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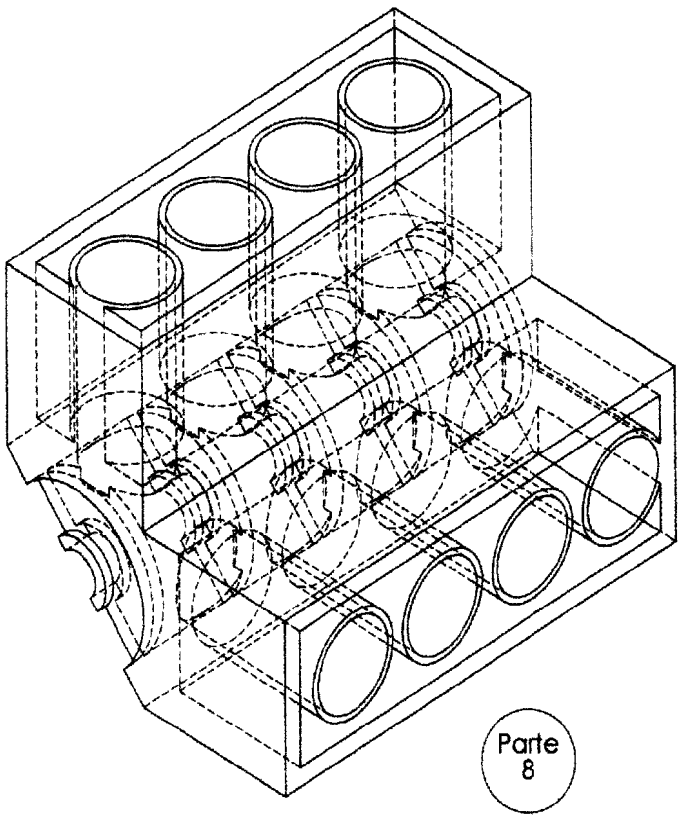
(54) Titre : MOTEURS AVEC PISTONS EXERCANT UNE FORCE MOTRICE PAR ENERGIE ELECTROMAGNETIQUE
(54) Title: MOTORS WITH PISTONS THAT USE ELECTROMAGNETIC ENERGY AS THE PISTONS' DRIVING FORCE



(57) Abrégé/Abstract:
The electromagnetic piston motor uses the internal combustion engines' design, and modifies the pistons motive force by replacing combustion with an electromagnetic drive system. An electrically energized copper wire coil electromagnet, is used to generate an electromotive force, proximate to the piston, which is purposely made to be magnetically reactive. A permanent magnet disk, or rod, is attached to the piston face. The polarities of the proximate piston face and the proximate end of the electromagnet will be the same. The said fields will overlap and interact. The result will be the repulsion of the moveable piston away from the fixed electromagnetic field. The moveable pistons are linked via rigid communicator arms, to a rotatable offset crankshaft, that will convert the reciprocating motion of the piston into rotary motion of the crankshaft. This is the objective of the invention.

Abstract

The electromagnetic piston motor uses the internal combustion engines' design, and modifies the pistons motive force by replacing combustion with an electromagnetic drive system. An electrically energized copper wire coil electromagnet, is used to generate an electromotive force, proximate to the piston, which is purposely made to be magnetically reactive.

A permanent magnet disk, or rod, is attached to the piston face. The polarities of the proximate piston face and the proximate end of the electromagnet will be the same. The said fields will overlap and interact. The result will be the repulsion of the moveable piston away from the fixed electromagnetic field.

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CIPO OPIC

MOTORS WITH PISTONS THAT USE ELECTROMAGNETIC ENERGY AS THE PISTONS' DRIVING FORCE INVENTION TECHNICAL SCOPE

My invention is a motor that will revolutionize the transportation field. My invention will significantly reduce our dependence on gasoline, as a fuel necessary to drive our engines. My invention is a replacement motor for any combustion type piston engine. This includes, but is not limited to, automobiles, aircraft, trains and ships. The application of electromagnetic energy, to drive the pistons of an engine, is what my patent covers. I have used the V8 automobile engine as a familiar example to explain my invention. This does not limit the applications of this invention. The dimensions used are as an example only. The use of the electromagnetic piston driver motor will be similar to that of an internal combustion engine.

The user will turn a key in the steering column. That will activate the starter motor which begins to turn the flywheel and resultantly turns the crankshaft. This is a standard operating procedure of the combustion engine. This would normally be followed by sparks intermittently igniting a fuel/air mixture in the space over the pistons. The force of the explosion would drive the pistons. The functions

This is Exhibit A referred to in the affidavit of Fernanda Gonzalez sworn before me, this 22nd day of January 20 09

M Teresa Bondy
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described are those associated with starting a combustion engine and are common knowledge to all those who have operated an automobile. The starter motor is a standard part of the V8 engine example, not unique to my design.

The start up of my electromagnetic piston driver motor is the same as a combustion engine. Turning the key energizes the starter motor. The starter motor is specially torqued to initially start the motor turning from a stopped position. This will ease the start up of the motor. The instant the motor begins to turn, the firing (energizing) sequence will activate. It will be the same as your car does now. Instead of causing a spark, the electricity is used to energize a copper coil that is wrapped many times around an electromagnetic piece of iron. The current through the coil converts the piece of iron (10/10) into an electromagnet. These electromagnets are affixed concentrically over the ports of the cylinders. The coils are energized by drawing current from a 12 volt battery.

The energizing sequence for the coils is the same as your firing sequence for your sparkplugs. The energizing sequence begins sending short electric pulses to the copper coils, alternately energizing and de-energizing the coils. This creates a strong

magnetic force in the space above the piston each time it is energized. This magnetic force acts upon the face of the piston above which it is affixed. The face of the piston is manufactured to be permanently magnetic. The two magnetic poles will be the same (the magnet and the piston). This doubles the magnetic force. When the piston face is closest to the magnet face (in the cylinder) the coil is energized. The moveable piston is repelled away from the fixed magnet driving it down into the cylinder. This linear motion is mechanically converted to rotary motion with the piston arms and crankshaft. The exact way it was designed for.

In the energized state, the magnet is charged with the same polarity as the piston is charged, repelling it away from the electromagnetic force fixed concentrically above it. Air is drawn in through ports in the side of the manifold to allow the piston to be driven down the piston sleeve (cylinder) without creating a vacuum behind it.

During the de-energized phase, the electromagnetic field dissipates and the piston is allowed to rise, following the natural mechanical movement of the crankshaft. The air atop the rising piston is exhausted through the same ports on the side of the manifold. The air is clean and free of pollutants.

The use of iron 10/10 is an example of a highly electromagnetic metal that is easily magnetized but doesn't hold the magnetic charge long after it is de-energized. This allows the piston to easily rise again in the cylinder to reach the top position (position A). When the piston is closest to the magnet, it is energized and thrust away to the bottom of the cylinder (position B).

Driving the pistons linearly down the piston sleeve inside the engine's block, by consistently pulsing the coils on and off and repeatedly creating an electromagnetic force on the top of each piston sequentially, causes the linkage arms (which are linked to the crankshaft) to mechanically turn the crankshaft. The engine will continue this repeated process of energizing and de-energizing the magnets sequentially, creating revolutions of the crankshaft until it reaches approximately 500 revolutions per minute. The engine will idle at that speed. This constant run is necessary to move at low speed.

The revolutions per minute can be increased and decreased, by increasing and decreasing the frequency of the pulses to each coil. This will be configured to work with the accelerator pedal of your automobile. By pressing your foot down on the pedal you quicken the pulses to the individual coils. This will increase the rpm's. By

taking your foot pressure off the pedal, it will spring back in place, and the rpms will decrease back to 500. The rpms will remain at 500 and the engine will idle at that tempo until the user applies positive pressure to the accelerator pedal again. It will respond the same way a combustion engine's throttle does.

