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(54) Internal combustion engine oil sump with an integrated oil intake pipe

(57) An oil sump for an internal combustion engine, having at least a monolithic concave member defining a vessel for containing lubricating oil and defined at the top by a peripheral edge securable to a block of the engine; and an oil intake pipe integral in one piece with the sump; wherein the oil intake pipe projects inside the vessel by opposite ends, a first located at a bottom wall of

the concave member, and a second substantially flush with the peripheral edge; the oil intake pipe being formed as a separate member from the concave member, and being fixed integrally to the concave member by the first end, at a given distance from the bottom wall, and by an intermediate portion; and the second end of the oil intake pipe having a fast-fit fitting projecting beyond the peripheral edge.

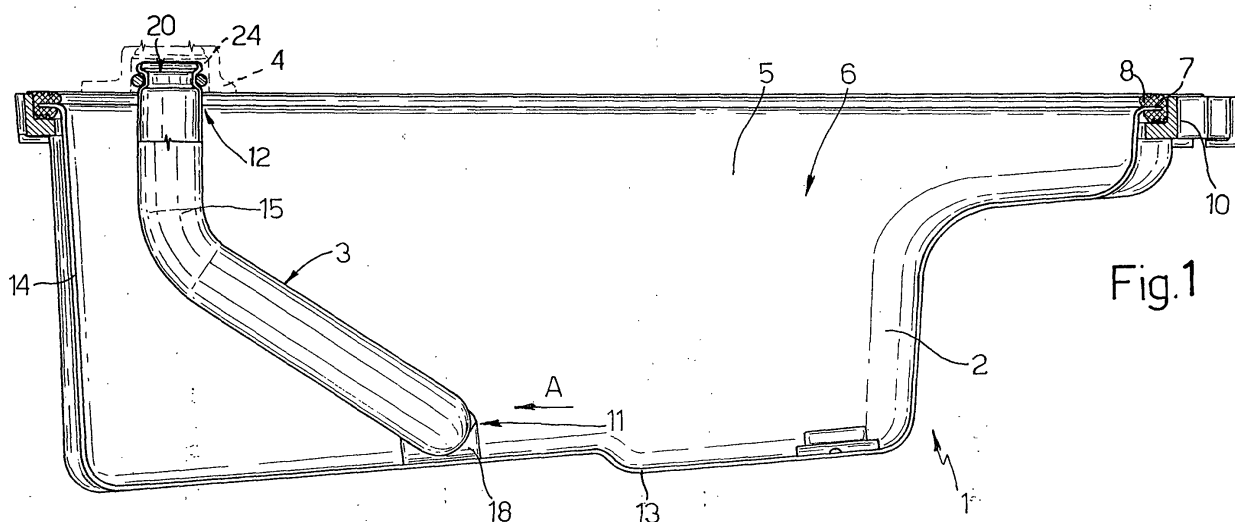
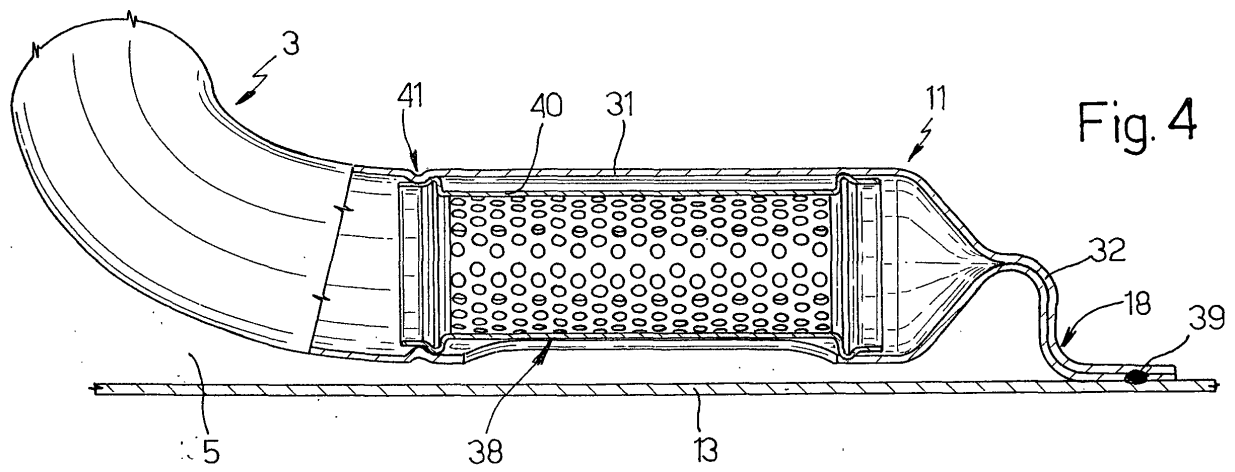


