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(54) **Abutting or opposite piston internal combustion engine for go-kart, motorcycle, motor vehicle, nautical and areonautical use**

(57) The present invention relates to an internal combustion engine, in particular for go-karts, motorcycles, motorboats, airplanes, motor vehicles and the like, comprising an engine body defining a combustion chamber therein.

The main feature of the invention is that first and second opposite pistons, coupled to respective driving means are included in said combustion chamber, the first and second pistons being movable with respect to a middle portion of the combustion chamber where igniting spark plug means are arranged.

The engine further comprises fuel feeding and gas discharging means.

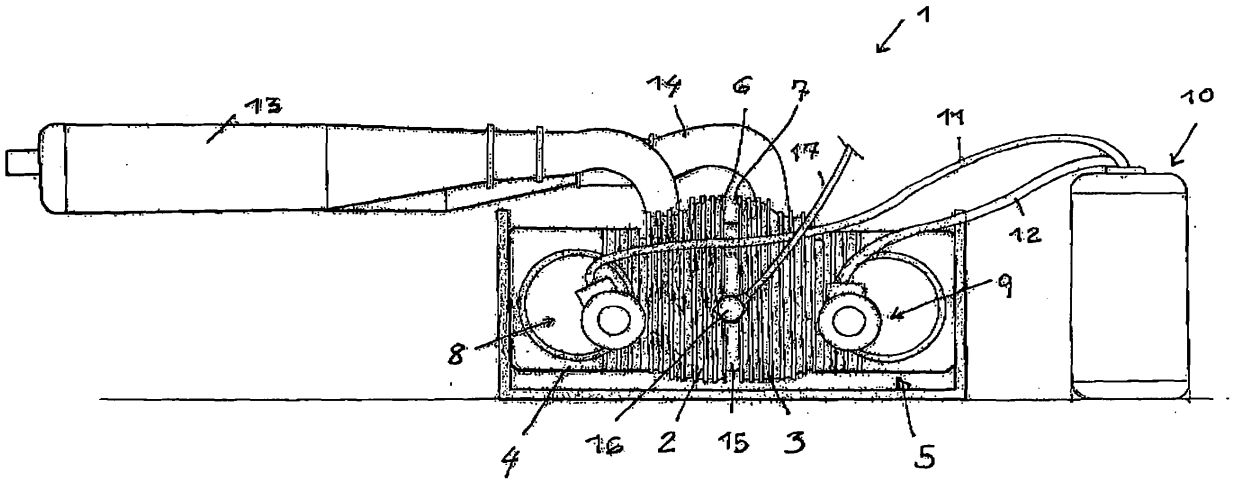

FIG. 1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an abutting or opposite piston internal combustion engine for go-kart, motorcycle, motor vehicle, nautical and aeronautical use.

[0002] As is known, the so-called "go-karts", or more simply "karts", that is small four-wheel vehicles used for sports races or the like, conventionally comprise small internal combustion engines, generally of a two-stroke or four-stroke type, with either a single cylinder or two cylinders, of a comparatively high power, since they operate with a comparatively high revolution number.

[0003] However, because of this high revolution number, which can amount up to 20,000 RPM's, prior kart engines are subjected to a high wear, and must be fully overhauled, even after a single race, with a very high overhauling cost.

[0004] Moreover, the efficiency of the above mentioned engines is very low, because of their great energy dissipation.

[0005] In this connection it should be pointed out that also engines used in motorcycle, nautical, aeronautical and other vehicles, even if they operate with a much smaller revolution number, have a small efficiency, because of their large power dissipations.

SUMMARY OF THE INVENTION

[0006] Accordingly, the aim of the present invention is to overcome the above mentioned drawbacks, by providing an internal combustion engine which has a much greater efficiency and power, together with a much .lower wear, than a conventional engine of a same displacement.

[0007] Within the scope of the above mentioned aim, a main object of the invention is to provide such an engine which is adapted to safely and efficiently operate with a broad range of operating loads.

[0008] Another object of the invention is to provide such an engine which can operate both with a high efficiency and a low wear, both in a two stroke and in a four stroke configuration.

[0009] Yet another object of the present invention is to provide such an engine which can be quickly and easily assembled on and disassembled from kart, motorcycle, boat, airplane and other motor vehicle chassis assemblies, without requiring substantial modifications of said chassis assemblies.

[0010] Yet another object of the present invention is to provide such an internal combustion engine which, owing to its specifically designed construction, is very reliable and safe in operation.

[0011] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, are achieved by an internal combustion engine, particularly for karts, motorcycles, motorboats, airplanes and the like, comprising an engine body defining a combustion chamber therein, and being characterized in that said engine body comprises, in said combustion chamber, a first and second opposite pistons, said first and second opposite pistons being coupled to respective driving means, said first and second pistons being movable with respect to a middle portion of said chamber, where igniting spark plug means are arranged, said engine comprising moreover fuel feeding and gas discharging means.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of two preferred, though not exclusive, embodiments of an internal combustion engine, specifically designed for karts, motorcycles, motorboats, airplanes and the like, which is illustrated, by way of an indicative, but not limitative example, with reference to the accompanying drawings, where:

Figure 1 is a side view showing a first embodiment of an internal combustion engine, of a two-stroke type, according to the present invention;

Figure 2 shows the engine shown in figure 1, as seen from the other side;

Figure 3 is a cross-sectional view showing the engine, the two pistons of which are arranged at the bottom dead center thereof;

Figure 4 is a further cross-sectional view of the engine, with the pistons being arranged at the top dead center thereof;

Figure 5 is a schematic view showing an internal combustion engine, of a four-stroke type, with the pistons thereof being arranged at the top dead center thereof;

Figure 6 shows the four-stroke internal combustion engine with the pistons thereof being arranged at the bottom dead center;

Figure 7 shows the distributing or timing belts of the four-stroke engine;

Figures 8 and 9 show the engine according to the present invention including the related valves; and

Figure 10 schematically shows a kart to which an internal combustion engine according to the present invention has been applied.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] With reference to the number references of the above mentioned figures, the internal combustion engine according to the present invention, which has been specifically designed for karts, motorcycles, motorboats, airplanes and motor vehicles in general, comprises an engine body defining in its inside a combustion chamber.

