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(54) **Gas compressors.**

(57) A single cylinder air compressor is provided with a valve arrangement (19, 20) in the crankcase which impedes breathing of the crankcase (11) during induction strokes to create crankcase pressure elevations to expel lubricating oil from a low point of the crankcase via a small passage (18).

EP 0 242 044 A2

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Gas Compressors

This invention relates to gas compressors and relates more particularly to gas compressors which utilise a reciprocating piston in a cylinder.

A common form of gas compressor relies upon one or more reciprocating pistons in a cylinder. Such gas compressors are used to charge reservoirs of compressed air braking systems of heavy road vehicles. The bearings of such compressors are usually lubricated by oil under pressure from the vehicle engine lubrication system and one problem encountered is that accumulation of oil drained into the compressor crankcase from the bearings can cause over-lubrication of the cylinder bores and resultant oil carry-over into the system can be excessive. Such oil carry-over can be detrimental to the system and is preferably to be removed or prevented. One obvious way to reduce such oil carry-over is to limit the flow of oil to the compressor bearings but this can seriously impair the working life of the compressor.

The present invention seeks to provide an improved gas compressor wherein oil carry-over can be substantially reduced without undesirably reducing the oil flow to the bearings.

According to the present invention there is provided a gas compressor comprising a crankcase and cylinder assembly having a rotatable crankshaft with a crankpin connected to a piston for reciprocating a piston in the cylinder for alternatively effecting induction and compression strokes said crankshaft rotating in bearings which are supplied with lubrication under pressure from a source of lubricant and characterised by said crankcase being provided with a valve which closes during induction strokes to create pressure elevations in the crankcase to scavenge surplus lubricant therefrom via a lubricant outlet passage.

In accordance with one example of the invention the valve which closes during induction strokes may comprise a check valve arranged to freely permit air flow into the crankcase during compression strokes but to close during induction strokes. Furthermore, said check valve may have a restricted flow by-pass to limit the pressure elevations which may be produced in the crankcase.

In a further preferred embodiment of the invention the invention the valve may comprise a passage which is obscured by a part of the crankshaft over a part of the induction stroke.

In order that the invention may be more clearly understood and readily carried into effect the same will be fuirther described by way of example with reference to the accompanying drawings of which:-

Fig. 1 illustrates a part-sectional view of a piston and cylinder air compressor in accordance with the invention,

Fig. 2 illustrates a side view thereof and,

Fig. 3 illustrates a fragmentary view of an alternatiive embodiment.

Referring to Fig. 1 a single cylinder piston compressor shown in sectional form therein comprises a cylinder and crankcase casting 1 provided with a valve plate 2 and a cylinder head 3. The casting 1 has a cylinder bore 4 within which a piston 5 is reciprocated by means of a crankshaft 6 connected to the piston via a connecting rod 7 and a gudgeon pin 8. The crankshaft is rotatable in respective bearings 9 and 10 which are pressure fed from the right-hand end of the crankcase wherein an oil pressure chamber 11 is provided. This chamber is pressure fed with oil from an engine to which the compressor is mounted by a suitable flange 12. The inner end 13 of the crankshaft is provided with a drive pinnion (not shown) engageable with a gear train in the crankcase of the engine.

The oil-ways providing connection between the oil chamber 11 and the big-end bearing and the left hand main bearing, are denoted by broken outlines 14 and 15 and it will be appreciated that in operation, oil flow leakage will run down into the lower part of the crankcase which is shown to be closed by a suitable cover plate 16 and as shown in Fig. 1 (and as a dotted outline in Fig. 2), there is provided a small upwardly directed oil flow passage 18 communicating at a low level with the sump in the lower part of the crankcase. Furthermore, at an appreciably higher point in the crankcase there is provided a somewhat larger air breather passage denoted by reference 19 (Fig. 2) and shown dotted in Fig. 1. The angular position of this air passage 19 in relation to the crankshaft rotation is chosen so that it is substantially obscured by close proximity of an outer face 20 of the crankweb counter-weight 21 during induction strokes of the crankshaft and piston assembly. Since passages 18 and 19 are the only breathing passages for the crankcase, the inner end of the passage 19 and outer face 20 of the crankweb 21 comprise a timed valve which can impede breathing of the crankcase over predetermined intervals during the rotation cycle.