With the patent, I will license all individual companies to use this motor and drive system, to replace their own combustion motors. My motor will be manufactured to copy existing motors so they can be an exact replica for the combustion engine it is replacing. The dimensions, motor mounts, fan, radiator, all these will remain the same. The motor will need oil and cooling and a separate 12 volt battery to run your lights, stereo and DVD players. You will not however, need your exhaust system, or fuel tank or gas lines. You will be able to just "plug it in" where the old combustion engine was. I am estimating that every two coils will need a 12 volt battery of its own.

Using a belt driven alternator recharging system for each battery that supplies the coils, and a spare, you could ultimately drive forever without stopping. The only way to stop it, would be to have two of the batteries completely fail at once, or by turning the key off.

My invention is basically this. An aluminum (non electromagnetic)

block piston motor, with a block mounted manifold that houses coil generated electromagnets, affixing them concentrically above the cylinder ports. The electromagnets are then sequentially energized and de-energized to drive the pistons up and down the cylinders of the motor, and by this facilitate the reciprocation of the crankshaft. It will be as similar in function to that of a combustion engine, as possible. This will decrease the need for a public user, learning curve. The motor will produce zero emissions. This drive theory and motor can be adapted to replace every combustion driven piston engine.

Drawings

Fig 1

Isolation view of the electromagnet assembly and a piston1 assembly, to illustrate the main theory of the design. The electromagnetic force is applied in the gap between the piston 1 (part 2) and the magnet (part 1) above it. The piston assembly shows the way the piston arm (part 9) connects to the piston axle (part 10). This view also shows the correct placement of the piston axle (part 10) as it fits into the pistons lower housing.
(includes parts 1, 2, 4, 9 and 10)

Fig 2

Isolation view of the piston 2 (part 3) assembly and the coil 2 (part 5). The coil is shown as being semi transparent to illustrate how this design is different. Piston 2 (part 3) features a solenoid style application. The transparency allows you to see the stem from piston 2's (part 3) face, inside the coil. The electromagnetic force is created inside the coils' (part 5) diameter. Therefore the force is applied to the stem inside the coil (part 5), forcefully ejecting the stem. This view also shows the assembled relations between the parts 3, 9, and 10. (includes parts 5, 3, 9 and 10)

Fig 3

This is piston 1 (part 2). It is shown beside piston 2 (part 3) to illustrate the difference in the two designs. The top flat surface, or the entire piston will be made of highly magnetic metal. The face of the piston is shown as flat, however that does not limit the shape of the pistons face. Other considerations are conical or domed. The lower housing shows the holes that accommodate the piston axle (part 10).

Fig 4

This is piston 2 (part 3). This image clearly shows the unique stem feature of this piston. It is shown next to piston1 (part 2), to clearly illustrate the differences in the two designs. This piston (part 3) must have a stem and face or the entire piston permanently magnetized. This piston (part 3) is designed specifically for use with coil 2 (part 5). It is more of a solenoid style application. The stem on the face of the piston (part 3) actually enters the coil ring (part 5) when it reaches its uppermost travel.

Fig 5

This image shows the key components of my design. The parts to which I am claiming as my intellectual property. The block (part 8), the retro head (part 6) and the head cover (part 7) have all been

drawn as transparent. This allows the main parts, the electromagnet assemblies (fig 6) and the pistons (parts 2 & 3) to be shown as they are configured in relation to each other in the assembled motor. (includes parts 1, 2, 3, 4, 5, 6, 7, 8 and 12)

Fig 6

This image shows the electromagnet assembly. It shows how the three parts (1, 4 & 11) are assembled together. The magnet is made by wrapping the copper wire into a coil (part 4) around the shaft of the iron or ceramic piece (part 1). The disc on the top edge of the magnet (part 1) is the framework that supports the connection terminals. They protrude from the top of the disc and have connectors compatible with the power supply cables. The coil cap (part 11) protects the coil from damage. (includes parts 1, 4 & 11)

Fig 7

Fig 7 is an exploded view of a fully assembled V8 motor. Its shows all the parts and how they go together. It depicts the two unique piston designs, and their separate assembly requirements. The V8 has been depicted as having both styles of drive, the solenoid type and the flat faced electromagnet type. In real world application, the V8 would use the same application for all 8 cylinders.

(includes all parts)

Fig 8 This is the top view drawing of the magnet (part 1).

Fig 9 Figure 9 is the front view drawing of part 1, the magnet.

Fig 10 This drawing is an isometric view of part 1, the magnet.

Fig 11 An isometric view of the head cover (part 7).

Fig 12 An isometric view of part 7, the head cover.

Fig 13 Isometric view of part 6, the retro head.

Fig 14 Annotation view of the retro head (part 6).

Fig 15 Another view of the retro head (part 6).

Fig 16 This image depicts the piston arm, as it would look if it were photographed.

Fig 17 The side view of the piston arm (part 9)

Fig 18 This is the front view drawing of part 9, the piston arm.

Fig 19 Top view of part 9 (piston arm)

Fig 20 This is an image of part 10, the piston axle (part 10)

Fig 21 The end view drawing of the piston axle (part 10)

Fig 22 Side view drawing of the piston axle (part 10)

Fig 23 A photo like image of the coil cap (part 11)

Fig 24 This is a top view drawing of the coil cap (part 11)

Fig 25 The side view drawing of part 11 the coil cap

Fig 26 This is the top view drawing of the magnet bracket (part 12)

Fig 27 Magnet bracket (part 12) side view drawing

Fig 28 A photo like image of the magnet bracket (part 12)

Fig 29 This is an isometric image of the crankshaft (part 13)

Fig 30 This image shows the offset sections of the Crankshaft (part 13).

Fig 31 This is an end view drawing of the crankshaft (part 13)

Fig 32 This is a top view drawing of part 13, the crankshaft

Fig 33 Side view drawing of the gasket (part 15)

Fig 34 Isometric drawing of the gasket (part 15)

Fig 35 The top view of the gasket (part 15)

Fig 36 This image is of a socket head cap screw (part 14). This is a blank screw. The thread callouts will be determined for each application. This is the type of screw used throughout the design.

Fig 37 A front view of the standard socket head cap screw. (part 14)

Fig 38 The end view drawing of the socket head cap screw (part 14)

Fig 39 Isometric drawing of the motor block. This is the V8 motor I used as an example through my design.

Fig 40 This is a front view drawing of the V8 motor.

General Description

The electromagnetic piston driving motor I invented, has a drive system that will utilize the proven design of an internal combustion type piston engine, but adds a clean, zero emissions, electromagnetic drive mechanism to the motor. My invention will use the basics of an internal combustion engine.

The intake and exhaust manifolds are removed from the engine. That leaves nothing but block, pistons, linkage and crankshaft. The block is remanufactured to be a non magnetic replica. The pistons are made to be permanently magnetic. Coil activated electromagnets are affixed concentrically over the open ports of the cylinders. The coils are activated and the magnets emit a powerful magnetic force on the piston.