[0014] More specifically, said engine body, which has

been generally indicated by the reference number 1, comprises, in a first embodiment thereof, a first half-body 2 and a second half-body 3 which, according to an important aspect of the invention, are conventional motorcycle or kart engine bodies, without their finned heads.

[0015] Said half-bodies 2 and 3, which are advantageously identical to one another, have respectively a bottom face, generally indicated by the reference numbers 4 and 5, and a top face, generally indicated by the reference numbers 6 and 7.

[0016] To said half-bodies 2 and 3, conventional fuel feeding means, indicated by the reference numbers 8 and 9 for feeding said bodies with a fuel supplied through pipes 11 and 12 from an outer tank 10, are coupled.

[0017] To said half-bodies 2 and 3 are moreover coupled, in a per se known manner, discharging gas silencers 13 and 14, communicating with the combustion chambers defined by said half-bodies 2 and 3, as is clearly shown in figures 3 and 4.

[0018] Said head-less half-bodies 2 and 3, are operatively coupled to one another by abutting and firmly coupling their head or top faces 6 and 7 which, as is known, are substantially of flat configuration and provided with a circular central bore, having a diameter substantially equal to that of the respective piston arranged inside the respective combustion chamber of each said half-body 2 and 3.

[0019] In connecting the flat faces, the two central bores will be so aligned as to cause their axes to be arranged one on the extension of the other.

[0020] In this connection it should be pointed out that the two head faces 6 and 7 may be coupled by a spacer ring-like element or washer 15, preferably made of a metal material.

[0021] According to a further embodiment, said washer element 15 is provided with a throughgoing threaded hole for coupling a conventional igniting spark plug 16, which, through a conductor element 17, is connected to conventional ignition timing means, which have not been specifically shown.

[0022] The number of sparking plugs and threaded holes, formed through the washer element 15, can be any, depending on requirements.

[0023] According to a modified embodiment of the inventive idea, the spacer washer or ring element 15 may be omitted, and the head faces 6 and 7 of the two half-bodies 2 and 3 can be abutted directly onto one another, by firmly coupling them.

[0024] According to yet another embodiment of the invention, the two half-bodies of the engine can be replaced by a single body defining a combustion chamber on a middle portion thereof will be defined recesses for housing spark plug means therein.

[0025] As shown in figure 2, sprockets 18 and 19 are herein provided, and coupled by a coupling driving chain 20, with optional chain tension means, for coupling to the drive shaft, which will turn in a single direction.

[0026] As shown in figures 3 and 4, the combustion chamber comprises two partial combustion chambers 22 and 23, therein are slidably housed corresponding pistons 24 and 25 having a piston body 26 and 27 and a piston head 28 and 29.

[0027] Said pistons are coupled, in a per se known manner, to a respective connecting rod 30 and 31.

[0028] Each connecting rod 30 and 31 has a first end portion 33 coupled to the related piston, and a second end portion 34 operatively coupled to the driveshaft.

[0029] The pistons 26 and 27 shown in figure 3 are arranged at their bottom dead center, whereas in figure 4 they are arranged at their top dead center.

[0030] Thus, at their top dead center position, the piston will substantially be arranged flush on the holes of the head faces of the motor bodies, that is said pistons have their crowns arranged near the chain supporting washer 15.

[0031] With reference to figure 5, is herein shown a four-stroke engine, where, at the middle portion of the combustion chamber, are provided piston valves 40 and 41 which are operatively coupled to cams 43 and 44 in turn coupled by small shafts or spindles 45 and 46 which are driven by distributing or driving chains 50 and 51 which, as is shown in figure 7, are coupled to respective drive shafts.

[0032] With the engine arrangement shown in figures 5 to 7, an internal combustion engine operating in an operating manner conceptually analogous to the above operating manner is achieved, said engine providing a possibility of adjusting at will the timings of its pistons.

[0033] Figures 8 and 9 show a modified embodiment of the four-stroke engine, including the related valves.

[0034] In particular, said figures 8 and 9 show a modified embodiment of the inventive motor, characterized in that it is provided with valves 61 which are respectively driven by the cams 43 and 44.

[0035] This engine comprises sparking plugs 16, opposite pistons 28 and 29, coupled to connecting rods 30 and 31 which, at the other end portions thereof, are in turn coupled to drive shafts 34.

[0036] Practical tests have shown that the subject engine may operate in a very reliable manner, with an efficiency much greater than that of a like engine of like displacement, with a minimum wear; moreover, it provides a high power which is transmitted to the driveshaft in a very even manner.

[0037] For the two stroke engine, the greater efficiency and power are probably due to a greater filling in of the engine according to the invention.

[0038] This volume is a direct consequence of the fact that the engine bodies are devoid of heads and are coupled as hereinabove disclose.

[0039] As shown in figure 10, the subject engine, which has been herein indicated by the reference number 1, is very suitable to be quickly and easily applied on a go-kart 60, since it has a small weight, together with a high power.

[0040] In this connection it should be apparent that the

inventive engines can be also applied to any desired types of motor vehicle.

[0041] From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

[0042] In particular, the fact is to be pointed out that the opposite arrangement of the pistons allows to provide practically a double combustion chamber, which allows to better balance the efforts, thereby reducing to a minimum the vibrations.

[0043] The invention, as disclosed, is susceptible to several modifications and variations, all coming within the scope of the invention.

[0044] For example, while the engine has been disclosed with reference to an embodiment thereof providing a single chamber with two opposite pistons, it would be possible to arrange in an adjoining relationship a plurality of cylinders, thereby providing engines including several pairs of pistons.

[0045] In practicing the invention, the used materials, provided that they are compatible to the intended application, as well as the contingent size and shapes, can be any, according to requirements.

Claims

1. An internal combustion engine, particularly for gokarts, motorcycles, motorboats, airplanes, motor vehicles and the like, comprising an engine body defining a combustion chamber therein, **characterized in that** said engine body comprises, in said combustion chamber, a first and second opposite pistons coupled to respective drive means, said first and second pistons being movable with respect to a middle portion of said chamber where igniting spark plug means are provided, said engine further comprising fuel feeding and gas discharging means.