As shown in Fig. 2 the direction of rotation of the crankshaft is denoted by an arrow 22, the crankweb 21 being shown in dotted outline. It is seen moreover that at a suitable angular position, moving away from top dead centre, after completion of a compression stroke the surface 20 of the counterweight of the crank-web is about to obscure the inner end of the passage 19. The effect of this is to immediately impede the formerly free flow of air into and out of the crankcase so that the downward movement of the piston is able to create a suitable pressure elevation which acts in a sense to drive oil above the plate 16 out into the gear housing upwards via the small passage 18. By such means, the level of drained-out oil in the crankcase of the compressor is effectively limited to a level determined by the position of the passage 18.

The size of the passage 18 and the larger passage 19 are selected, along with the range of angular positions of the crankshaft for which the passage 19 is closed during induction strokes, to ensure that any tendency for oil build-up in the crankcase is prevented. On the other hand it is undesirable to create more than minimal cyclic pressure elevations in the crankcase because this can not only reduce the efficiency of the compressor but it may also be counter effective in that it will tend to drive lubricant upwards past the piston rings into the compression chamber of the compressor.

As mentioned in the foregoing,and as illustrated in Fig. 3, an alternative method of achieving the same result as that described above with reference to Figs. 1 and 2, would comprise the provision of a suitable check valve 23 in place of the passage 19 but it may be appreciated that careful selection of the check valve characteristics and the provision of a possible by-pass path around it is desirable to avoid high cyclic crankcase pressure elevations during operation as these are undesirable for reasons already given above.

With a compressor such as described with reference to Figs. 1 and 2, it may be appreciated that correct functioning of the invention is dependent upon the compressor always being mounted at an attitude for which it is designed having regard to the invention. In order to provide for positioning at a range of different but pre-determined attitudes the crankcase may be provided with a plurality of passages such as 18 all but the lowest of which for the selected compressor attitude, being plugged-off as required.

It will be appreciated that the present invention relies upon the production of an acceptable crankcase pressure to drive out surplus oil. In the case of a single cylinder compressor this is effected by closing a valve during an induction stroke but in the case of multiple cylinders with a common crankcase volume it may be necessary to arrange the relative cyclic positions of the pistons such that there is an interval of net reducing crankcase volume and to arrange for the valve device to close during that particular interval. This will inevitably still occur during an induction stroke of at least one such cylinder.

CLAIMS

1. A gas compressor comprising a crankcase and cylinder assembly (1) having a rotatable crankshaft (6) with a crankpin connected to a piston (5) for reciprocating the piston in the cylinder for alternatively effecting induction and compression strokes said crankshaft (6) rotating in bearings (9, 10) which are supplied with lubrication under pressure from a source of lubricant and characterised by said crankcase being provided with a valve (19, 21) which closes during induction strokes to create pressure elevations in the crankcase to scavenge surplus lubricant therefrom via a lubricant outlet passage (18).

2. A gas compressor as claimed in claim 1, said valve comprising a check valve (23) arranged to permit air flow outwardly of the crankcase but not inwardly of the crankcase.

3. A gas compressor as claimed in claim 2 said check valve being provided with a bypass passsge to limit pressure elevations in the crankcase.

4, A gas compressor as claimed in claim 1, said valve being formed by a part (21) of the crankshaft of the compressor obscuring a breather passage (19) during induction strokes.

5 A gas compressor as claimed in claim 4 said part (21) comprising a crankweb counterweight portion of the crankshaft (6).

