

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

EP 0 905 377 A2

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
31.03.1999 Bulletin 1999/13

(51) Int Cl.6: **F04B 39/00**

(21) Application number: **98307618.3**

(22) Date of filing: **18.09.1998**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: **Goay, Eng Hwa**  
**Singapore 510106 (SG)**

(74) Representative: **Style, Kelda Camilla Karen et al**  
**Page White & Farrer,**  
**54 Doughty Street**  
**London WC1N 2LS (GB)**

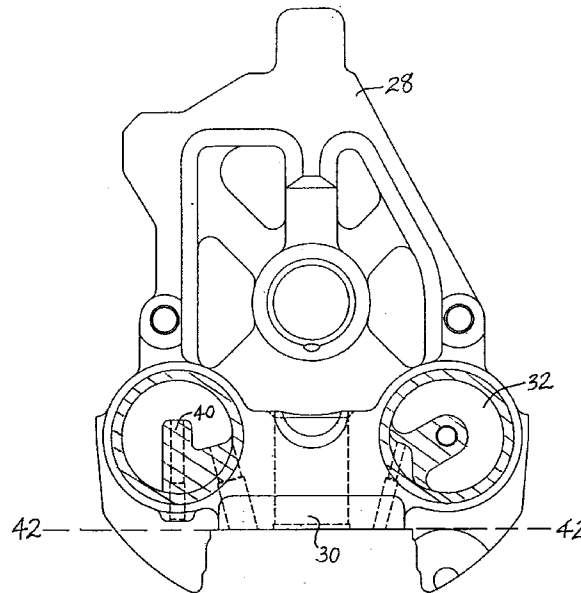
(30) Priority: **24.09.1997 SG 9703545**

(71) Applicant: **MATSUSHITA REFRIGERATION  
INDUSTRIES (S) PTE Ltd.**  
**Singapore 469267 (SG)**

(54) **Casted suction inlet**

(57) A casted iron muffling suction chamber comprising in a single integrated body the suction inlet (40) and the suction chamber. The casted tubular section inlet extends into the interior of the suction chamber to

enhance the muffling effect of the chamber. The cast suction inlet is projected long enough into the chamber to prevent suction resonance due to the pulsating sounds given off when the piston draws the refrigerant gas.



**FIG. 4**

EP 0 905 377 A2

## Description

**[0001]** The present invention relates to a suction chamber of the cylinder block of a reciprocating type hermetic compressor. In particular, it relates to the integration of the suction tube with the suction chamber to form a muffling suction chamber.

**[0002]** Reciprocating-type hermetic compressors are well known in the art. Typically, an electric motor drive is built into a sealed housing or shell, and has a stator or electric armature affixed therein, and a rotor assembly assembled into the cylindrical passage of the stator. An integral cast iron cylinder block is built above the motor assembly having a compression chamber, suction chamber and the discharge chamber. The rotor assembly includes a rotor and a crankshaft, with the crankshaft inserted into the cylindrical passage of the rotor by interference fit. The reciprocating motion of the piston in the compression chamber compresses low pressure into high pressure gas. The gas typically comprises freon or the like. The low pressure gas enters the sealed shell from the system, and is sucked into the compression chamber via a suction tube inserted into the suction chamber.

**[0003]** A conventional bundy suction tube is inserted into an aperture in the suction chamber wherethrough the refrigerant gas, mixed with lubricating oil, is sucked. The suction chamber is an empty chamber which reduces the level of noise produced by the flowing gas. The suction tube has a narrower end which is inserted into the suction chamber, and a wider end which remains projecting outside the suction chamber. A sufficiently long suction tube serves two purposes. The first purpose is the further attenuation of the noise caused by pulsation and resonance from the gas flow at the suction stroke of the piston. The second purpose is to minimize the amount of oil sucked into the suction chamber together with refrigerant gas. The second purpose is generally achieved at the wider portion of the tube that remains projecting out from the suction chamber. This projection is well know to act like a shelter to create a barrier against the dripping lubricant oil that has been sprayed upwards due to the spinning movement of the crankshaft. Despite its benefits, the use of an inlet tube constitutes an additional purchased part, which increases the overall cost of production. As a result, it is desirable that this extra cost be lowered without compromising the noise control and oil sheltering function of this part.

