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(54) Pistons.

(57) Pistons for 2-stroke engines are described, the pistons including a crown member and a skirt, the skirt comprising an axially extending, uninterrupted skirt portion depending from the crown member on at least that part of the piston which traverses the exhaust port of a co-operating cylinder portion which is axially spaced apart from the crown member on at least part of the area of the piston which traverses the transfer port or ports of the co-operating cylinder. Improved cooling of the crown member and improved lubrication of the small-end is achieved.

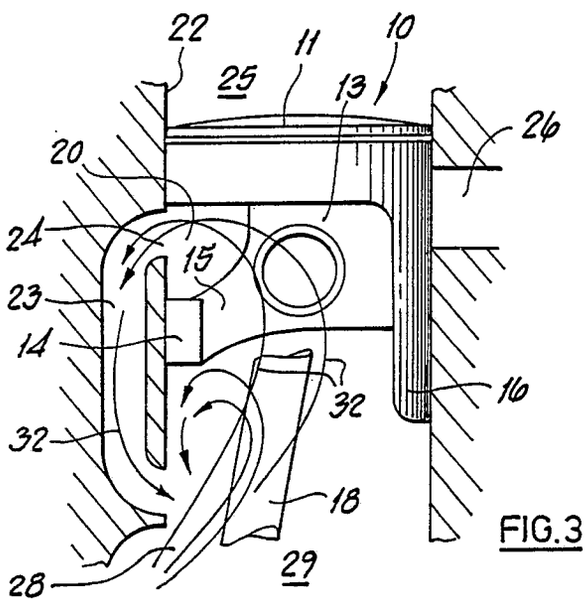

FIG.3

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PISTONS

The present invention relates to pistons and particularly, though not exclusively, to pistons for two-stroke engines.

Particular problems associated with pistons in two-stroke engines are those of achieving adequate cooling of the piston undercrown region and of providing adequate lubrication of the connecting-rod small-end bearing.

With a piston having a conventional skirt the gas charge in the internal cavity tends to stagnate without circulation.

It is an objective of the present invention to provide a piston having enhanced undercrown cooling and small-end lubrication due to improved circulation of the incoming fresh mixture charge.

According to the present invention a piston includes a crown member and a skirt, the skirt comprising an axially extending, uninterrupted skirt portion depending from the crown member on at least that part of the piston which traverses the exhaust port of a co-operating cylinder and a skirt portion which is axially spaced apart from the crown member on at least part of the area of the piston which traverses the transfer port or ports of the co-operating cylinder.

By having at least part of the skirt on the transfer side of the piston axially spaced apart from the crown it allows circulation of fresh incoming charge around the crown underside and also brings oil-bearing charge into proximity with the small-end. In some engines which currently employ a needle roller bearing small-end this may allow the use of a plain bearing.

If it is desired the spaced-apart skirt portion may allow charge circulation around all the transfer ports, if the engine has more than one, or around only a proportion of the transfer ports.

The spaced-apart skirt portion may be formed by forming an aperture in the skirt of a conventional full skirted piston. In a preferred embodiment, however, the spaced-apart skirt portion comprises a skirt land supported on struts depending from the gudgeon pin bosses. This has been found to provide a stronger piston than that produced by opening up of a conventional full-skirted piston.

Pistons according to the present invention may also be lighter and have lower friction in operation.

The uninterrupted skirt portion may depend from the crown and may be additionally supported by the gudgeon pin bosses from ribs or webs etc. extending therebetween.

A further advantage conferred by a piston according to the invention is that increased turbulence in the fresh charge may enhance mixing of the fuel, oil and air components producing enhanced combustion.

In order that the present invention may be more fully understood an example will now be described by way of illustration only with reference to the accompanying drawings, of which:

Figure 1 shows a view in elevation of a piston according to the present invention parallel to the gudgeon pin axis;

Figure 2 shows the piston of Figure 1 turned through 90° and viewed from direction A;

Figure 3 shows a schematic view of the piston of Figures 1 and 2 in a two-stroke engine cylinder;

Figure 4 shows a schematic perspective line drawing of a two-stroke engine on the induction/compression stroke;

Figure 5 shows the engine of Figure 4 on the firing/exhaust stroke; and

Figure 6 which shows an alternative piston to that shown in Figure 1.

Referring now to the drawings and where the same or similar features are denoted by common reference numerals.