Since the face of the piston is permanently charged with the same polarity as the electromagnet, the two poles repel each other. This drives the moveable piston down away from the fixed magnet. My invention uses the force of electromagnetic energy to drive the pistons of an engine. My invention is one part retro-fit replacement manifold (part6) that provides a drive mechanism for the pistons (parts 2and 3) and one part non magnetic block with specially made magnetic pistons. This manifold (part 6) is designed to house an equal number of electromagnets (part 1) as there are pistons /

cylinders in the motor block (part 8). Mounting my retro fit manifold to the motor's non magnetic block (part 8), will position and affix these electromagnets (part 1) concentrically above the permanent magnet pistons (parts 2 & 3) as they are configured in the cylinders. My motor consists of both a manifold (part6) designed specifically for every piston engine individually and a non magnetic block with special pistons. The manifold (part 6) holds electromagnets (part 1) in place concentrically, over the piston's (parts 2 & 3) cylinders. It is designed to hold the electromagnets (part 1) in place at a minimal gap from the pistons (parts 2 & 3) when they reach their upper most travel (position A). My machine uses a 12 volt current to energize, then de-energize the coils of copper wire wrapped around iron or ceramic to form electromagnets (part 1). It does this energizing in an intermittent manner that will cause the electromagnetic force to be applied to the permanently magnetic pistons (parts 2 & 3) sequentially, as they reach the point of minimal distance from the electromagnet (part 1)(position A). The like polarities of the permanently charged pistons (parts 2 & 3) and the electromagnets (part 1), forcefully repel each other, and this drives the moveable piston away, down into the cylinder of the motor block (part 8) (position B) The electromagnets (part 1) then de-energize, to eliminate the magnetic field, and allow the piston (parts 2 & 3) to

return to its point of upper most travel (position A). Then the electromagnet's coil (part 4 or 5) is re-energized when the piston returns to its uppermost travel (position A), and the process is repeated.

This replicates the continuous sparking sequence of a combustion engine. My manifold bolts directly to the engine block (part 8), in place of the engines' intake and exhaust manifolds. My manifold (part 6), that houses the electromagnets (part 1) can be manufactured to be mounted on to any or all engines blocks that use combustion as the driving force of the piston.

My invention replaces the intake and exhaust manifolds from a combustion engine. They will not be needed. The retro head (part 6) manifold has air vents manufactured into them. They allow air to enter the cylinder behind the descending piston (part 2 or 3). This is so that no vacuum can be created and negatively affect the performance of the motor. They also allow air to be expelled from above the pistons (parts 2 & 3) as they rise up to position A. The air that is expelled is clean and free of pollutants. My manifold (part 6) is designed to affix electromagnets (part 1) concentrically above each of the cylinders/pistons (parts 2 & 3) of the motor block (part 8). The engines' pistons (parts 2 &3) are manufactured to be

permanently magnetized. The coil will generate the same polarity as the electromagnets (part 1) when they are energized. The two similar magnetic fields will repel each other. The magnetized pistons (part 2 & 3) will be repelled by the electromagnetic force generated by the fixed coil (parts 4 & 5) magnet (part 1). This will result in the pistons (parts 2 & 3) being driven away from the fixed electromagnet (part 1).

The moveable piston will be repelled down into the cylinder. The pistons are linked to the crankshaft (part 13) with the piston arms (part 9). The resultant lineal displacement of the piston (parts 2 & 3) facilitates the turning of the crankshaft (part 13). The invention consists of 8 newly designed parts. They are assembled into a retro fit manifold (part 6) and mounted to my non magnetic block, in order to drive my special pistons. This manifold (part 6) can be designed in any shape or size depending on the motor block (part 8) dimensions to which it will be mounted. This patent application mentions parts that are standard to a piston engine. Since my invention is designed to provide drive to an existing piston engine, the affected engine parts are also included in the description. In the following text, I describe the features and functions of the 15 related parts individually, according to their part numbers. A corresponding

drawing of each part can be found in the drawings portion of this application.

Magnet

Part 1

The magnet is a key component of my electromagnetic motor. The magnet is made from wrapping copper wire around a rod made ceramic grade 8, or iron 10/10 or another suitable grade of ferromagnetic material. These materials facilitate a strong magnetic field production, without any lingering energy when its de-energized. One end of the rod will have a circumference approximately equal to that of the piston (part 2) that is in the cylinder below. This allows for the strongest field. It will be assembled into the magnet bracket (part 12) so it slides in concentric to the cup feature of the magnet bracket (part 12) and comes to rest in the bottom of the bracket atop the gasket (part 15). The face of the rod is exposed through the bottom opening of the magnet bracket. This allows the electromagnet to discharge unobstructed force to the piston below.

The top side of the magnet or the coil end, is designed to have a thinner section turned down on the rod (fig 10). This smaller diameter shaft is designed to accommodate the coil of copper wire (part 4). The copper wire that makes up the coil (part 4) will be wound many times around this thinner diameter of the rod/magnet.

The end of the smaller diameter is capped with a disc that is placed concentrically in such a way as to provide protection for the coil (part 4). This top protective disc will also provide the framework for the coil-end terminals. The coil-end terminals will eventually be connected to a power source.

When the coil (part 4) is energized it will turn the ceramic or iron rod, into an electromagnet and emit a force of electromagnetic energy onto the top surface of the piston (part 2) and facilitate the linear motion needed to turn the crankshaft (part 13). This specifically designed iron or ceramic rod, is what I will use to generate the electromagnetic force.

Piston 1

Part 2

The pistons (parts 2 & 3) are key parts of the function of the machine I invented. In the following pages I will describe to you, two different styles of pistons that I will be claiming as my intellectual property. This description refers to piston 1 only. The dimensions are for reference only and are not limiting factors in my design. The piston is typical to that of any piston type combustion engine. It is circular and has a flat face and has a hollowed out body below. It is designed to travel linearly through the cylinder of the engine block. There is a close tolerance between the cylinder and the pistons' sides. The top face of the piston (part 2) or the entire piston (part 2) must be made of a highly ferromagnetic material. Alnico is the preferred choice but another highly ferromagnetic material can be used instead. This does not limit the material selection of the piston (part 2).

I am stating that it must be susceptible to the force of electromagnetic energy. The piston, or even just its face, should be permanently magnetized, and made from a ferromagnetic metal that will hold the polarity indefinitely. Alnico is my preferred choice of materials. The piston body (part 2) below the top face, has two

holes in it with a gap in between. These holes are concentric to each other and mate with the piston axle (part 10) as it bridges the gap in the piston body (part 2). This will provide a means of attaching the piston arm. The piston (part 2) with the piston axle (part 10) pressed into it, can then be attached to a piston arm (part 9) that will link the piston (part 2) and piston axle (part 10) assembled, to the crankshaft (part 13). This allows the repeated linear motion of the piston (part 2) through the cylinders in the block (part 8) to be converted to rotary motion, using the piston arm (part 9) as the link between the piston (part 2) and the crankshaft (part 13).

Piston type 2

Part 3

This text describes piston 2 (part 3). Its design is unique for this application of electromagnetic science. This second type of piston is a solenoid rod style. This piston is designed with a solid rod protruding from the exact center of its face, 90 degrees to its surface Figure 4. This piston (part 3) is for use with coil 2 (part 5) exclusively. These two go together. The outside diameter of the stem fits inside the inner diameter of the ring shaped coil 2 (part 5)(Figure 2). During its designed use the piston (part 3) rises to its uppermost travel (Position A) and the stem enters the inner diameter of the coil (part 5).

At that instant of insertion the coil (part 5) is energized and the electromagnetic field generated by the coil (part 5) forcefully ejects the rod/piston (part 3) out of the magnetic field.

The piston (part 3) has only one option for displacement, and that is down, away from the electromagnetic field, into the cylinder inside the motor's block (part8) (position B). Since the piston (part 3) is linked with the crankshaft (part 13) this facilitates the rotation of the crankshaft (part 13) and the designed function motor. The piston should be permanently magnetized to double the effect the coils field will have on the piston.

Coil 1

Part 4

The coil is another main part of my design. There are two types of coils. This section describes type 1. The coil (part 4) is simply this. Very thin, 0.25mm diameter (approximately), solid copper wire wound many times around the small diameter of the magnet (part1). The copper wire will be insulated with a non conductive element such as lacquer or latex. This will stop the copper wire from shorting itself out and provide protection to the individual strands of wire. The light gauge copper wire facilitates fast energizing and low resistance so many turns can be applied increasing the strength of the electromagnetic force without causing a marked increase of required amperage to energize the coils (part 4). The coils' (part 4) loose ends are then soldered to terminals designed to couple to sparkplug wires or another pulse regulated, sequentially timed, power source. Each time an electrical current is applied to the coils (part 4) it turns the iron or ceramic to which it is wrapped around, into a powerful electromagnet.