**[0004]** It is an aim of embodiments of the present invention to reduce the cost of production by eliminating the use of a separate inlet tube and the corresponding insertion step in the suction chamber, while maintaining good compressor performance.

**[0005]** According to one aspect of the present invention, there is provided a casted iron muffling suction chamber combining in a single integrated body the suction inlet and the suction chamber of a reciprocating type hermetic compressor. The casted tubular suction inlet

projects into the interior of the suction chamber to enhance the muffling effect of the chamber. This projection is long enough to prevent suction resonance due to the pulsating sounds given off when the piston draws the refrigerant gas.

**[0006]** For a better understanding of the present invention, reference will now be made by way of example to the accompanying drawings in which:

**[0007]** Figure 1 is a horizontal cross-sectional view of a hermetically sealed motor driven compressor in the prior art.

**[0008]** Figure 2 is a horizontal cross-sectional plan view of the cylinder block in the prior art, the arrow illustrating the insertion of the suction tube. The dotted lines show the connecting apertures.

**[0009]** Figure 3 is a horizontal cross-sectional plan view of the cylinder block in the prior art with the suction tube inserted

**[0010]** Figure 4 is a horizontal cross-sectional view of the cylinder block embodying the present invention.

**[0011]** There has been a long felt need in the field to reduce the cost of producing a separate suction tube for the suction chamber of a cylinder block, and to streamline the assembly process by eliminating the insertion step. However, conventional view is that there is no cheaper substitute for the suction tube, since there are limits to the cylinder block designs which can be casted and milled, particularly if the cylinder block has to be compatible with existing parts. In addition, conventional thinking is that the suction inlet tube is essential for the noise reduction function and the alleviation of oil.

**[0012]** The casted suction inlet embodying the present invention overcomes the drawback of the suction chamber provided in the prior art while allowing the compressor capacity and efficiency to be maintained at the level of the prior art compressors.

**[0013]** Referring to Figure 1, a typical reciprocating compressor in the prior art includes a sealed housing or shell **22**, wherein an electric motor **24**, the crankshaft **26** and the cylinder block **28** are housed. The bold arrows indicate the path from which the refrigerant gas enters the housing and into the compression chamber **30** via the suction chamber **34**, before being discharged into the discharge chamber **32**.

**[0014]** Figure 2 shows in greater detail the cylinder block as typically found in the prior art. The cylinder block includes a compression chamber **30**, a discharge chamber **32** and a suction chamber **34**. The compression chamber is connected to the discharge and suction chambers through channels in the cast iron which are controlled by reed valves. These channels are shown in dotted lines in Figure 2. A bore **35** in the suction chamber **34** is provided to allow the insertion of the suction tube **37**. The suction tube has a narrower inner section **36** and a wider outer section **38**. The direction of the insertion is shown by the arrow.

**[0015]** Figure 3 shows the suction chamber with the suction tube inserted as typically done in the prior art.

The inner section **36** projects into the suction chamber, the length thereof being sufficiently long to effectively reduce the pulsating resonance of the suction stroke. The outer section **38** of the suction tube extends outwards from the suction chamber into the interior of the housing. The prior art teaches that this projection is necessary to alleviate the oil intake by the suction chamber as refrigerant gas is sucked in.

**[0016]** Figure 4 shows the one embodiment of the cylinder block in the present invention. Instead of the simple insertion hole as provided in the prior art, embodiments of the present invention called the muffling suction chamber, includes a tubular casted suction inlet **40** extending into the interior of the suction chamber. The tubular casted suction passage effectively replaces the suction tube in the prior art, eliminating the need for this additional part. The tubular passage is shown as dotted lines in Figure 4.