Figures 1 and 2 show a piston. The piston comprises a crown member 11 having one or more piston ring grooves and piston rings 12. Gudgeon-pin bosses 13 depend generally from the crown member 11. Depending from the bosses 13 is a skirt land 14 supported by strut members 15 therebetween. On the opposite side of the piston the skirt is an axially extending, uninterrupted portion 16 depending from the crown 11 and further supported by the gudgeon pin bosses 13. The piston is connected to a crankshaft 17 by a connecting rod 18 (shown in part). Axially extending between the skirt land 14 and the crown member is a clear space 20 which in radial extent encompasses the cylinder transfer parts as will be shown below.

Figures 3, 4 and 5 show the piston 10 in a cylinder 22 having transfer passages 23 with ports 24 opening into the cylinder volume 25 and an exhaust port and passage 26. The incoming charge 28 of fuel, air and oil enters the engine crankcase region 29 from a suitable carburettor (not shown) and porting 30. On the induction and compression stroke of the piston (Figures 3 and 4) the charge 28 is drawn into the crankcase 29 and due to the piston clear space 20 is able to circulate within the crankcase 29, the transfer passages 23 and in the space below the crown 11. Arrows and curved lines 32 indicate circulation of charge. The effect of charge circulation under the crown 11 is to improve cooling of the crown and lubrication of the small-

end bearing. Enhanced turbulence may also improve mixing of the charge constituents. The skirt portion 16 maintains the exhaust port 26 closed to the crankcase whilst the piston is on the induction and compression stroke. On the firing and exhaust stroke (Figure 5) the piston behaves in the normal manner of a two-stroke engine to compress the fuel charge in the crankcase 29 and expel it into the combustion volume via the ports 24 as they are uncovered by the piston. Firing and exhaust functions are as in a conventional two-stroke engine.

The piston shown in Figure 6 has the gudgeon pin bosses 13 depending from the crown 11 and the skirt portion 16 is largely self-supporting.

Although the piston above has a clear space 20 which allows charge circulation through all the transfer ports on the induction stroke, the clear space in other pistons may only extend to uncover part of the total transfer port area.

The engine inlet porting could be by reed valve, disc valve or piston controlled induction, for example. Furthermore, the piston of the present invention may be used with fuel injection, only air being admitted via the induction and transfer porting.

Claims

1. A piston (10) including a crown member (11) and a skirt characterised in that the skirt comprises an axially extending, uninterrupted skirt portion (16) depending from the crown member on at least that part of the piston which traverses the exhaust port (26) of a co-operating cylinder (22) and a skirt portion (14) which is axially spaced apart from the crown member on at least part of the area of the piston which traverses the transfer port or ports (24) of the co-operating cylinder.

2. A piston according to Claim 1 characterised in that the spaced-apart skirt portion comprises a skirt land supported on struts (15) depending from the gudgeon pin bosses (13).

3. A piston according to either Claim 1 or Claim 2 characterised in that the uniterrupted skirt portion is additionally supported by ribs or webs extending from the gudgeon pin bosses.

