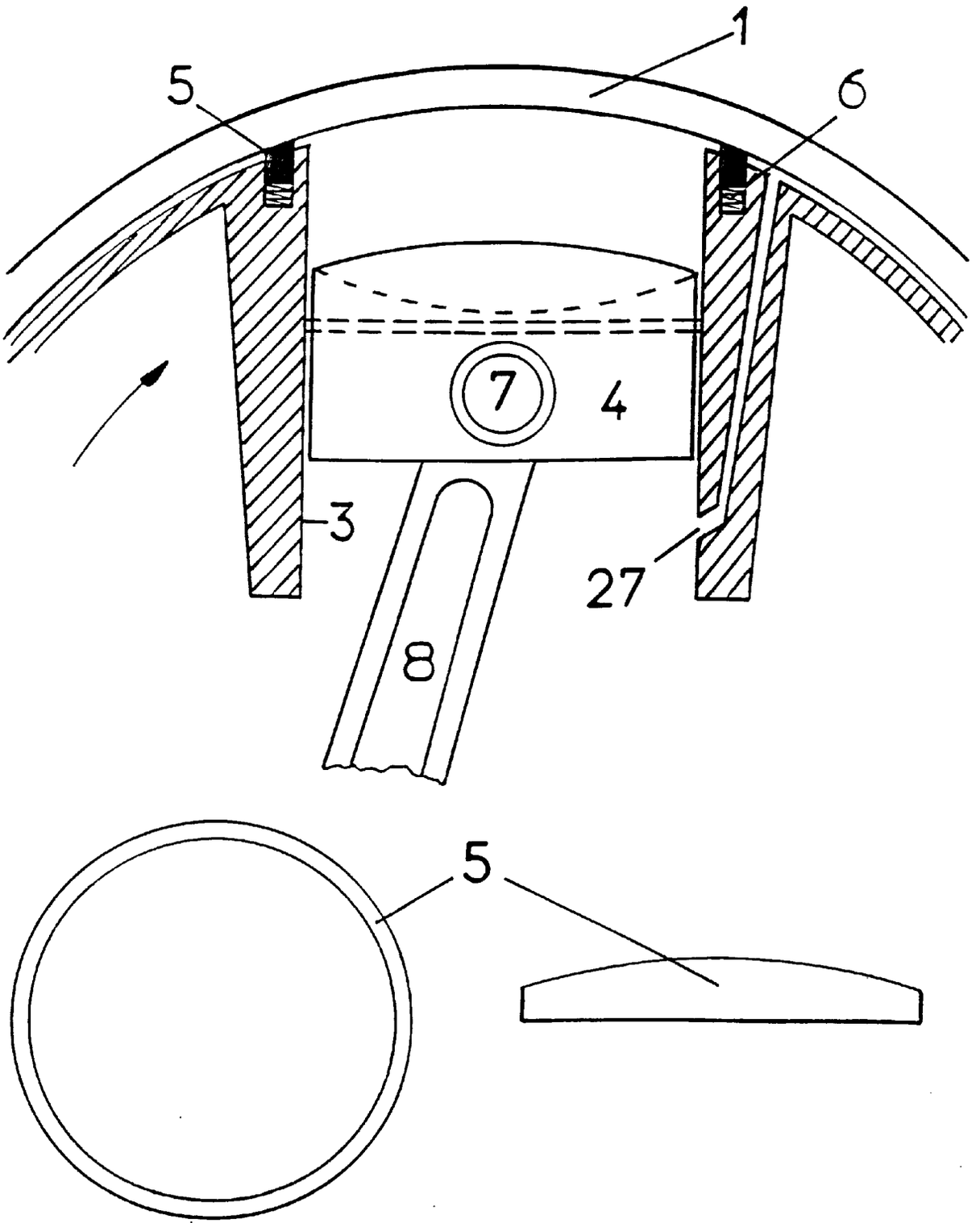
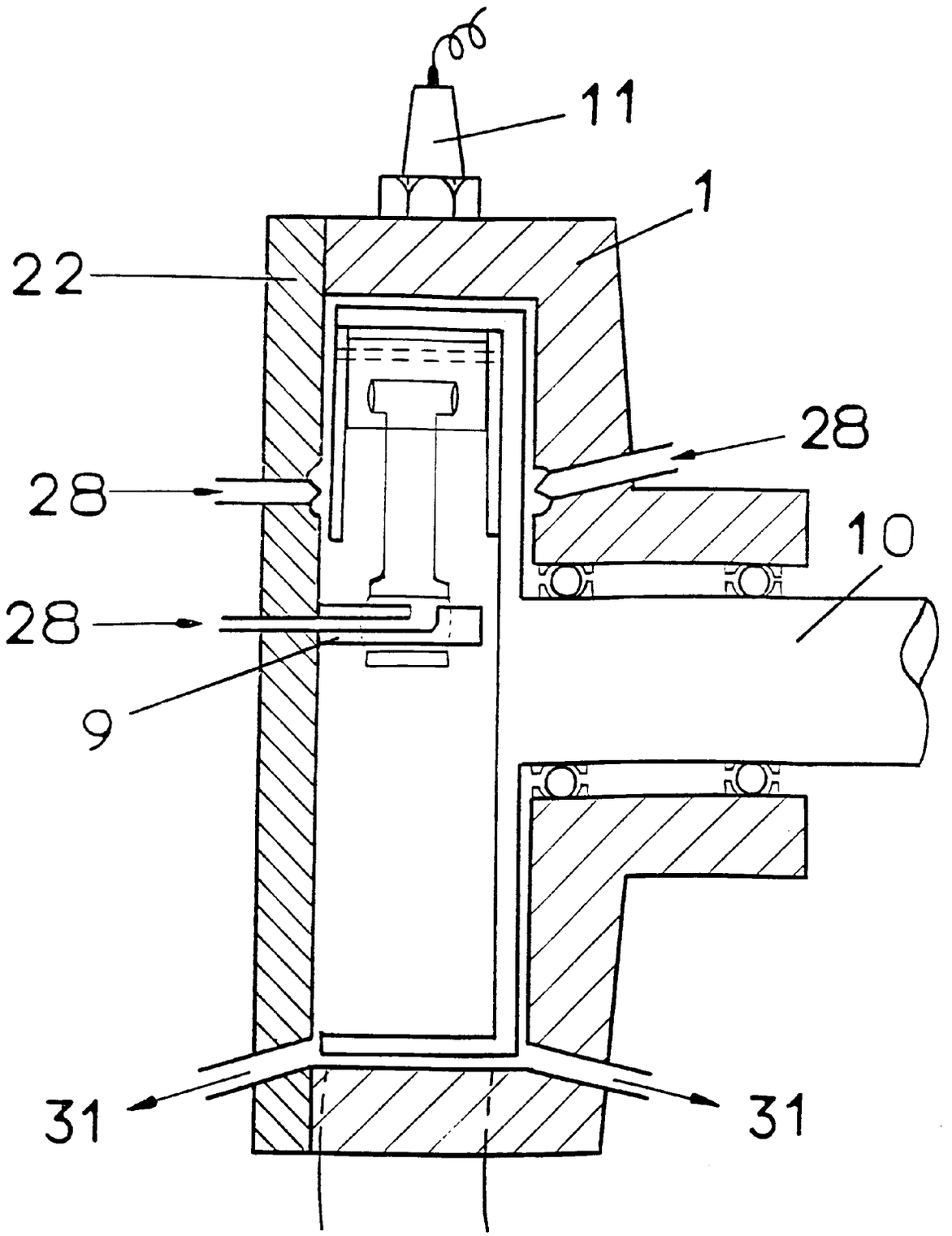


FIG.-9



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EUROPEAN SEARCH REPORT

Application Number
EP 93 50 0147

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	GB-A-132 691 (PARKES) * the whole document *	1,6	F01B13/06
X	FR-A-336 935 (SCHMUCKER) * page 1, column 1, line 24 - page 3, column 2, line 94; figures *	1	
X	DE-C-480 302 (WICHTENDAHL) * the whole document *	1	
X	US-A-5 123 394 (OGREN) * column 3, line 25 - line 39; figure 4 *	3	
X	GB-A-K20787 (SHARP) * figure 6 *	2	
A	US-A-4 010 719 (LAPPA)		

TECHNICAL FIELDS SEARCHED (Int.Cl.5)
F01B F02B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 December 1993	Mouton, J

CATEGORY OF CITED DOCUMENTS

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