**[0017]** The embodiment of the invention as shown in Figure 4 does not include an outer section, as in the prior art. In this example, the front of the compression chamber **30** is a square head that is vertically milled after casting to allow the reed valves to be installed, and no outer projection is casted beyond a position as delineated by line **42-42**. This outer projection, however, has been widely accepted as being necessary for the alleviation of oil intake at the suction chamber. Contrary to conventional teaching, though, it has been found that the present casted suction inlet with the truncated outer section still maintains the same level of noise control without causing any increase in oil intake. For many compressor designs, including the design described in this embodiment, the front of the compressor chamber is a head that has to be vertically milled after casting to allow the reed valves to be installed. In addition, honing has to be performed on the compression chamber. In order to make room for the jig to secure the cylinder block to perform these machining steps, no projecting part can be casted beyond the section head. In such designs, an outer projection of the casted suction inlet cannot be casted. With the general belief in the art that the outer section is necessary, teaching in the art would have discouraged a person of ordinary skill in the art from the approach taken in the present invention. Yet, embodiments of the present invention shows that using a casted suction inlet does not compromise the performance of the compressor. This is an unexpected result which makes this design both practical and economical.

**[0018]** Other embodiments are envisioned wherein the outer and inner sections of the suction inlet are casted into various lengths, depending on the product design without departing from the scope of the present invention. The teachings here illustrates the feasibility and usefulness of an integrated suction inlet, and it is contemplated that many models of reciprocating-type hermetic compressors would benefit from them.

## Claims

1. A suction inlet in a cylinder block of a reciprocating-type hermetic compressor, said cylinder block including a compression chamber, a suction chamber and a discharge chamber, characterized in that the suction inlet is casted as an integral part of said suction chamber.
2. A suction inlet according to claim 1 wherein said suction inlet is a tubular cast suction passage projecting into the interior of said suction chamber.
3. A suction inlet according to claim 2 wherein said tubular cast suction passage is at least 20mm long.
4. A suction inlet according to the preceding claims wherein said suction inlet comprises an inner section directed towards the interior of the suction chamber, and a truncated outer section directed towards the exterior of the suction chamber.