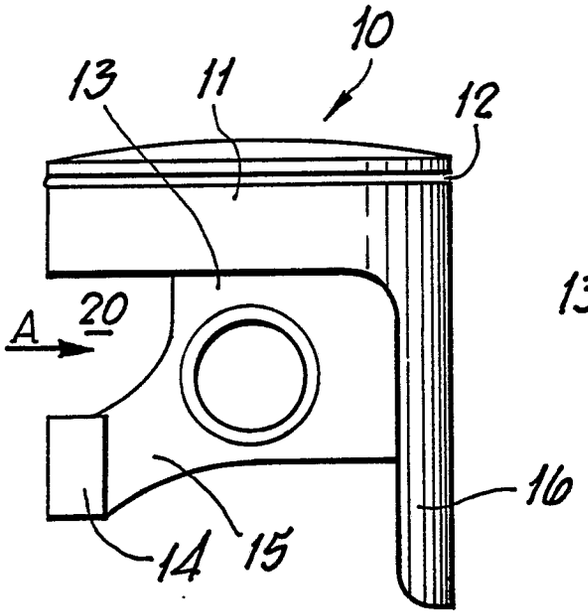

FIG.1

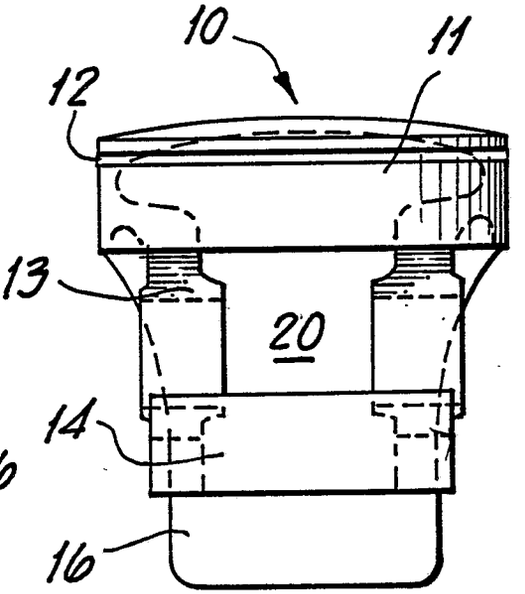

FIG.2