Coil 2

Part 5

The second coil (part 5) I am going to describe is for the solenoid rod style application of my invention. This style of coil (part 5) is for use with piston 2 (part 3) exclusively. This coil (part 5) is also made with very thin solid copper wire. The wire is coated with a lacquer or latex, or another insulation plastic or rubber. This coil is pre-formed to be circular. The insulation will help hold its donut shape. Its size will vary to fit the constraints of each individual design. The loose ends of the coil (part 5) are connected to terminals, that will link the coil (part 5) to an electrical supply. The center of the ring is where the magnetic field is generated when energized by electric current. The center of the ring (interior diameter) is sized specifically to accommodate the rod on the face of piston 2 (part 3), with a minimum gap. At the top of the stroke of the piston (part 3) the rod on the face of the piston (part 3) enters the center of the coil's (part 5) inner diameter.

At that instant the coil (part 5) is energized with electric current. It creates a powerful electromagnetic force on the stem inside its ring, and strongly repels the rod of the piston 2, out of the field. This displaces the piston (part 5) in the only direction it can go, down into the cylinder facilitating the intended use of the motor.

Retro Head

Part 6

The retro head is just my own name for the drive mechanism of my invention. The design of this head/manifold (part 6) can be modified in such a way as to mimic the approximate dimensions of any combustion engines' intake and exhaust manifold. It can be retrofitted to any and all piston engines. It can be mounted on any piston type combustion engine and convert it to an electromagnetic motor. My electromagnetic drive system will completely replace the combustion manifold of any piston engine. My manifold (part 6) is specifically designed to house the magnet (part 1), the magnet bracket (part 10), the gasket (part 15) the coils (parts 4 & 5) and the coil cap (part 11).

These parts together will be referred to as the electromagnet assembly. The retro head (part 6) mounts flush to the motors' block (part 8) separated by a thin gasket. The manifold (part 6) is the housing for the magnet/coil assembly, and is securely fastened to the engine block (part 8).

For the purpose of this application for patent, the V8 type motor is used as an example. The manifold (part 6) is mounted so the eight housed electromagnet assemblies line up directly concentric to the

cylinders of the motor block (part 9) below. This will allow the face of the magnet (part 1) to be securely mounted at a minimal distance from the top stroke of the pistons (parts 2 & 3). The retro head (part 6) will be made exclusively from a non magnetic metal or plastic.

Head Cover

Part 7

The head cover is specially designed to hold both the magnet assembly and the magnet bracket (part 12) into the retrofit head (part 6). It also provides protection for the coils. The bottom side of the cover (part 7) has hollow bosses protruding out from the bottom side. These bosses fit into the pockets of the retrofit head (part 6) and surround the electromagnet assemblies. They are just long enough to firmly hold one edge of the magnet (part 1) and one edge of the magnet bracket (part 12) down in place. The concentric boss is 50% on the magnet (part 1) and 50% on the bracket (part 12). This is designed to counteract the natural tendency of the magnet assembly to move when the coils (parts 4 & 5) are energized, and the electromagnetic force is applied to the top, or rod, of the pistons (parts 2 & 3). The head cover (part 7) will prevent the magnet (part 1) or the coils (parts 4 & 5) from moving.

This will allow only the desired linear travel of the moveable pistons (parts 2 & 3) and not allow any movement from the magnet (part 1). The head cover (part 7) is bolted securely to the retro fit head (part 6) with screws (part 16). Ports are open

in the top of the head cover to expose the terminals for the connection of power cables to the coils (parts 4 & 5).

Motor Block

Part 8

The engine block is an example of any type V8. I used this example because of its ease of recognition. It is a common looking motor and perfect for my demonstration purposes. The engine block should be made of a non ferromagnetic metal (aluminum) or plastic (nylon 6). The motor block has 8 cylinders milled through its core to accommodate the pistons.

The pistons are made to travel linearly through the cylinders of the motor. This will generate heat. The motor will require an oil system for lubrication of the moving parts and glycol/water cooling circuits as well. An alternator system, water and oil pumps, will still need pulleys and belts to drive them. The drawings are specific to my invention and unrelated motor functions are absent to allow focus on the novel parts. The design of the motor block will vary according to the end use. It will have cylinders for pistons.

The new block is made of non magnetic metal or plastic to prevent electromagnet energy from being stored in it. This may negatively affect the performance of the motor.

Piston Arm

Part 9

My electromagnetic motor converts the linear motion of the pistons into rotary motion of the crankshaft. The piston arm is the link. The piston arm is a part of all piston motors that convert linear motion to rotary motion and is not unique to my design. The piston arm (part 9) has a bushing pressed into a hole in each end of the arm. A smaller diameter at one end, and a larger diameter at the opposite end. The smaller diameter bushing connects directly to the piston axle (part 10) and is secured by locking screws. The other end has a larger diameter bushing and is connected to the crank shaft (part 13) with locking screws. This arm is what transfers the linear motion of the pistons (parts 2 & 3) to the offset sections of the crankshaft (part 13). This facilitates the conversion of linear motion into rotary motion. This function is typical of all automobile type V8 engines. It is used as an example.

Piston Axle

Part 10

The piston axle (part 10) press fits into the holes in the sides of the piston body (parts 2 & 3). The piston axle (part 10) is typical of all piston driven motors and serves as a clamping rod between the pistons (parts 2 & 3) and the bushings inside the piston arms (part 9). The piston axle (part 10) is not an original design, but is used in my application as an incidental part that is part of the assembly of my invention.

Coil Cap

Part 11

The coil cap is a molded plastic shield designed to protect the coils (part 4) from dirt and damage. The coil cap should be made of acrylic or polycarbonate. It must be strong and not susceptible to increased levels of heat. It is designed to allow the loose ends of the coil (part 4) to pass through its body and soldier to the terminals. The part should be transparent enough to allow visual examination of the coil it is protecting. The coil cap is a secondary part of the motor. The motor can function without it.

Magnet Bracket

Part 12

The magnet bracket is a cup like housing for the magnet (part 1). Its flanged surface is square and notched to be fitted into an appropriate depression in the retro head (part 6). The square features of the flange will provide adequate housing for the cup/boss feature on the opposite side and also prevent the bracket from spinning or moving in any direction. The cup like feature of the magnet bracket houses the end of the magnet (part 1) and the gasket (part 15). The coils (parts 4 & 5), the coil cap (part 11), are above the cup depression. The back edge of the magnet should end up flush to the top edge of the magnet bracket. When the head cover is fastened, the bosses on its bottom side will contact those two flush edges and hold them so there can be no movement. The bottom of the cup is cut to allow most of the magnet face to be exposed.

This will permit unobstructed access to the cylinder below it.

The magnet bracket will be made from a non magnetic metal or plastic.

Crankshaft

Part 13

The crankshaft is the typical device used that converts linear motion into rotary motion. It does so by offsetting sections of the main shaft creating this "second diameter" concentrically around the same axis, giving the main axis diameter a group of evenly spaced push handles to revolve it. These offset sections are secured to the bushings in the piston arms (part 9) with locking screws (part 14). The other end of the arm is linked to the piston (part 2 or 3). The pistons (part 2 or 3) supply the linear motion. The arms (part 9) transfer that motion to the "push handles" spaced along the crankshaft (part 13), by mechanical design the shaft will rotate when the linear motion is supplied by the piston (parts 2 or 3). The rotation is the direct mechanical result of the linear movement of the pistons (parts 2 or 3). This is the purpose of my electromagnetic motor, to create the linear motion of the pistons, (parts 2 & 3) that is needed to turn the crankshaft.