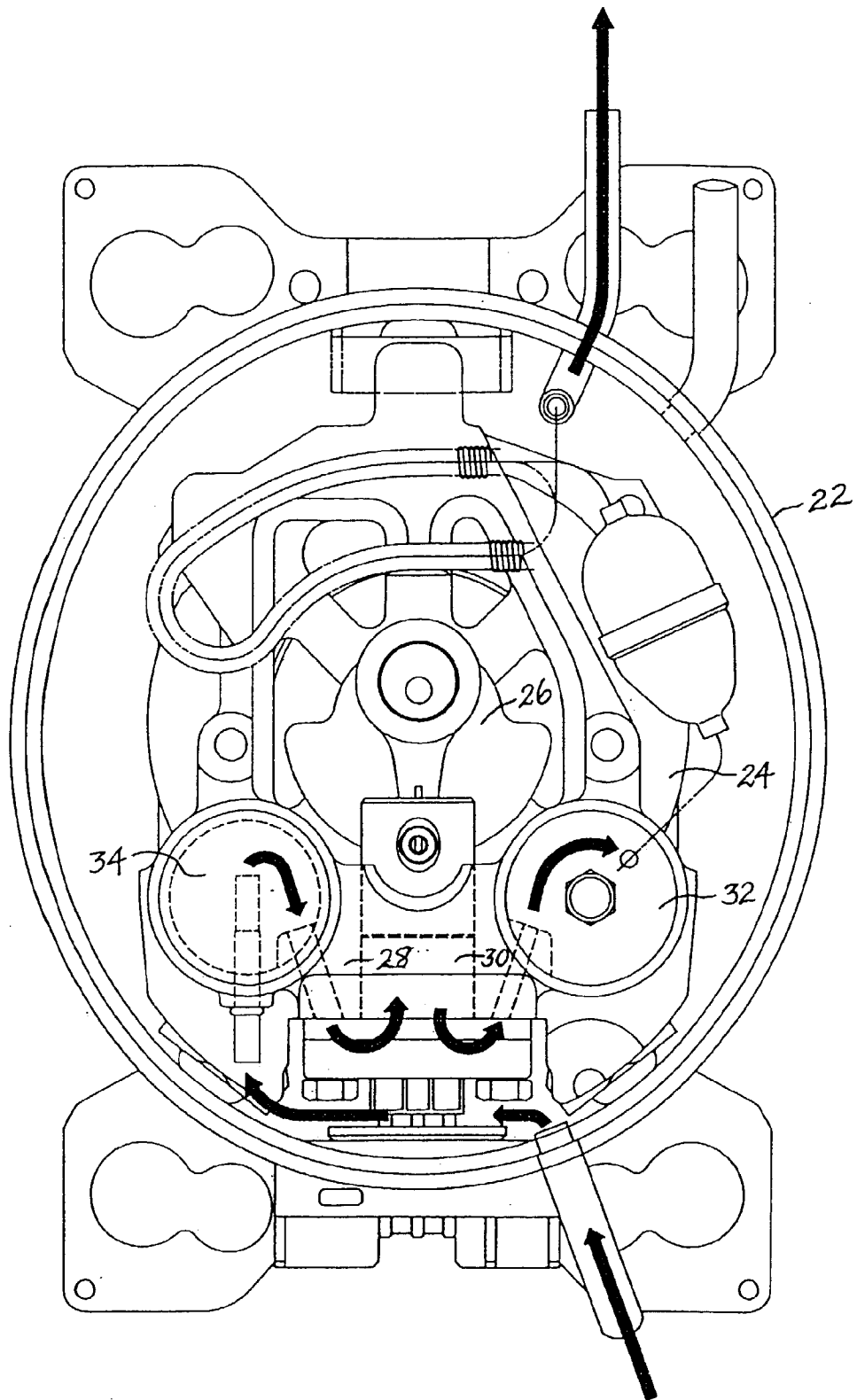


FIG. 1