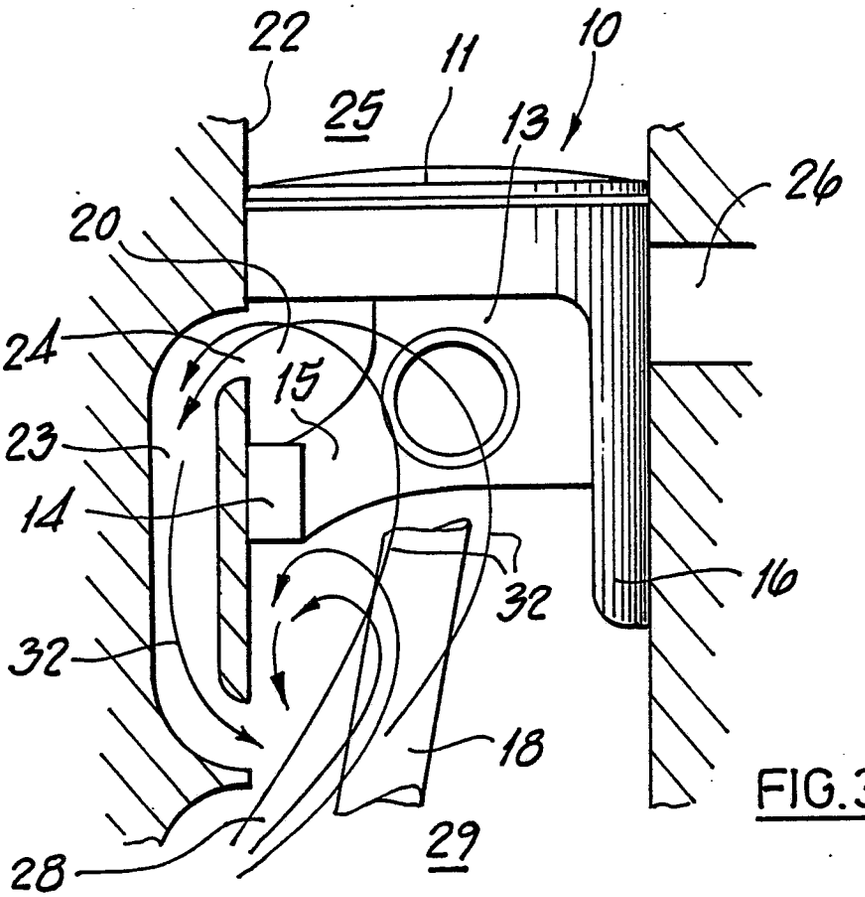

FIG.3

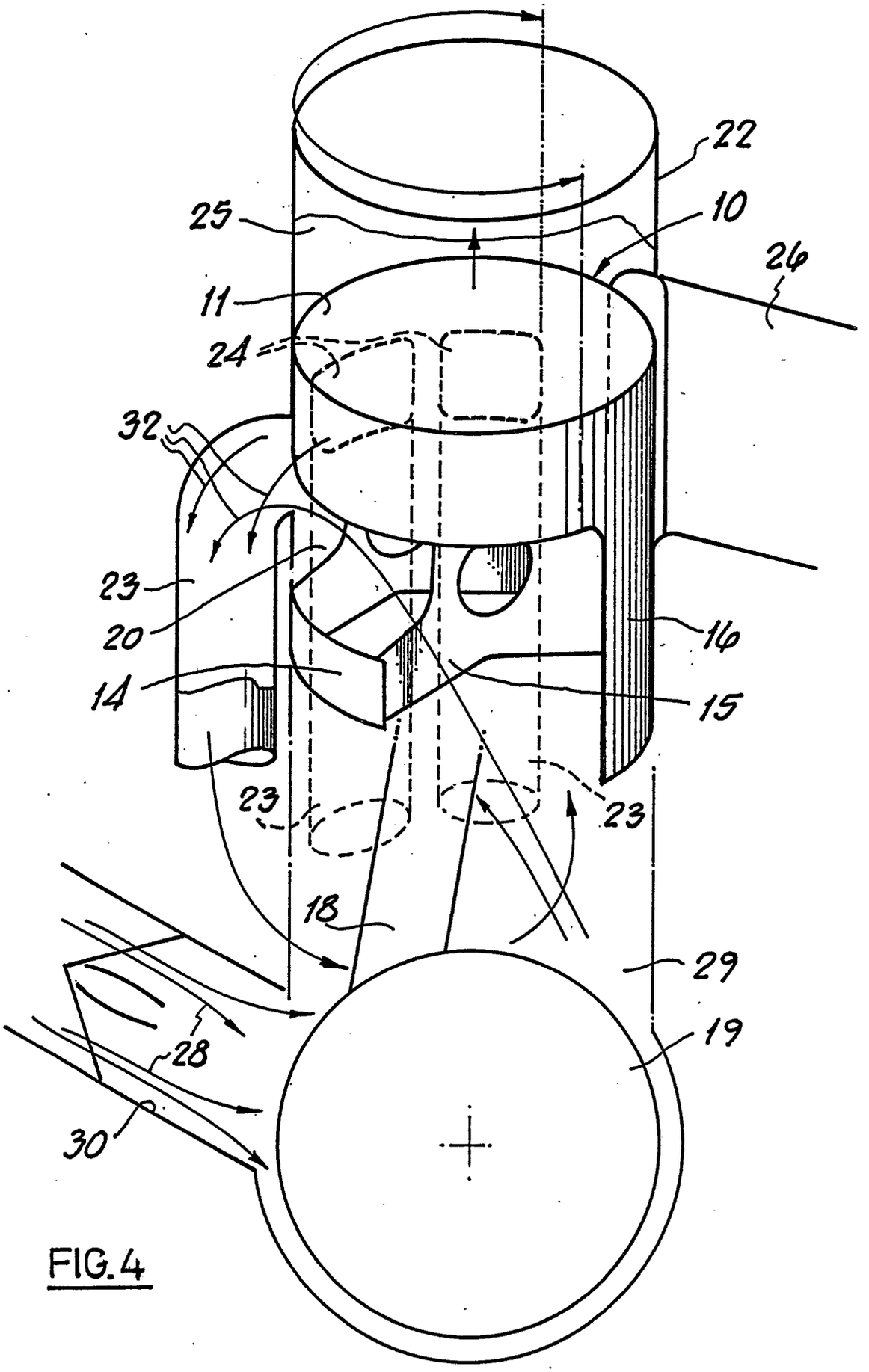

FIG.4