2. An engine, according to the preceding claim, **characterized in that** said engine body comprises a first and second engine half-bodies which are substantially equal to one another, and each having a bottom end portion and a head end portion, the head end portions of each said engine half-body defining a substantially flat head face having a circular throughgoing bore for coupling said head faces thereby causing their central bores to substantially axially coincide and being arranged one as an extension of the other according to the longitudinal axis.

3. An engine, according to the preceding claims, **characterized in that** said head faces of said end first engine half-bodies are abutted against one another by an interposition of a spacer washer element of a substantially circular crown configuration, said washer element defining a peripheral rim and being axially aligned with said two bores of said head faces.

4. An engine, according to one or more of the preceding claims, **characterized in that** said head faces of said second engine half-bodies are directly abutted against one another without an interposition of a spacer washer element.

5. An engine, according to one or more of the preceding claims, **characterized in that** said engine body comprises a headless integral cast single body.

6. An engine, according to one or more of the preceding claims, **characterized in that** said spacer washer element comprises at least a throughgoing hole for engaging therein an igniting spark plug means.

7. An engine, according to one or more of the preceding claims, **characterized in that** said spacer washer element has a diameter substantially equal to the diameter of each said bore of said head face of each said engine half-body.

8. An engine, according to one or more of the preceding claims, **characterized in that** said spacer washer element has a diameter larger than the diameter of said bore.

9. An engine, according to one or more of the preceding claims, **characterized in that** said spacer washer element is made of a metal material.

10. An engine, according to one or more of the preceding claims, **characterized in that** said end portions of the connecting rods are operatively and rotatably coupled to the drive shaft through a coupling chain.

11. An engine, according to one or more of the preceding claims, **characterized in that** said coupling chain comprises a chain tension device.

12. An engine, according to one or more of the preceding claims, **characterized in that** said engine comprises, in a four stroke embodiment thereof, piston valves controlled by control cams coupled, through an adjustment chain, to the related drive shafts.

13. An engine, according to one or more of the preceding claims, **characterized in that** said recesses for said ignition spark plug means are formed on the engine body at said middle portion thereof.

14. An engine, according to one or more of the preceding claims, **characterized in that** said engine comprises a plurality of control cams oppositely driving corresponding valves.