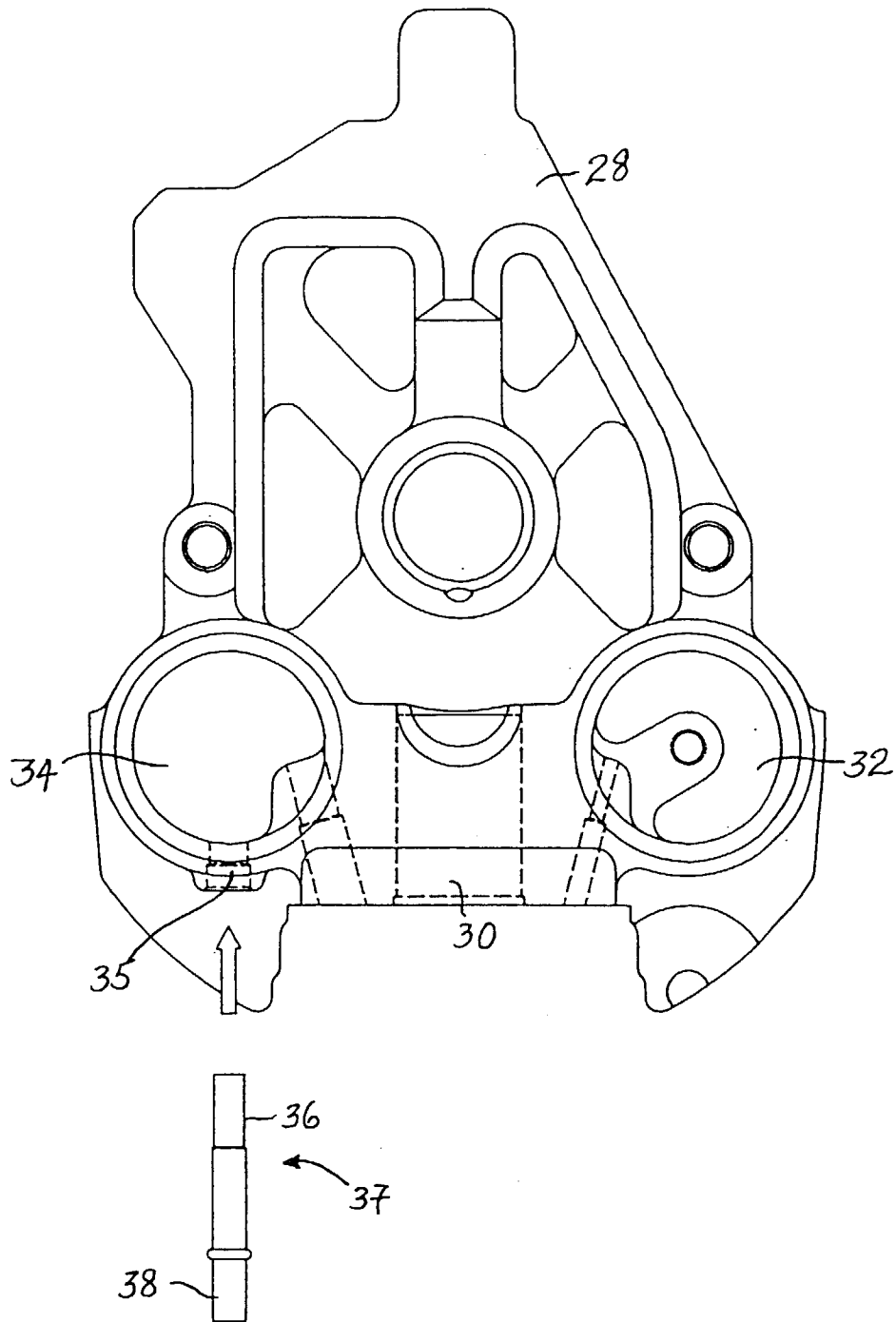
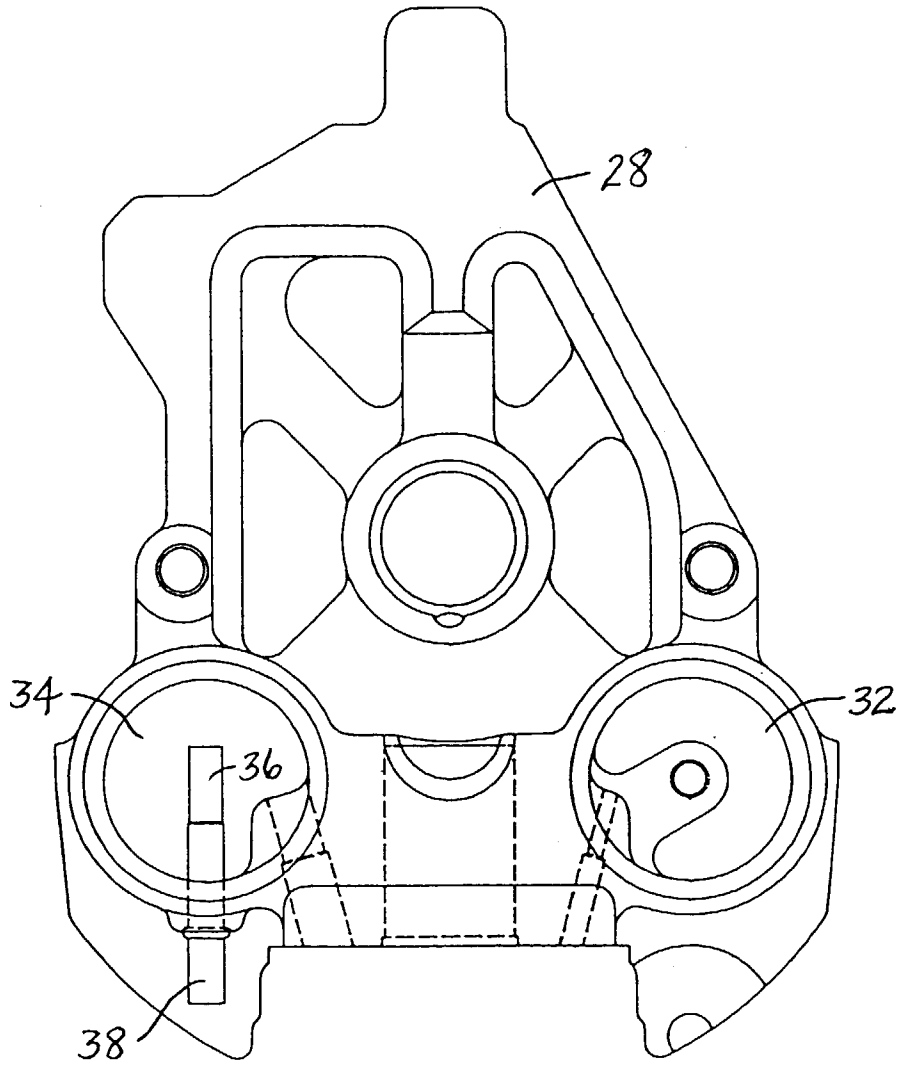