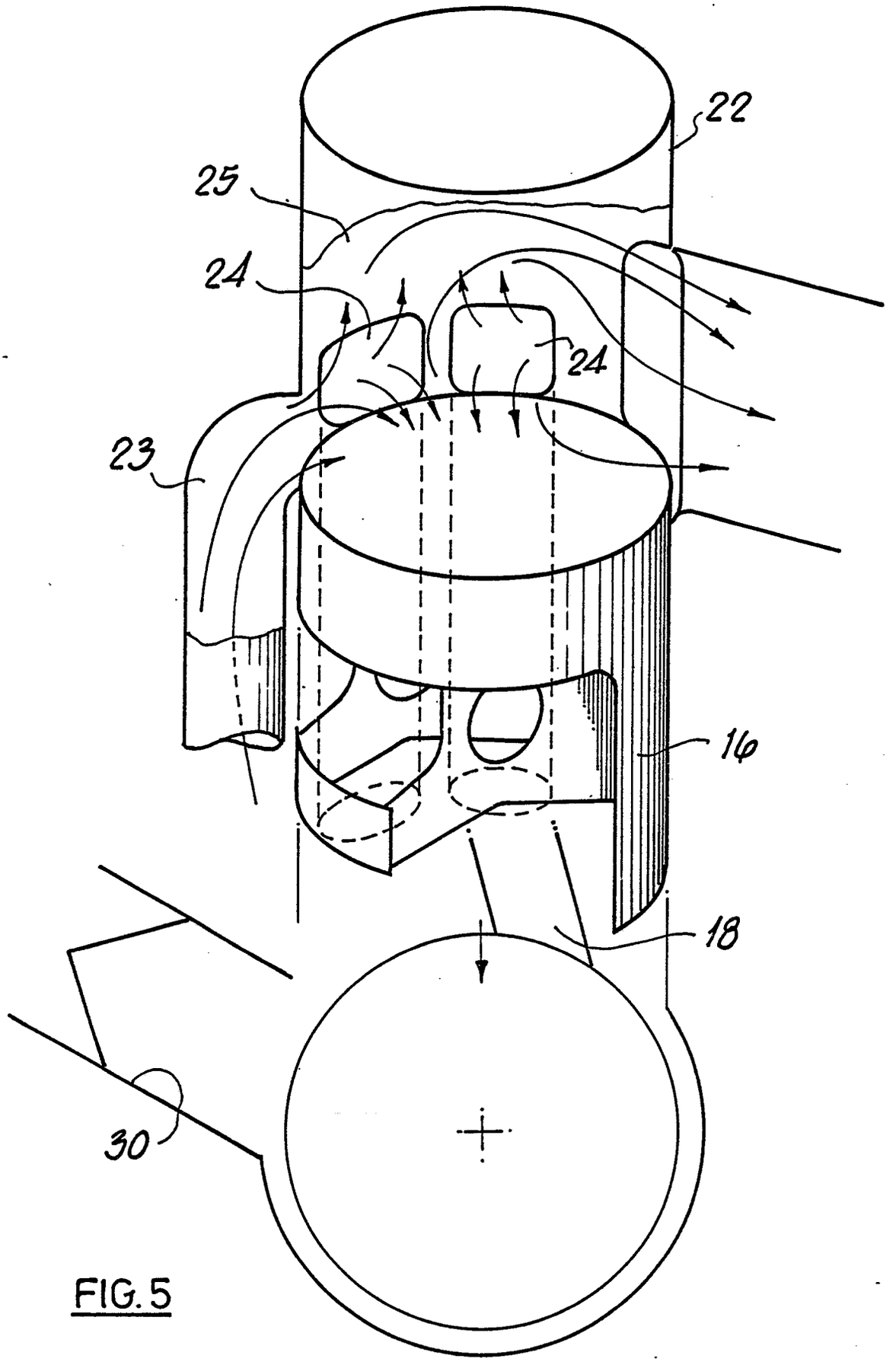

FIG. 5

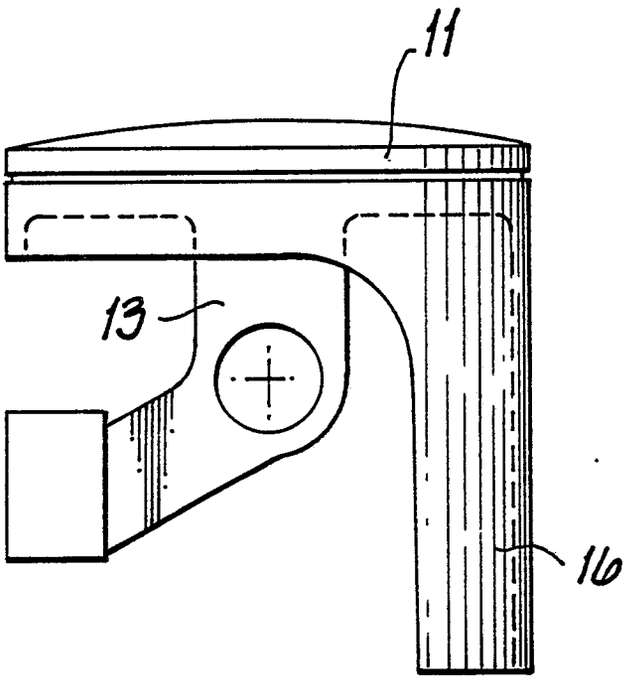

FIG.6