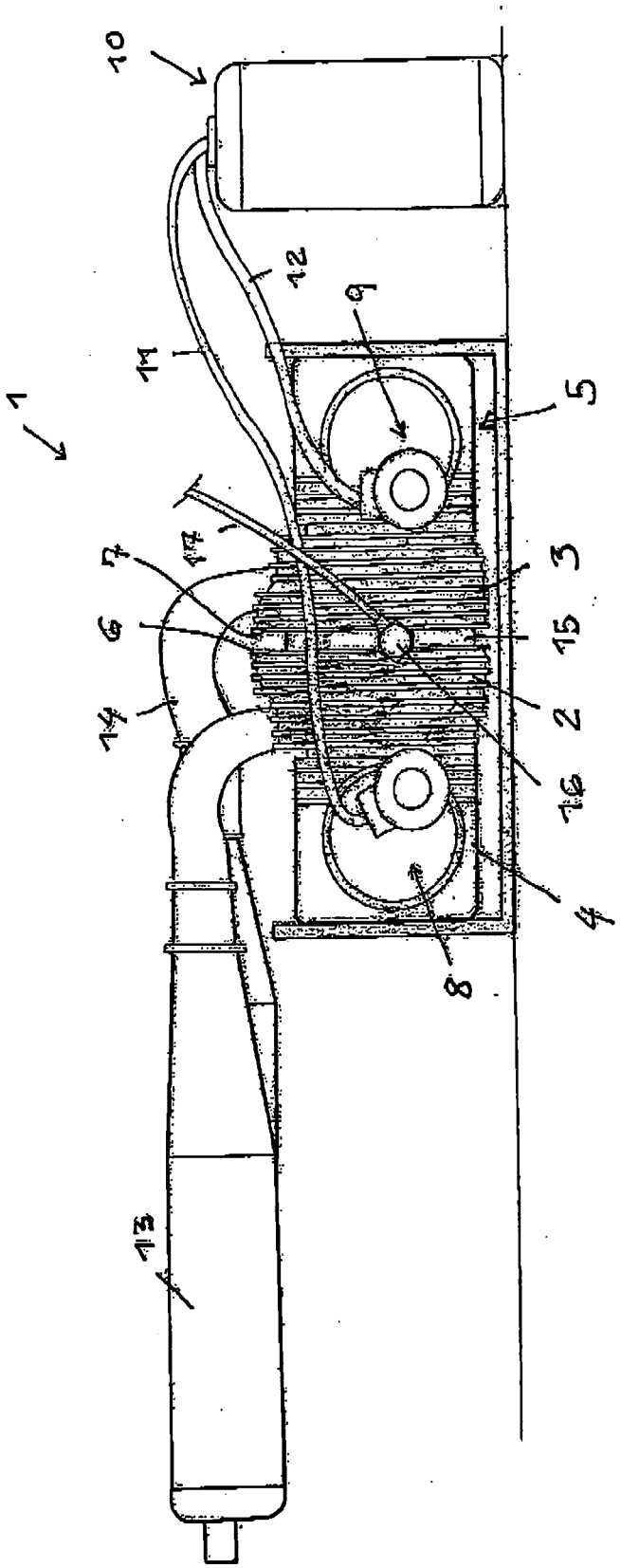

FIG. 1

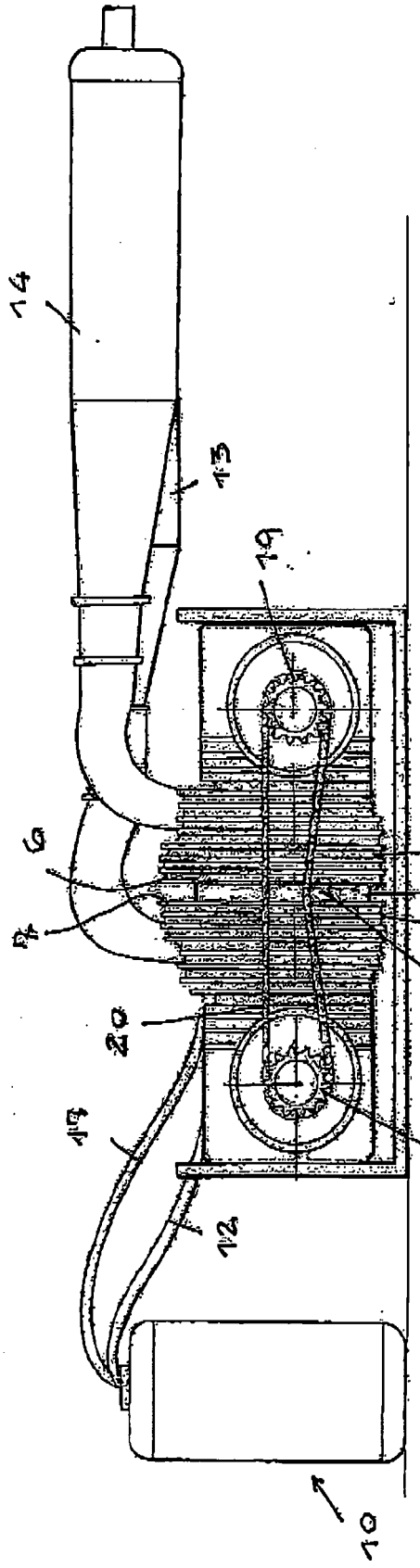

FIG. 2