Socket Head Cap Screw

Part 14

The socket head cap screw is the type of screw I have used in my design. The thread pitch, diameter and length will vary. They are used to secure the manifold (part 6) I invented to the engine block (part 8). A different length socket head cap screw will be used to fasten the head cover (part 7) to the retro head (part 6). They will also be used to lock the piston arms (part 3) to the piston axle (part 2) at one end. They will be used to lock the other end of the piston arm (part 9) to the crankshaft (part 13).

Gasket

Part 15

The gasket is a buffer between the magnet face and the bottom of the magnet bracket. The gasket is made of EVA (Ethyl Vinyl Acetate). This is a durable rubber plastic polymer that will be fitted into the sleeve of the cup feature of the magnet bracket (part 12). It will lay flush, flat on the bottom of the bracket. This thin gasket provides cushion for the magnet (part 1) and allows for thermo expansion of the magnet. This allows the firm fitting of the magnet against the bottom face of the magnet bracket (part 12) and not break or chip any fragile edge of the magnet (part 1).

Novelty

The electromagnetic piston driven motor, is a unique motor that uses copper coil activated electromagnets to force the movement of the magnetized, specially designed pistons, inside the non magnetic engine block, turning the crankshaft.

My new motor mounts a manifold of electromagnets to a non magnetic engine block. This affixes the electromagnets concentrically over the open cylinder ports. This new electromagnet filled manifold is a substitution for a combustion engines' intake and exhaust manifold. The motor I invented will be manufactured to be a replacement for the combustion motor. The block will be remanufactured to be non magnetic, and the pistons will be manufactured to be permanently magnetic. The "retro head" will be a manifold of coil activated electromagnets affixed concentrically above the open cylinder ports . This is a replacement for, or retrofit, of an internal combustion engine, converting it to a clean running electromagnetic motor. This new motor couples the established reliability of the engines design with my novel method of driving the pistons. The novelty is this specific application of coil generated electromagnetic force to drive the pistons, instead of a spark igniting an air and gas mixture.

The force is applied to the top of the piston in one case, (method 1) and to the rod of the specially designed piston in another case, (method 2). The rod method (method 2) uses the same application of electromagnetic energy, it just uses less parts. This alternative method (2) is the same application of my novel drive method, just a solenoid style configuration. I'm not re-inventing the engine, the novelty is making it run with electromagnetic energy, not gasoline. This is the novelty of my invention. No other person or corporation has ever made a similar motor.

History

The electromagnetic motor was invented in Windsor Ontario, Canada, by Michael Robert Axford. The idea came to me while doing renovations on my home in July of 2007. The renovations coincided with the opening of my own business, GLOBAL DESIGNS. I had to improve the appearance of my home office, since clients were likely to visit for business. Part of my business plan was to use the software program solidworks, and the flow/part analysis software called moldflow. Moldflows part advisor allows you to virtually perform any experiment on any part and receive data on its performance. This is particularly advantageous for me since my main business I hoped would be designing plastic parts and injection molds.

I set up my business on Sept. 27 2007, and since I had no jobs to do, I set out to design something for myself and the world. Using the idea I had in July, I designed the electromagnetic motor on my solidworks program. I designed several experiments to test the function of the motor. The experiment I used first to test the function, was to simulate the force applied on the piston.

I calculated the force using the following formula:

B x gap = Mu x N x I. This calculation yielded the force in kN, and I

applied it to the top of the piston. It slammed the piston down into the cylinder. I found that increasing the value of N in the equation, increased the force generated. I used 250 wounds of 0.25mm solid copper thread around a 25mm shaft as my test example. The force was great enough to easily turn the motor. It worked. I had invented a way of driving the pistons of a piston type engine with electromagnetic force, not gasoline. It could convert all combustion engines into zero emissions electromagnetic motors. I then designed piston 2 (part 3) and coil 2 (part 5) as another alternative way to apply my piston driving method. I felt the patent application should include both styles.

This electromagnetic motor is a new way of driving a combustion engine's pistons, using electromagnetic energy. The design was completed November 14, 2007 in Windsor, Ontario, Canada, by Michael Robert Axford. It was notarized in Windsor by attorney Anita Berecz, Dec 7 2007.

My motor affixes powerful electromagnet assemblies concentrically over the pistons (parts 2 & 3) in their cylinders. The electromagnet assemblies draw current from a 12 V deep cycle battery. The electromagnet assemblies are energized then de-energized intermittently with the 12 V current to cause the permanent magnet pistons (parts 2 & 3) below them to be repelled. The permanently magnetized pistons have the same polarity as the electromagnets so they repel each other. The current is stopped and the coils (parts 4 & 5) de-energize, so the field can diminish and allow the pistons (parts 2 & 3) to rise again, through their designed range of travel. The pistons (parts 2 & 3) are then driven back down the cylinders in the motor block (part 8) using a re-application of this same science. This repeated driving of the pistons (parts 2 & 3), mechanically facilitates the turning of the crankshaft (part 13). This is what the motor is designed for. The design of my invention will vary in shape so it can be substituted for any and all piston engines. The science remains the same for each instance. The

internal parts are the same, just modified for each different application. The retro head (part 6) for an automobile motor will differ from that of a retro head (part 6) for an airplane motor, in shape and size, but will still apply the same science of electromagnetic energy, to drive the pistons of both motors. This application of electromagnetic energy to a piston as the driving force of the motor, is what I wish to protect as my own intellectual property. I plan to license all companies to use this technology, and allow them to design a substitute motor exactly as the one they intend on replacing with my new electromagnetic motor. After all, zero emissions is good for all of us.

What I claim as my invention is:

I am claiming ownership of the application of an electromagnetic energy field affixed concentrically above the cylinder/piston, as the driving force of said piston, to enable the designed function of the piston motor, as my intellectual property.

I claim ownership of the specifically designed parts necessary to make the machine work.

My patented drive system will adapt to all internal combustion piston engines, to function using this alternative drive method. My

manifold (retro head) can be adapted to mount on any and all piston motors. My motor uses two methods of applying this same science. This science can be applied to any and all piston engines. It is done so by the use of one or more of my retro heads.

All the dimensions are only as an example for the purpose of this application. One should not imply or infer limitations to the dimensions.

I, Michael Robert Axford, am the inventor of this motor that creates an electromagnetic energy field to drive all piston motors. Electromagnetic force, as the power behind driving a piston engine, is my intellectual property. I alone am the inventor of the electromagnetic motor. I seek patent protection for any motor that applies the specific science of electromagnetic energy as the driving force of any piston engine.

Summary

The piston electromagnetic motor uses the mechanical advantage of the internal combustion motors design and applies an electromagnetic driving system. The novelty of my motor is that instead of igniting a mixture of fuel/air above the piston, I use an electromagnetic force of equal intensity activated by coils, above the pistons to drive their movement. The pistons are manufactured with a permanent magnetic disk fixed on the piston's face. My new driving mechanism is bolted to the block.

The new driving mechanism houses the electromagnetic assemblies. There is an assembly for every piston and it is situated directly on the piston concentrically with the cylinder hole. The current in the coils creates a discharge of powerful electromagnetic energy.

The polarity of the piston's face and the electromagnet must be the same.

The two forces are opposite and the fixed electromagnet will repel the movable piston driving it inside its cylinder. The electromagnetic energy becomes the driving force of the motor pistons.

Claims

1. What I claim as my invention is, the method of using coil activated electromagnetic force to drive the pistons of a motor. This drive method can be applied to any piston type combustion engine to convert it to an emission free electromagnetic motor. The method consists in affixing electromagnets directly over the magnetic pistons of the motor in which you wish to provide drive to.
When the coils are activated, the electromagnetic energy forcefully repels the pistons below them, down into the cylinders of the block, providing the linear motion necessary to turn the crankshaft of the motor.