Fig.1

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Description

[0001] The present invention relates to an internal combustion engine oil sump with an oil intake pipe integral in one piece with the oil sump, and may be used to advantage in automotive, particularly industrial vehicle, internal combustion engines.

[0002] As is known, to operate, internal combustion engines require a continuous flow of lubricating oil, which, at rest, is contained in a concave member, normally made of drawn sheet metal, i.e. the oil sump, located beneath and closing the engine block. Oil is drawn from the sump and circulated in the engine lubricating circuit by a pump, which draws the oil directly from the sump by an oil intake pipe or so-called suction rose.

[0003] In currently marketed vehicle engines, the suction rose is separate from both the oil sump and the engine block, and is fixed rigidly to and projects from the bottom of the engine block into the sump at the desired oil intake point.

[0004] Such a solution has the drawback of seriously hindering maintenance of the vehicle. That is, owing to the small amount of space available in most vehicle engine compartments, the sump cannot be removed from the engine block without inevitably interfering with the suction rose, and must therefore be removed in a fairly complex two-stage operation comprising partly removing the oil sump to reach the suction rose-engine block connection with special wrenches, removing the suction rose so that it drops into the oil sump, and then removing the oil sump maneuvering as best as possible in the space provided by removal of the suction rose. The same also applies in reverse for reassembly, thus increasing maintenance cost. Moreover, given the fairly wide machining tolerances of sheet metal parts, a fairly wide clearance must be allowed between the bottom of the oil sump and the suction rose inlet (normally fitted with a grille to filter any course impurities in the oil), so that the minimum oil level in the sump must be relatively high to ensure lubrication of the engine. In fact, if the oil level falls below the suction rose inlet, oil cannot be drawn by the pump.

[0005] To eliminate the above drawbacks, US-A-5601060 and DE-A-4016968 propose forming the suction rose as an integral part of the oil sump wall. Such a solution, however, on the one hand, increases the construction cost of the sump, and, on the other, cannot be applied as such to engines featuring a "floating" oil sump, i.e. secured to the engine block by a peripheral seal allowing small relative movements.

[0006] It is an object of the present invention to eliminate all the above drawbacks by providing an oil sump with an integrated suction rose, which is cheap and easy to produce, is easy to assemble and disassemble, is also adaptable to engines with floating sumps, and allows a minimum oil draw level, in use, as close as possible to the bottom wall of the oil sump.

[0007] According to the present invention, there is

provided an oil sump for an internal combustion engine, in particular for vehicles, comprising at least a cup-shaped, monolithic, concave member defining a vessel for containing lubricating oil and defined at the top by a peripheral edge securable to a block of the engine; and an oil intake pipe integral in one piece with the sump and having the characteristics claimed in Claim 1.

[0008] More specifically, the oil intake pipe is formed separately from and fixed integrally in one piece to the concave member so as to project inside the vessel by a bottom end and an intermediate portion, which are connected respectively to a bottom wall and a lateral wall of the concave member, preferably by means of flexible brackets; and the top end of the oil intake pipe has a fast-fit fitting projecting from the peripheral edge of the concave member for direct connection to a mating fitting in the engine block.

[0009] An oil sump with an integrated suction rose can thus be obtained, which is easy to assemble and disassemble in one operation, even in confined engine compartments, without increasing the production cost of the oil sump as compared with conventional types. Moreover, the oil sump with an integrated suction rose according to the invention can be produced using existing machinery and methods normally used to produce the two component parts (sump and pipe) separately, and is so structured as to also provide a solution to both floating-sump assembly and oil draw problems. The oil pipe inlet, in fact, can be formed as close as possible to the bottom wall of the sump, thus enabling the manufacture of engines with an extremely low minimum oil level.