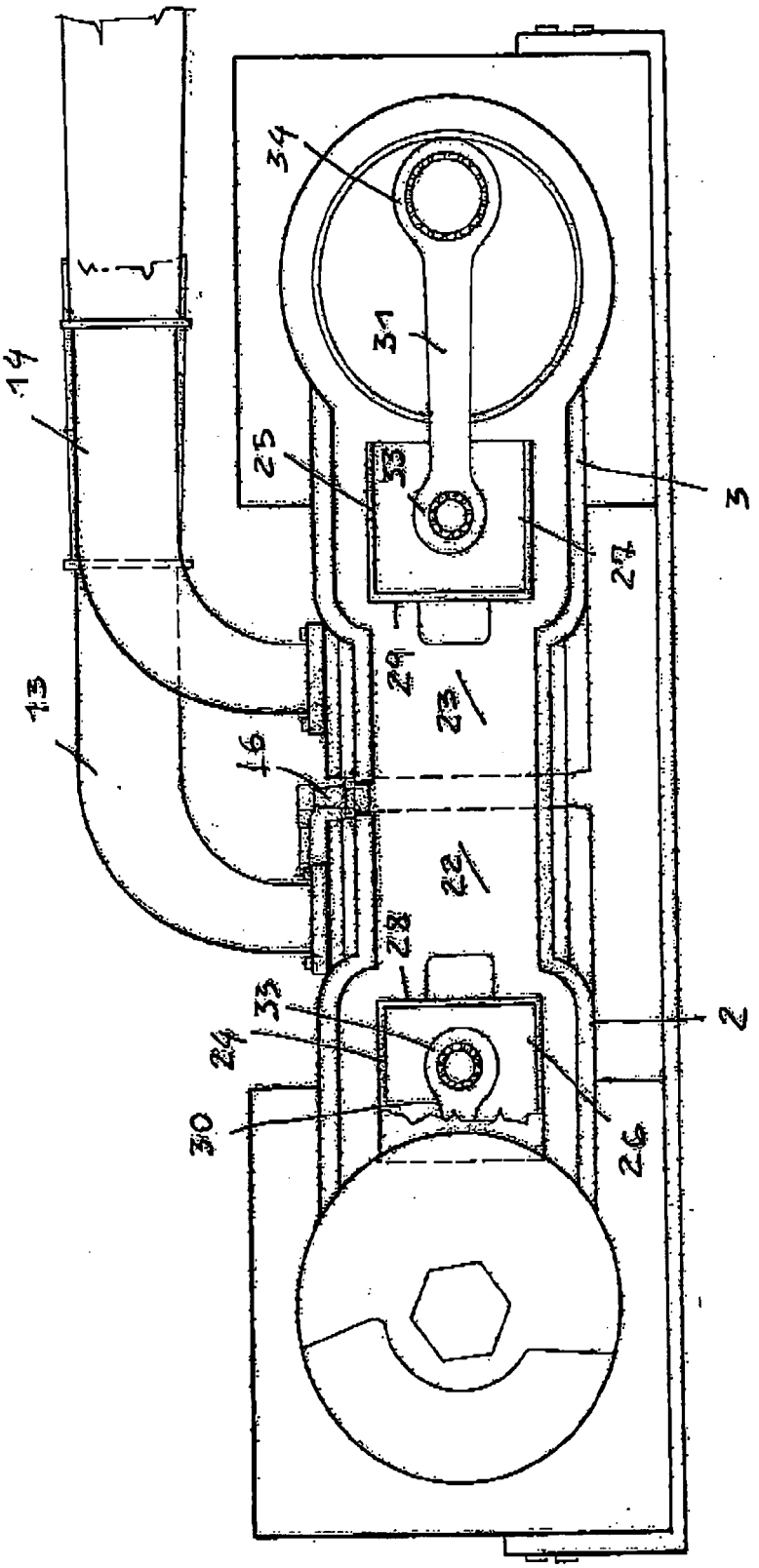

FIG. 3

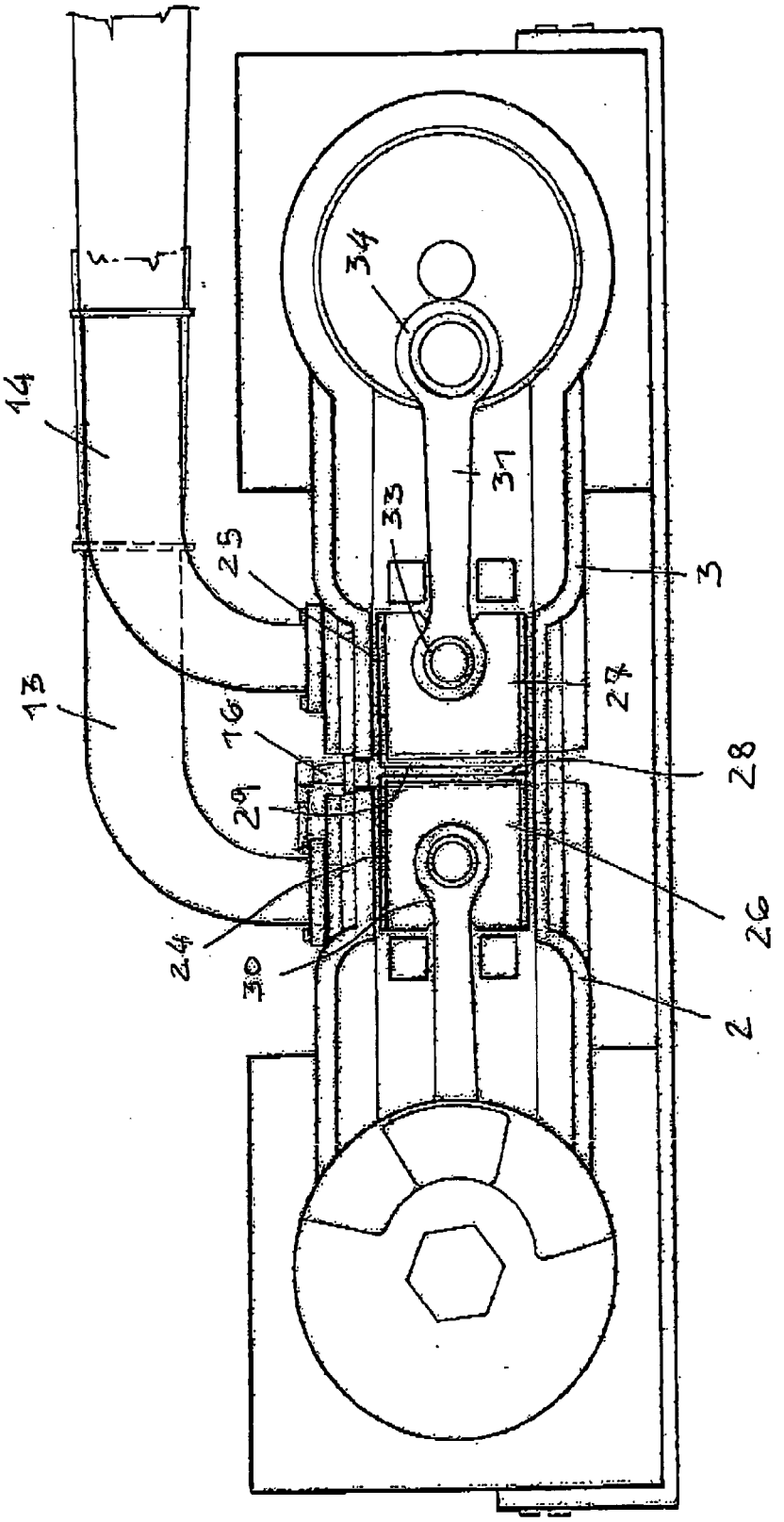

FIG. 4