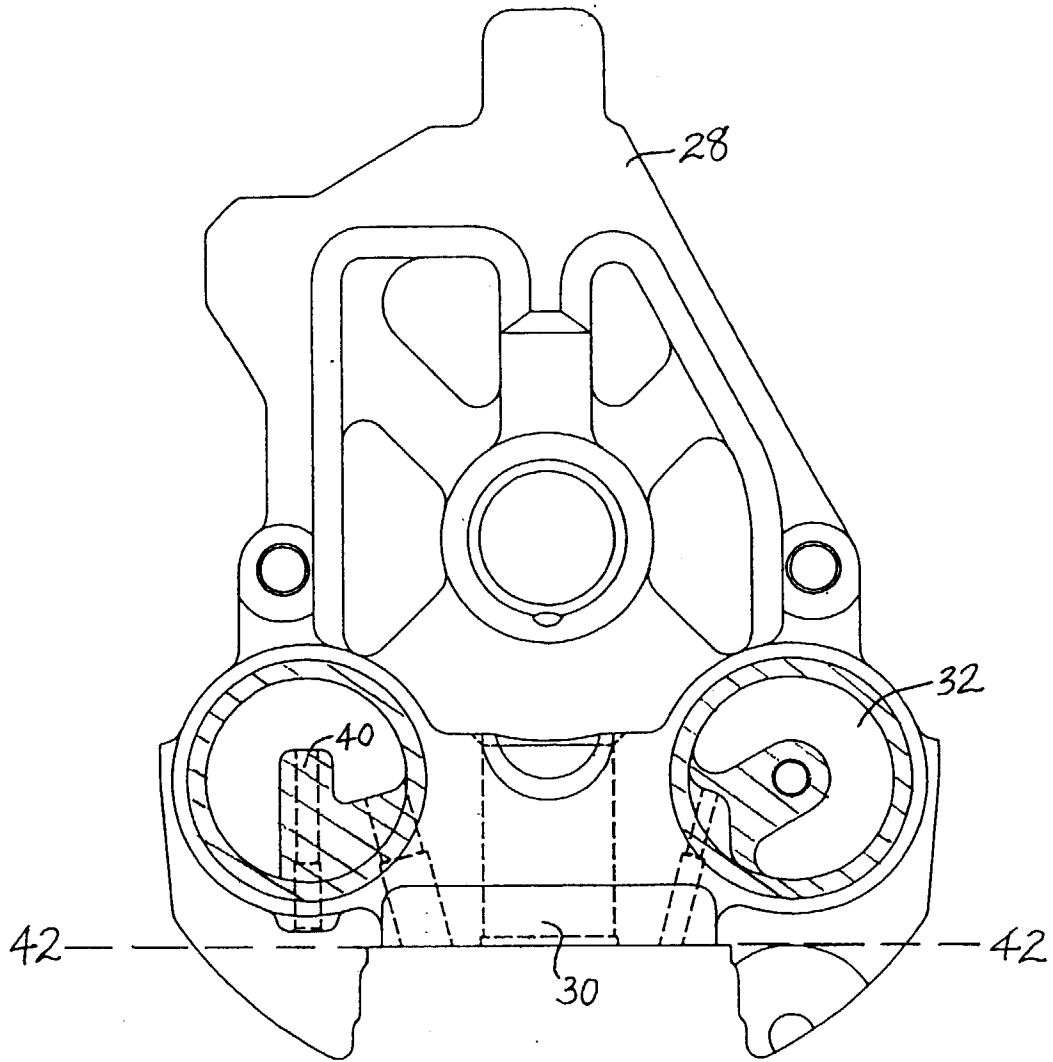


FIG. 2



**FIG. 3**



**FIG. 4**