[0010] Finally, the structure according to the invention enables the oil sump and/or suction rose to be produced using other than sheet metal stamping technology, e.g. using non-weldable materials, and, whichever the case, enables automatic assembly of the sump and suction rose at the engine production stage.

[0011] A non-limiting embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a sectioned elevation of an oil sump and integrated suction rose in accordance with the invention;

Figure 2 shows a top plan view, with part removed for simplicity, of the oil sump and integrated suction rose in Figure 1;

Figures 3, 6 and 7 show larger-scale sections of respective details in Figure 1;

Figures 4 and 5 show a larger-scale, partly sectioned elevation, and a larger-scale bottom plan view of the same detail in Figure 1 in the direction of arrow A.

[0012] Number 1 in the accompanying drawings indicates as a whole an integrated unit defined by an oil sump 2 and a suction rose 3. Here and hereinafter, the term "suction rose" is intended to mean an oil intake pipe

for drawing oil from sump 2 to a block 4 - shown only partly by the dash line - of a known internal combustion engine not shown for the sake of simplicity. In the example shown, oil sump 2 is defined by a single concave member 5 made of drawn sheet metal, defining internally a vessel 6 for containing lubricating oil, and defined at the top by a peripheral edge 7 securable in known manner to block 4 and provided (Figure 7) for this purpose with a "floating" seal 8, and a frame 10 for attachment to block 4 and inside which peripheral edge 7 rests with the interposition of seal 8.

[0013] According to the invention, oil intake pipe or suction rose 3 is formed separately from concave member 5, e.g. from bent, welded sheet metal, and projects inside vessel 6 by opposite ends, a first (11) located at a bottom wall 13 (Figures 2, 4) of concave member 5, and a second (12) substantially flush with peripheral edge 7, well within the closed geometric perimeter defined by peripheral edge 7, and therefore well away from a peripheral lateral wall 14 of concave member 5 (Figures 2, 3, 7).

[0014] According to the invention, suction rose 3 is integral in one piece with oil sump 2 to form unit 1, by being fixed integrally to concave member 5 - in the example shown, by end 11, at a given distance from bottom wall 13, and to lateral wall 14 by an intermediate portion 15 of suction rose 3 - by means of at least partly flexible fastening means 18, 19 (Figure 2) defined by a first sheet metal bracket 18 made flexible by at least one S- or Z-shaped bend and securing end 11 to bottom wall 13, and by a second sheet metal bracket 19 made flexible by at least one S-shaped bend and connecting intermediate portion 15 of suction rose 3 to the nearest portion of lateral wall 14, at a given distance from peripheral edge 7, so that end 12 of suction rose 3 projects outwards of vessel 6 towards peripheral edge 7.

[0015] According to a further characteristic of the invention, end 12 has a fast-fit fitting 20, which projects beyond peripheral edge 7 and is defined by a straight cylindrical pipe portion 21 (Figure 7) having at least one rolled outer annular groove 22 housing a known sealing ring 23. Fitting 20 is sized to simply slide, in use, inside a mating fitting 24 on block 4 (Figure 1) when fitting sump 2 to block 4, and is also compatible with "floating" assembly of sump 2 by means of seal 8 and frame 10, by allowing small relative movements of end 12 and block 4, but without impairing fluidtight connection of fittings 20 and 24, which is ensured by ring 23.

[0016] In the preferred embodiment of the invention, end 11 is defined by an elbow having a straight tubular portion 31 (Figures 2, 4, 5) parallel to bottom wall 13, and bracket 18 is defined by an end portion 32 of end 11, which is flattened and bent (into a Z or inverted S shape) to form bracket 18, which is secured to bottom wall 13, on the opposite side to portion 15, by a weld 39 (Figure 4) or, in an alternative embodiment, by a fast-fit "tucker" type fastener 34 (Figure 6), the male and female elements 34a, 34b of which are connected integrally (e.

g. welded) to bottom wall 13 and bracket 18, at a through hole 35 formed through bracket 18.