6. A gas compressor substantially as described herein with reference to Figs. 1 and 2 of the accompanying drawings.

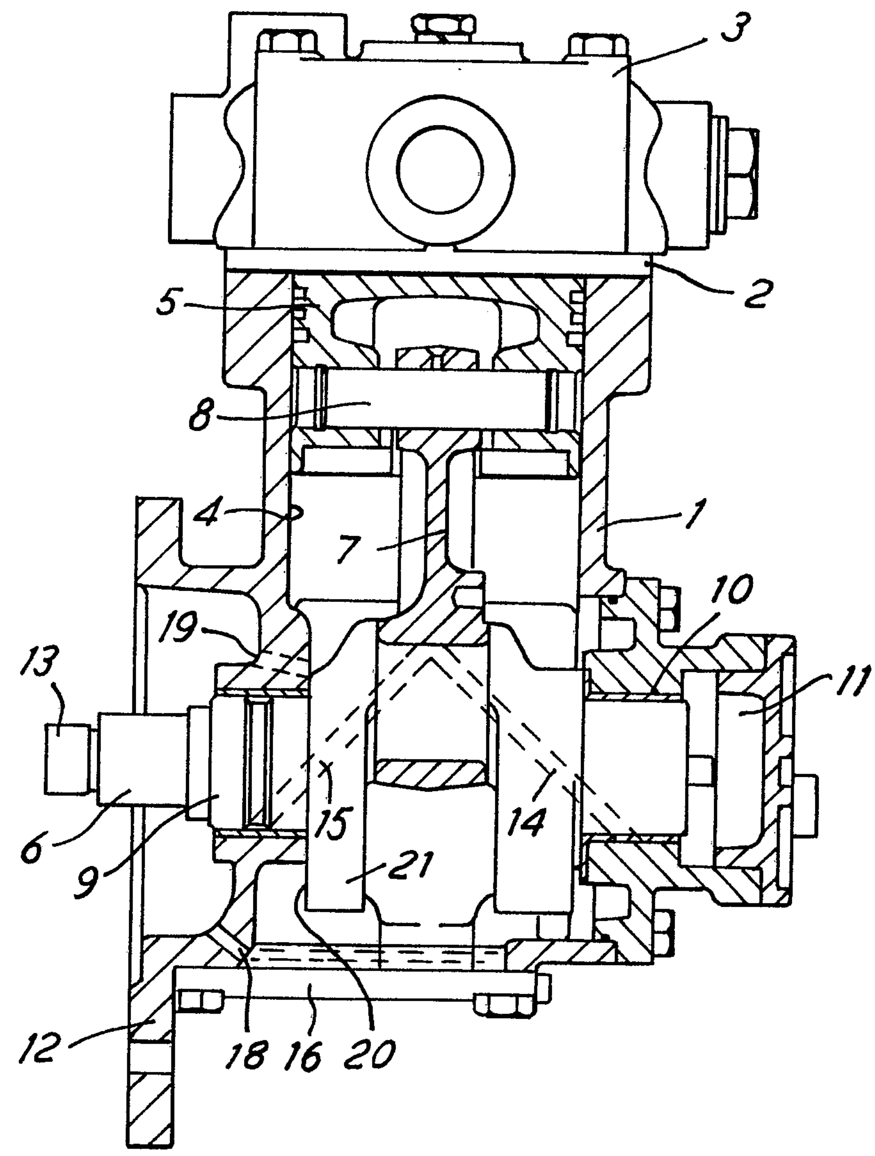

FIG. 1

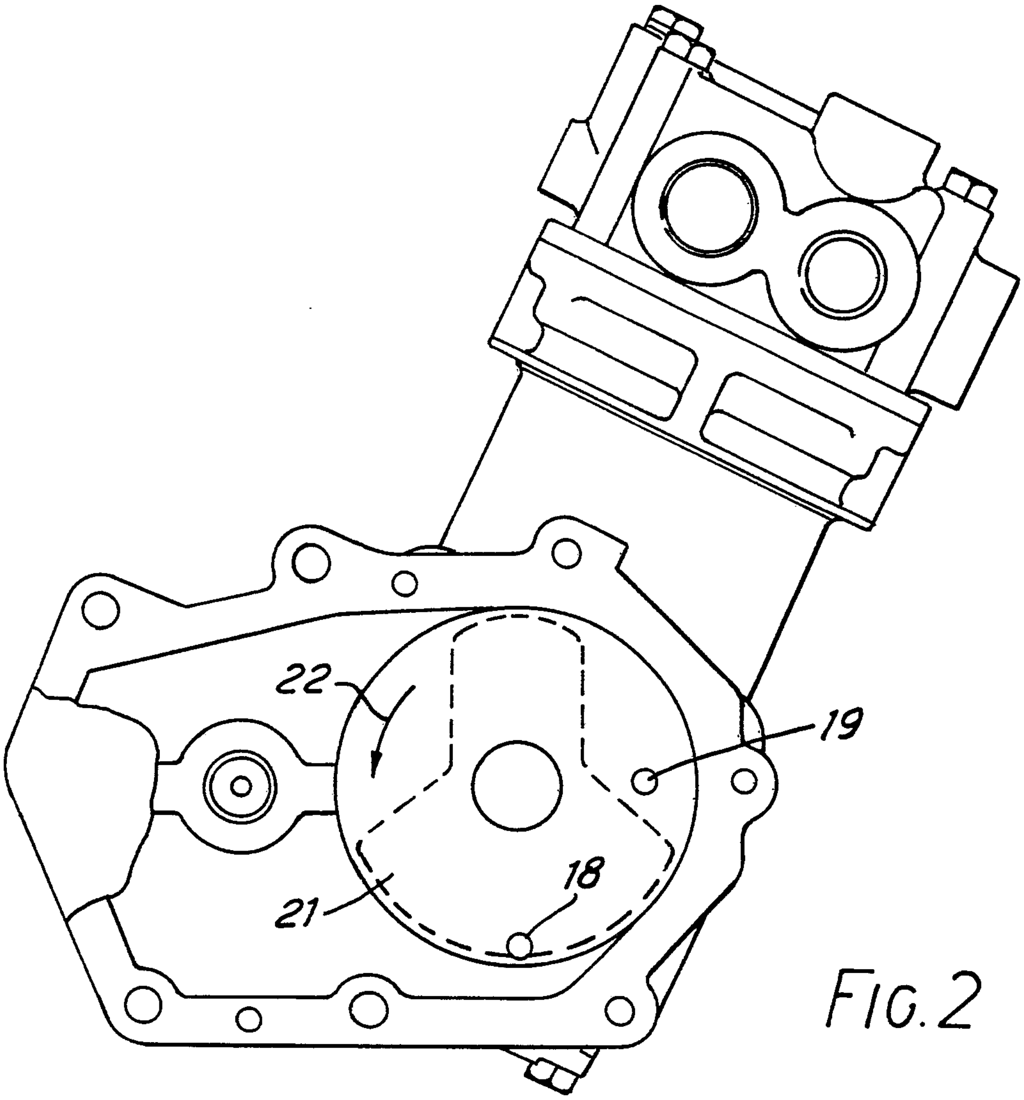

FIG. 2

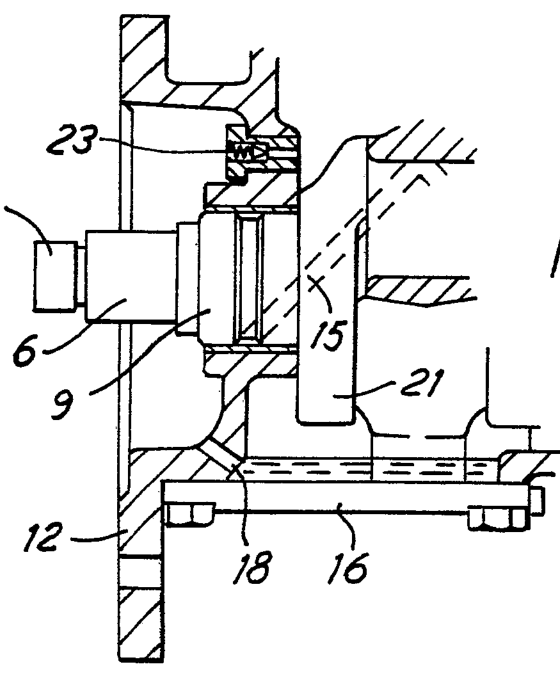

FIG. 3