2. A method that coverts the internal combustion motor in an electromagnetic motor and provides the combustion motor a new driving system. This new driving system is housed inside a non-magnetic manifold mounted on the motor block instead of the combustion motor manifold. This new driving systems consists of generating rods made of an easily magnetized material when activated by electricity but that quickly dissipates the electromagnetic energy when it is deactivated. The copper magnet wire is wrapped many times around these generating rods. The copper wire is connected to an electrical supply source. When

activated, the coils magnetize the generating rods. When they are deactivated, the rods retain little or none residual magnetic energy. The electromagnets provide the electromagnetic energy source used to drive the pistons. This energy substitutes the energy produced when burning a mixture of fuel and air to drive the pistons. The motor will work now using electromagnetic energy to drive the pistons instead of combustion. The strength of the magnetic energy is controlled by the number of turns of the copper wire around the generating rods. This is determined before manufacturing the electromagnets. These electromagnets are placed inside a non-magnetic manifold. The manifold is mounted flush to the motor block exactly in the same spot previously occupied by the combustion manifold. There is an electromagnet per piston inside the motor block. This, by design, will fix one of the individual electromagnetic assemblies directly above and concentrically to each piston of the motor. The electromagnets activated by coils create a force above the motor's pistons. The pistons or their face are covered with permanent magnetic discs. The piston face polarity will be the same as that of the electromagnetic generator. This will make these two parts to repel each other. The fixed electromagnetic force will repel the mobile pistons making them move along the cylinder hole in the motor block. This is called the piston stroke. The motor operation

requires that pistons return to the upper part of the stroke where the electromagnetic force can be applied again to produce the continuous movement of the pistons. The coils are deactivated to allow for this to happen. The electromagnetic energy dissipates when the coils are deactivated and therefore there is little or no repulsion force to affect the piston.

The coils are intermittently activated and deactivated to facilitate the continuous movement of all the pistons inside the motor block. The pistons are connected to the crankshaft by the piston arms. They are the connection between the piston and the crankshaft. Each stroke of the piston connected to the crankshaft makes it turn. Therefore, the lineal movement of the pistons, caused by their electromagnetic repulsion, connected to the crankshaft, provides the necessary movement to make the crankshaft rotate.

3. In a motor that functions according to the method described in claim number 2, where the shape of the design and the exact size of the magnet will vary in order to be more efficient for the motor where they are going to be used. The magnet must be made out of grade 8 ceramic or iron 10/10, or any other material that dissipates the magnetic energy quickly. The electromagnets will be able to generate a magnetic flux larger than 20 maxwells. Each

electromagnet with a rod shape will have a narrower section in the middle where the copper wire will be wrapped around and will magnetize the rod of the ceramic or iron 10/10 generator. There will be a disc placed at the end of the rod. The disk holds the terminals. The copper coil ends are connected to the terminals. The disk also provides protection for the upper part of the coil.

4. In a motor that functions according to the method described in claim number 2, there are two types of pistons I am claiming. The first is a standard faced type. The face is *concave.*

What makes my piston a novelty, is the fact that the face, or the entire piston, will be a permanent magnet. The pistons can be made out of any ferromagnetic material. A permanent magnet disk of neodymium-iron-boron (NdFeB) can be affixed to the face of the piston. The face or entire piston will be made of NdFeB or alnico or another type of metal that stays magnetic a long time.

Each piston, or piston face will have a residual induction of a minimum 30 gauss and a coercive force of greater than 22 oersteds. This is necessary for function.

5. In a motor that functions according to the method described in claim number 2, there are two types of pistons I am claiming. The first is a standard faced type. The face is *convex*. What makes my piston a novelty, is the fact that the face, or the entire piston, will be a permanent magnet. The pistons can be made out of any ferromagnetic material. A permanent magnet disk of neodymium-iron-boron (NdFeB) can be affixed to the face of the piston. The face or entire piston will be made of NdFeB or alnico or another type of metal that stays magnetic a long time. Each piston, or piston face will have a residual induction of a minimum 30 gauss and a coercive force of greater than 22 oersteds. This is necessary for function.

6. In a motor that functions according to the method described in claim number 2, there are two types of pistons I am claiming. The first is a standard faced type. The shape of the face is inclined. What makes my piston a novelty, is the fact that the face, or the entire piston, will be a permanent magnet. The pistons can be made out of any ferromagnetic material. A permanent magnet disk of neodymium-iron-boron (NdFeB) can be affixed to the face of the piston. The face or entire piston will be made of NdFeB or alnico or another type of metal that stays magnetic a long time.

Each piston, or piston face will have a residual induction of a minimum 30 gauss and a coercive force of greater than 22 oersteds. This is necessary for function.

7. In a motor that functions according to the method described in claim number 2, the type of piston (part 3) is unique due to its shape. This piston has a circular rod that projects from its face, concentric with the piston's center. It rises proportionately to the piston's diameter. The length and shape of the rod can be altered to increase the yield of the pistons. The rod can be made of any type of metal that reacts well to the electromagnetic energy. This piston is designed to act as a solenoid rod and it is expelled from an electromagnetic circular field. This is my intellectual property. A piston or a piston's face, manufactured from a highly electromagnetic material, such as alnico, permanently magnetized, for it to be specifically reactive to the electromagnetic energy.

8. In a motor that functions according to the method described in claim number 2, is for a non magnetic manifold mounted on a motor block, called a "retro head". It is called a retro head because it can be designed to retrofit any piston engine.

The head will be made of aluminum or any other suitable non magnetic metal or plastic. Aluminum or Nylon 6 for example, but not limited to. It will be designed specifically to mount to each piston engine block, and to house electromagnetic discharge devices activated by coils called electromagnets.

Every "retro head" will be designed to mount to a motor block and affix magnets and coils, concentrically and minimally spaced, directly over the pistons/ cylinders ports of the engine. Another feature of the retro head is the expelled air ports in the sides of the head. These vents allow air to suck in at the top of the cylinder when the piston is thrust down. They allow the air above the cylinder to vent out and not cause air compression during the upward piston movement.

9. In a motor that functions according to the method described in claim number 2, the non magnetic manifold cover (part 7) is designed specifically to bolt onto the retro head (part 6).

It is designed to have bosses manufactured on the inside that line up concentrically to the magnetic discharge assemblies. The cover holds the assemblies in place, and prevents any movement from the magnet assembly.

There will be access ports in the head cover, to allow the connection the wires to the energy supply. These ports will also have vents to allow cooling.

The head cover (part 7) design will vary in shape and size between applications. It will always be non magnetic metal or plastic. It will always bolt on to a retro head (part 6). It will always prevent the magnets from any movement.

10. In a motor that functions according to the method described in claim number 2, the block will be made of a high content aluminum alloy or plastic, so it does not become magnetized itself with all the electromagnetic energy around it. This invention will work in a block that is ferrous but will not be very efficiently over time. The cylinder walls will be lined with brass or another wear resistant non magnetic material. This will reduce friction with the pistons, and further isolate the electromagnetic energy. This is important for my design.

11. In a motor that functions according to the method described in claim number 2, the motor block itself will vary in design shape, from application to application, but the patent will apply to all piston engines that are configured with my invention.

To enable my invention to work the way I've intended, the engine block must be made of non magnetic materials. The novelty of my motor is, that the block (part 8), is made from non magnetic metal or plastic, specifically for the purpose of isolating the electromagnetic energy created by the magnets (part 1) and providing a housing for the linkage and pistons and internal workings of the motor.