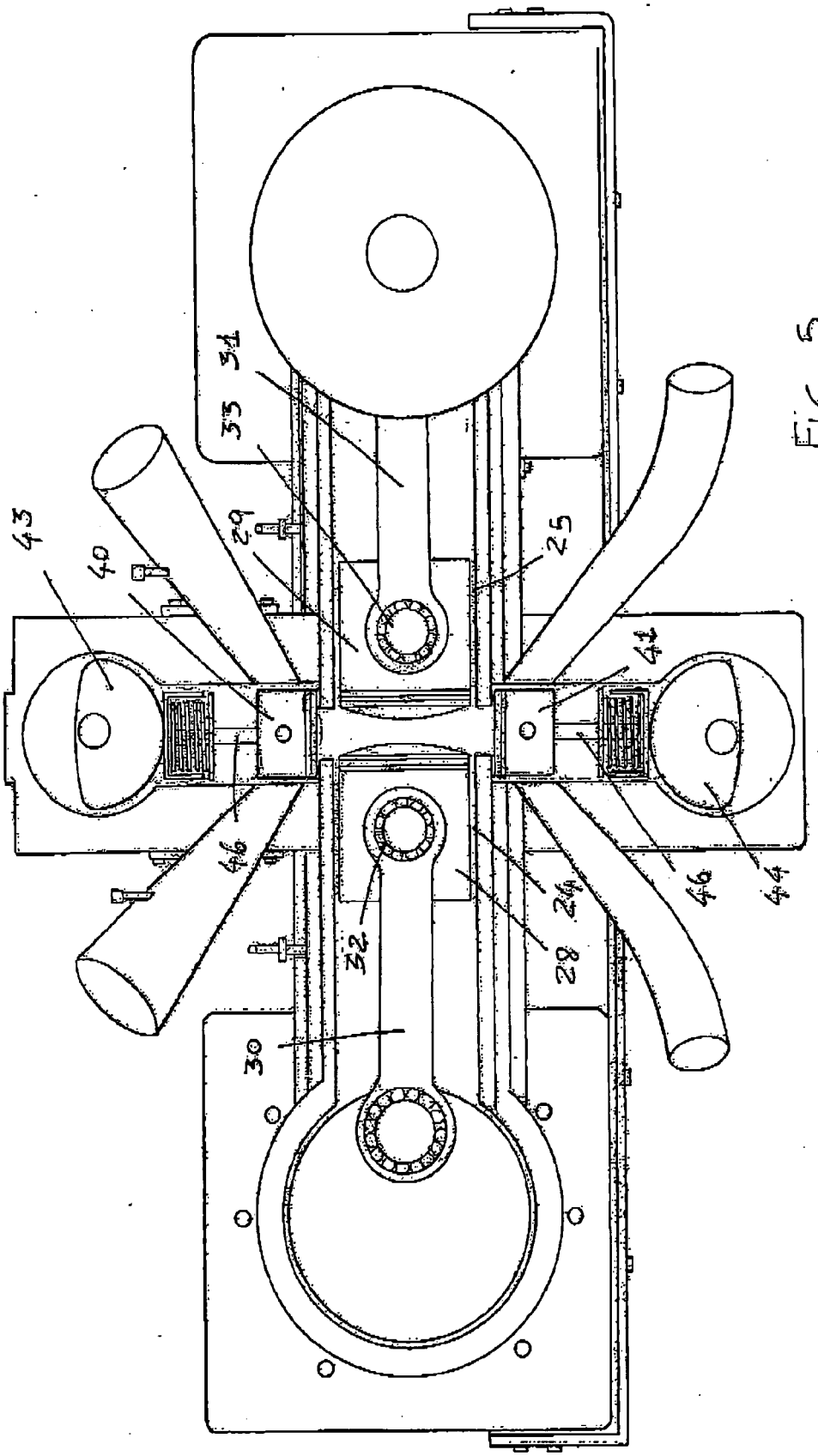

FIG. 5

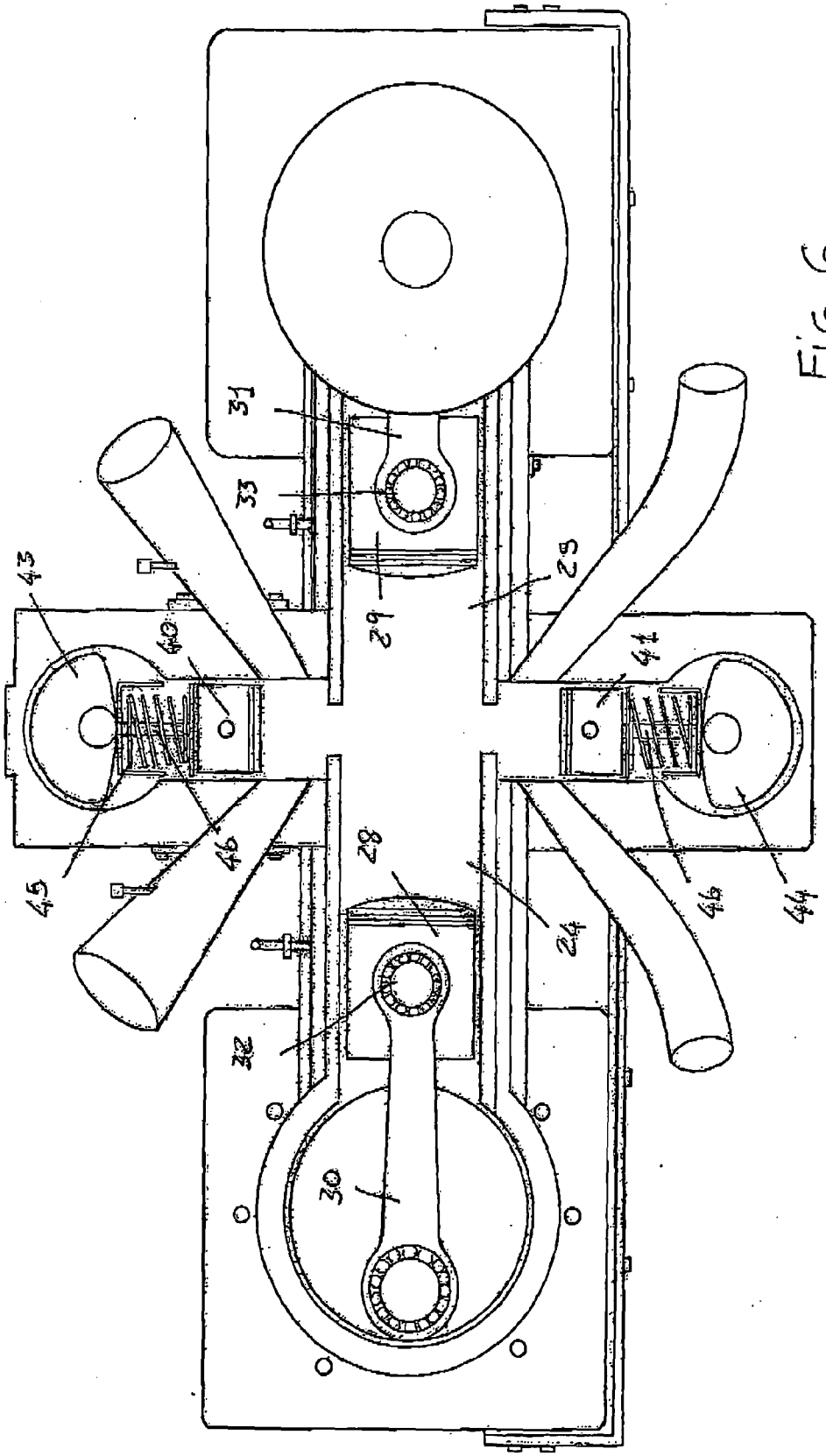

Fig. 6