12. In a motor that functions according to the method described in claim number 2, it is for the entire electromagnetic piston motor assembly. I claim ownership of a low or non magnetic motor block, and coil activated, electromagnetic piston driving manifold, that drives the pistons of an engine with electromagnetic force instead of combustion.

13. In a motor that functions according to the method described in claim number 2, I claim ownership of all and every piston motor that use electromagnetic energy as the pistons driving force. This is my intellectual property.

Application number/numéro de demande: 2656739

Figures: 1, 2, 3, 4, 5, 6, 7, 11, 16, 20, 23, 28, 29, 30
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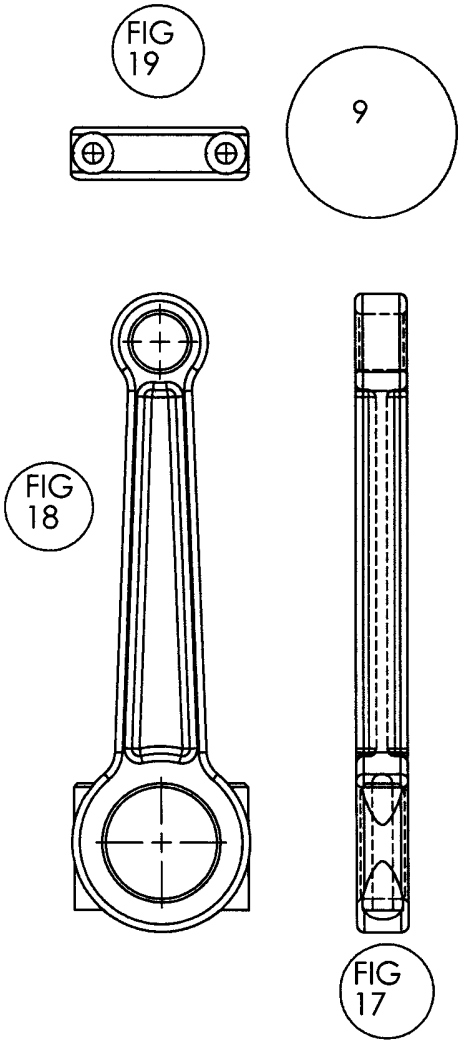
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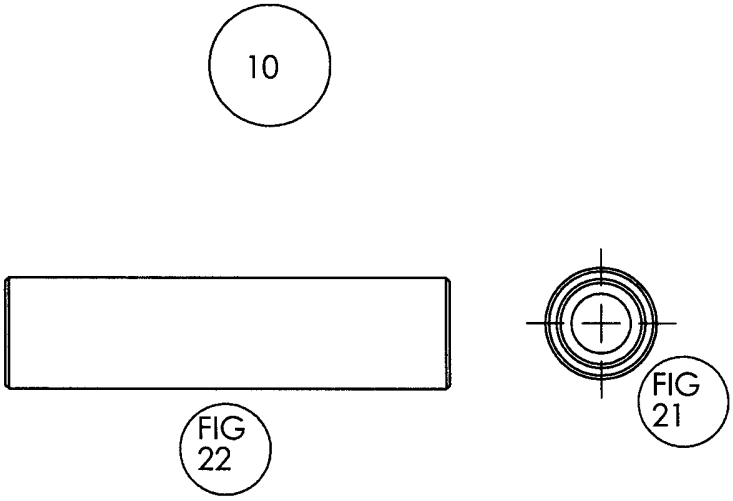
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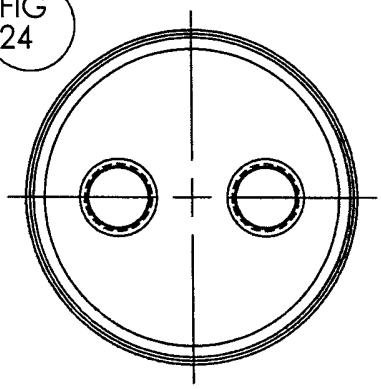
FIG 22
FIG 21

FIG 24



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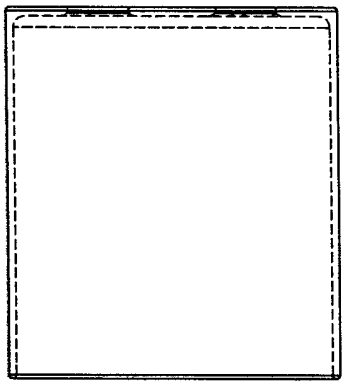
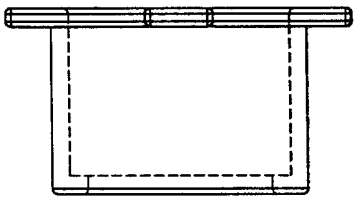
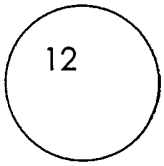


FIG 25

FIG 27





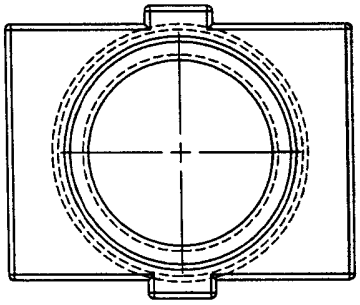


FIG 26

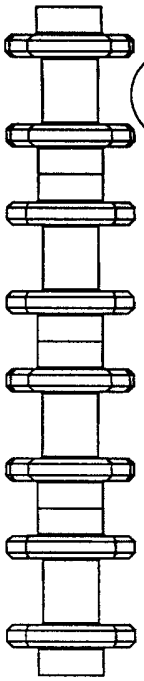


FIG 32

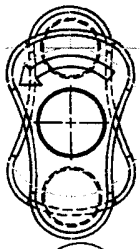


FIG 31

FIG 33

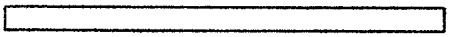
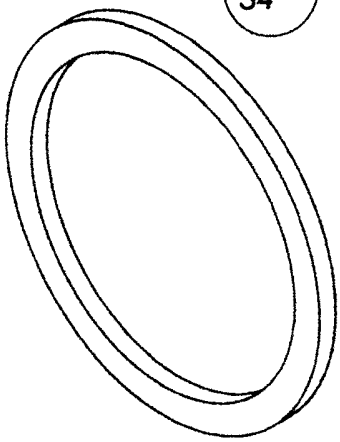


FIG 34



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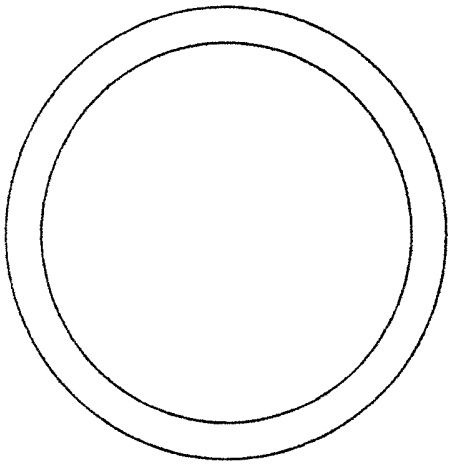