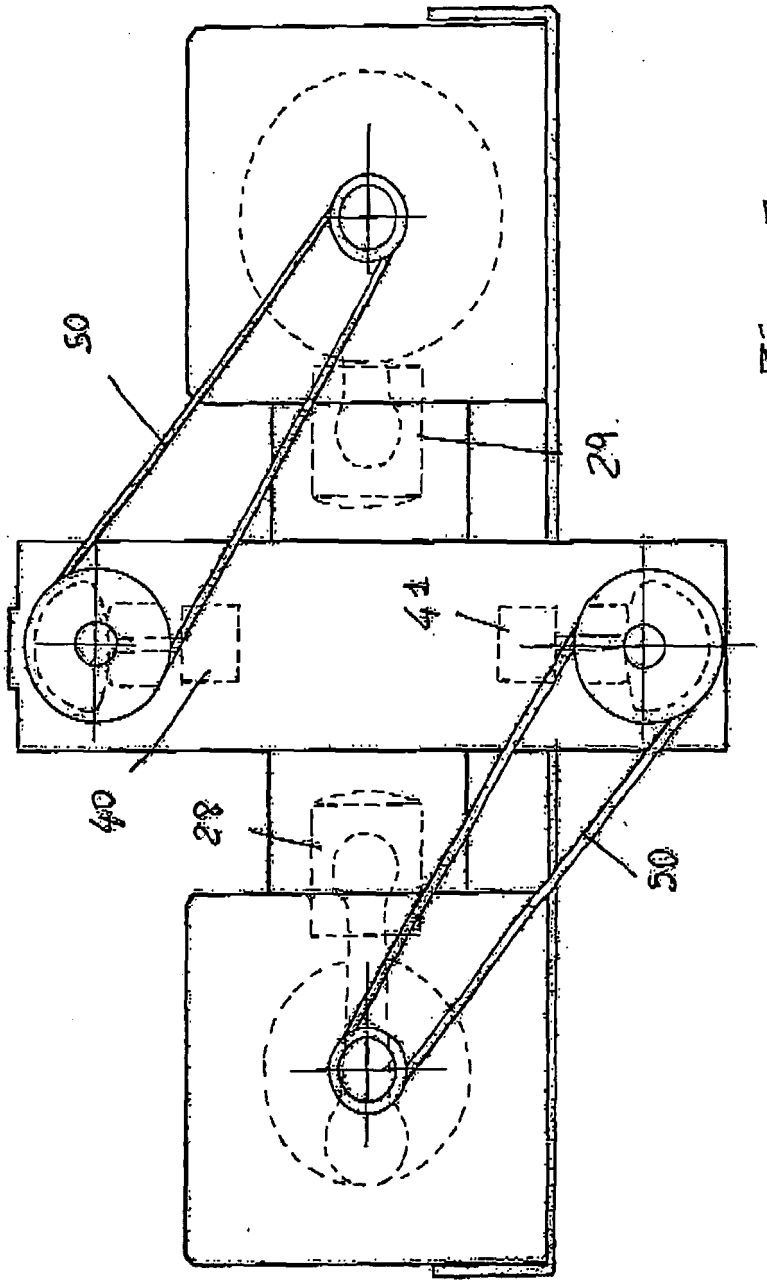

FIG. 7

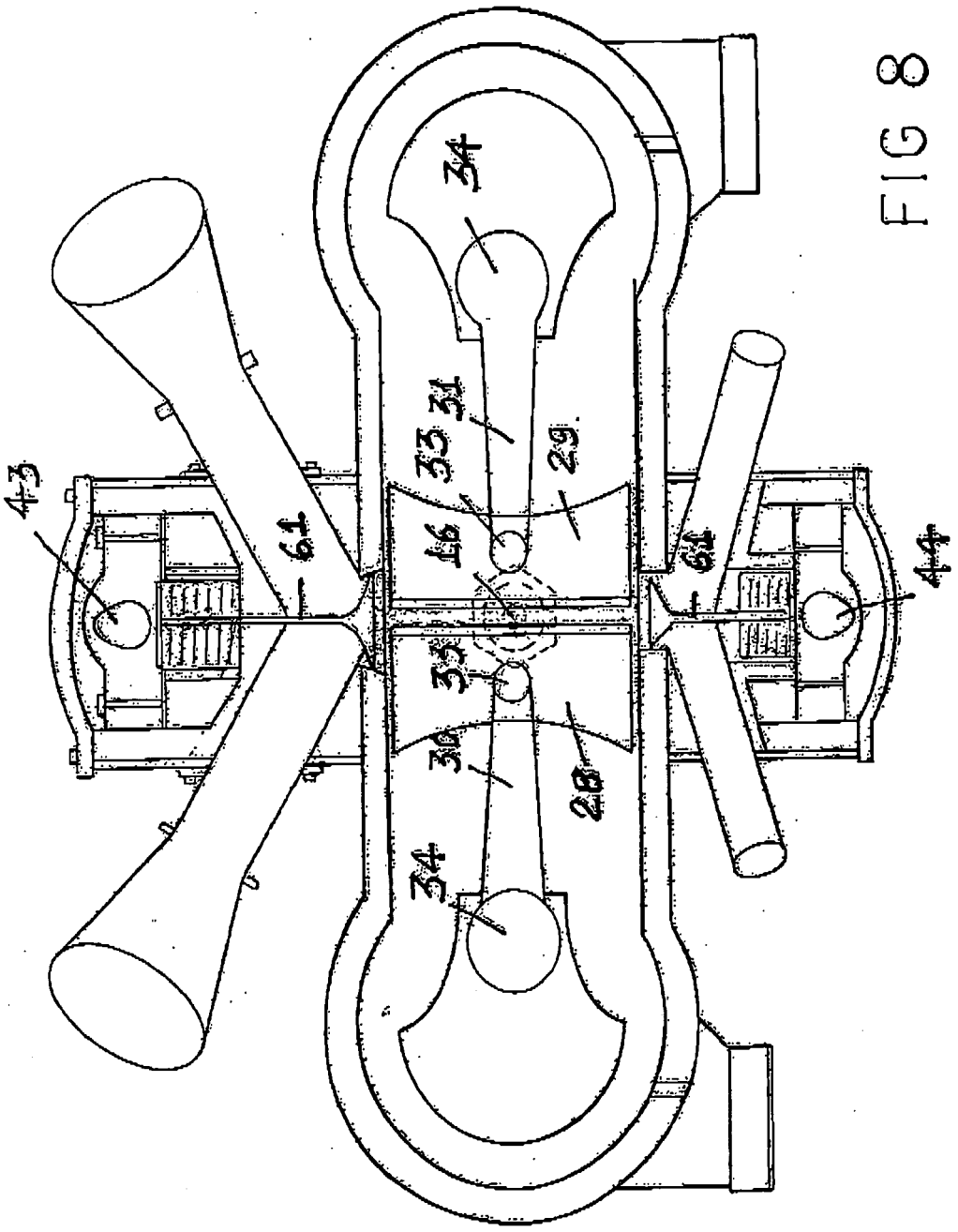

FIG 8

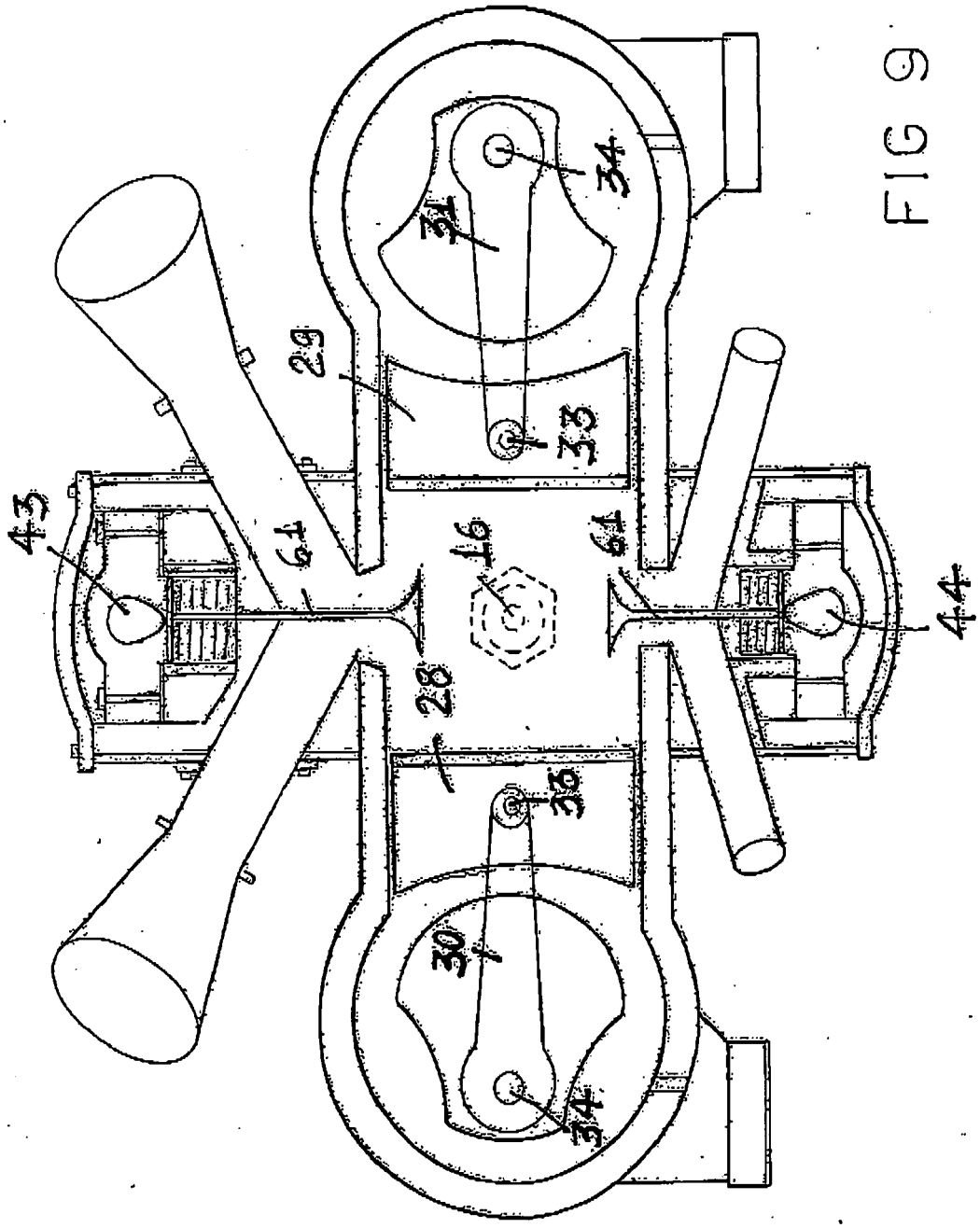

FIG 9

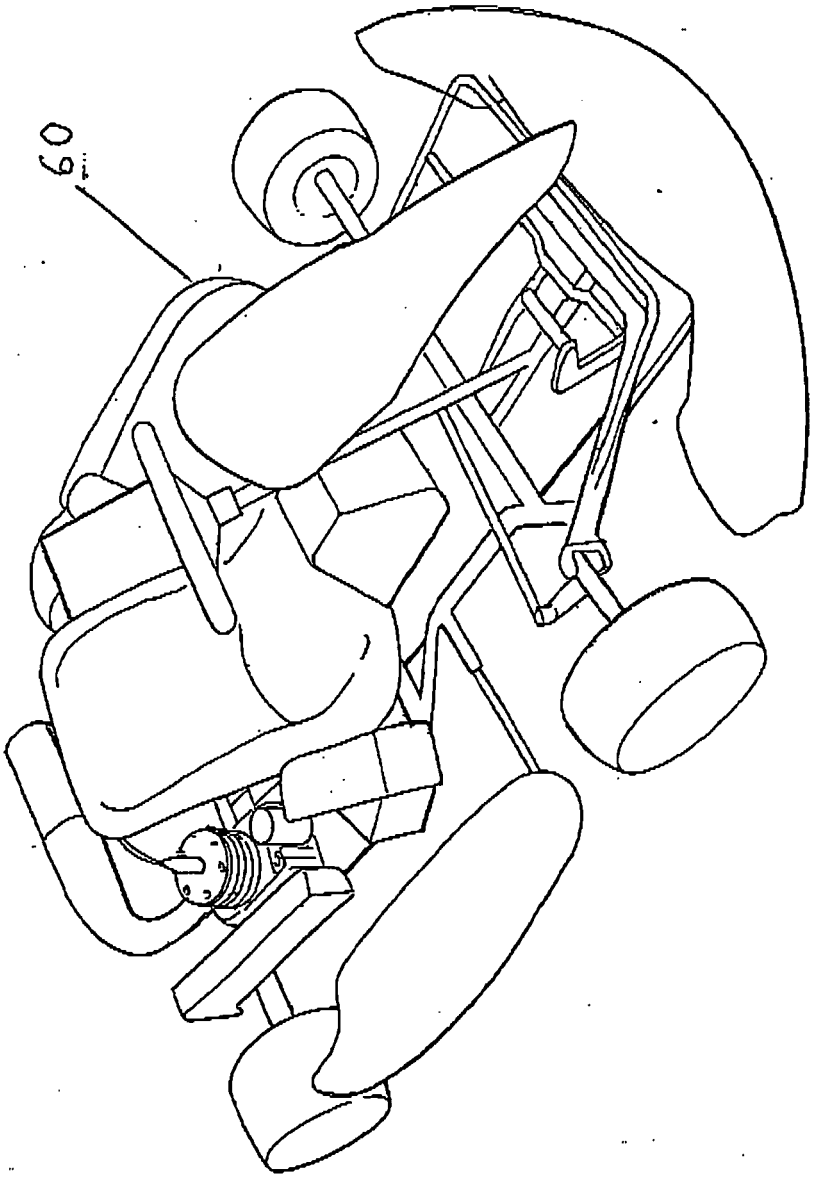

FIG.10