FIG 35

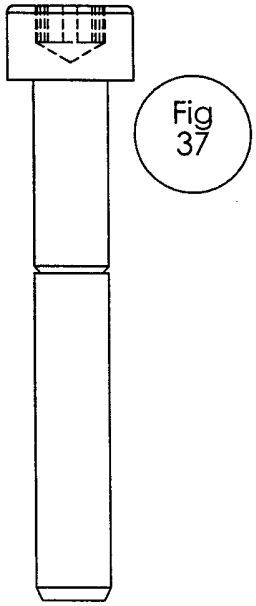


Fig 37

Parte 14

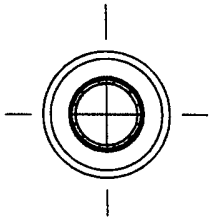
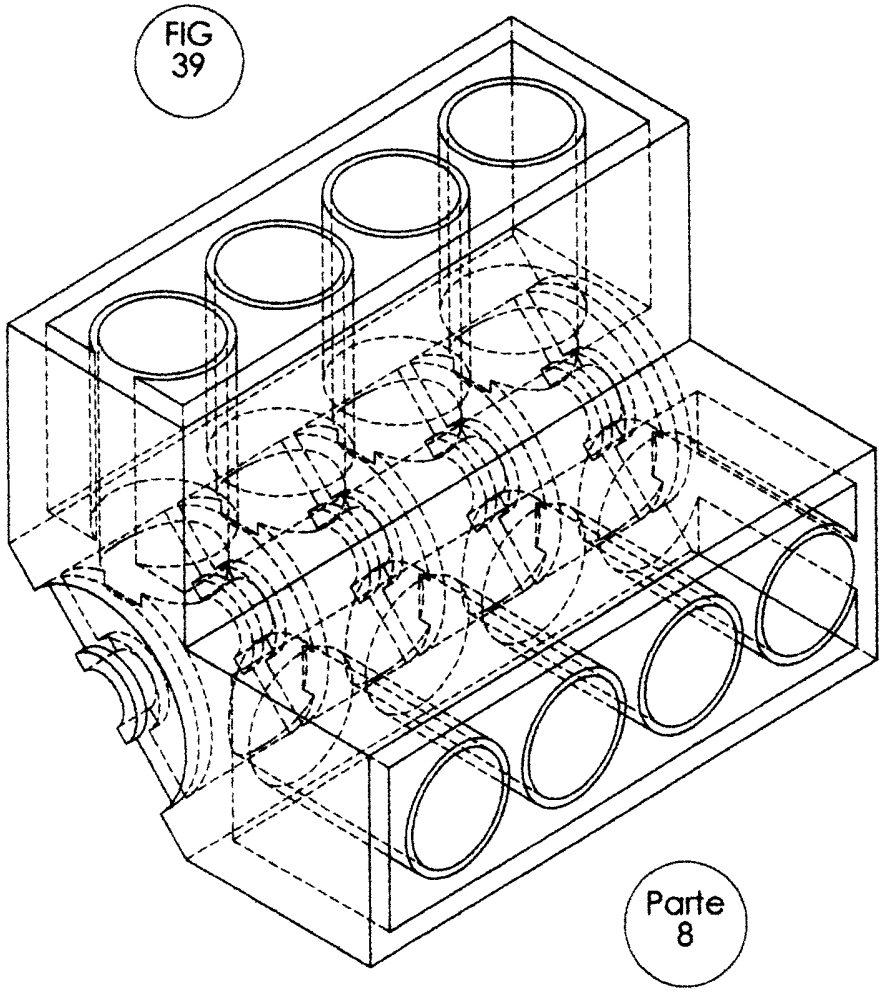


Fig 38

FIG 39



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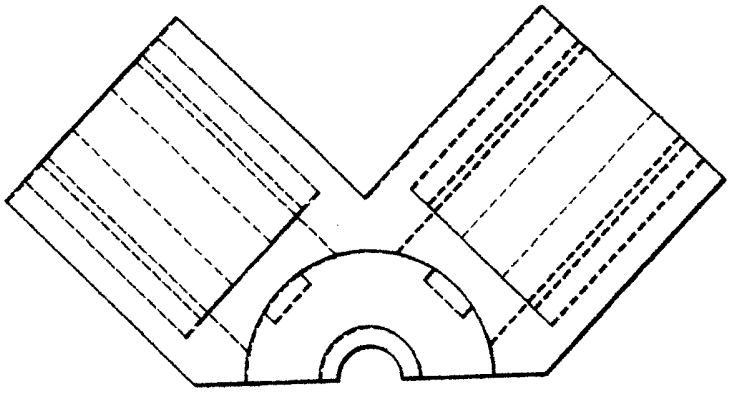
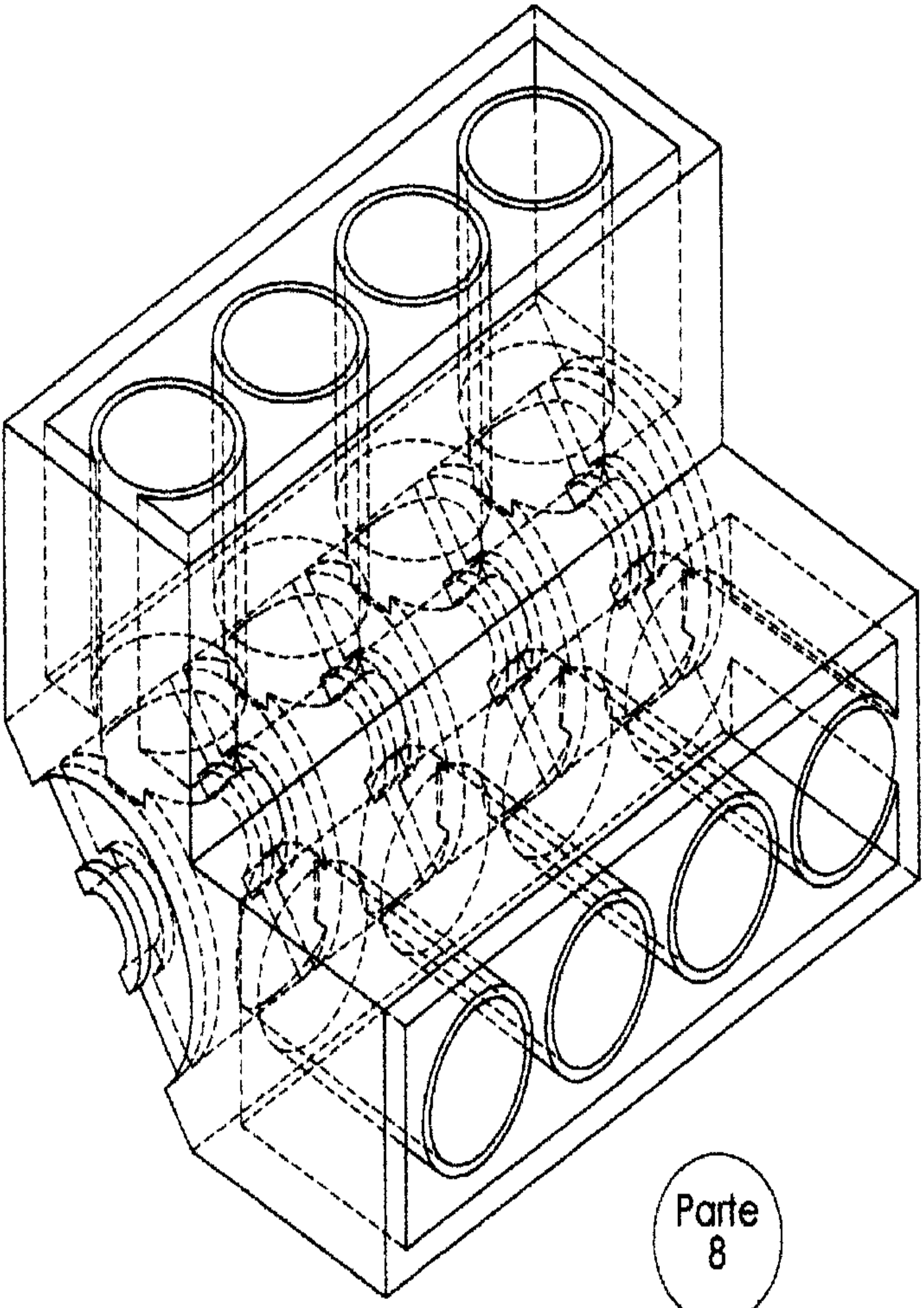


FIG 40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