[0017] Suction rose 3 (Figures 4, 5) comprises an inlet 38 defined by an oval window facing bottom wall 13 and formed through straight tubular portion 31 of the elbow defining end 11; and a filtering element defined by a sleeve 40, which is made of perforated (e.g. bent and welded) sheet metal, is inserted inside straight tubular portion 31 so as to face inlet 38, and is longer than inlet 38 where it is locked axially by at least one annular crimp 41 formed on straight tubular portion 31, on the opposite side to end portion 32 flattened and bent to define bracket 18, so that sleeve 40 is gripped between flattened portion 32 and crimp 41.

[0018] A maximum oil flow section, substantially equal to the inner flow section of suction rose 3, is thus ensured with a maximum of compactness and a minimum distance between inlet 38 and bottom wall 13.

Claims

1. An oil sump for an internal combustion engine, in particular for vehicles, comprising at least a cup-shaped, monolithic, concave member defining a vessel for containing lubricating oil and defined at the top by a peripheral edge securable to a block of the engine; and an oil intake pipe integral in one piece with the sump; **characterized in that** said oil intake pipe projects inside said vessel by opposite ends, a first located at a bottom wall of said concave member, and a second substantially flush with said peripheral edge of the concave member and within the geometric perimeter defined by said peripheral edge; said oil intake pipe being formed as a separate member from said concave member, and being fixed integrally to the concave member by said first end, at a given distance from said bottom wall, and by an intermediate portion; said second end of said oil intake pipe having a fast-fit fitting projecting beyond said peripheral edge.
2. An oil sump as claimed in Claim 1, **characterized in that** said oil intake pipe is fixed integrally to said concave member by at least partly flexible fastening means.
3. An oil sump as claimed in Claim 2, **characterized in that** said fastening means comprise a first bracket made flexible by at least one S- or Z-shaped bend and securing said first end of the oil intake pipe to said bottom wall of said concave member; and a second bracket made flexible by at least one S-shaped bend and connecting said intermediate portion of the oil intake pipe to a lateral wall of said concave member, at a predetermined distance from said peripheral edge, so that said second end of the oil intake pipe projects outwards of said vessel to-

wards said peripheral edge.

4. An oil sump as claimed in Claim 3, **characterized in that** said first end of the oil intake pipe is defined by an elbow having a straight tubular portion parallel to said bottom wall of said concave member. 5

5. An oil sump as claimed in Claim 4, **characterized in that** said concave member and said oil intake pipe are made of drawn, bent, welded sheet metal; said first bracket being defined by an end portion of said first end of the oil intake pipe, which is flattened and bent to define the first bracket. 10

6. An oil sump as claimed in Claim 5, **characterized in that** said oil intake pipe has an inlet defined by a window facing said bottom wall of said concave member and formed through said straight tubular portion of the elbow defining said first end; and **in that** said inlet has a filtering element defined by a sleeve of perforated sheet metal inserted inside said straight tubular portion of said elbow, positioned facing said inlet, and locked axially at said inlet by at least one annular crimp formed on said straight tubular portion of the elbow. 15
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7. An oil sump as claimed in any one of Claims 3 to 6, **characterized in that** at least said first bracket is secured integrally to said bottom wall of the concave member by a "tucker" type fastener. 30

8. An oil sump as claimed in any one of the foregoing Claims, **characterized in that** said fast-fit fitting of said second end of the oil intake pipe is defined by a straight, cylindrical pipe portion, which has at least one outer annular groove housing a sealing ring, and simply slides inside a corresponding fitting in the engine block. 35

9. An oil sump as claimed in any one of the foregoing Claims, **characterized in that** said peripheral edge of the concave member has a floating-type seal, and a frame for attachment to the block and inside which said peripheral edge rests with the interposition of said seal. 40
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10. An internal combustion engine, **characterized by** comprising an oil sump as claimed in any one of the foregoing Claims; and a block fitted at the bottom with a fast-fit fitting mating with that of said oil intake pipe of the sump, and into which the fast-fit fitting of said oil intake pipe is simply inserted when fixing the sump to the block. 50

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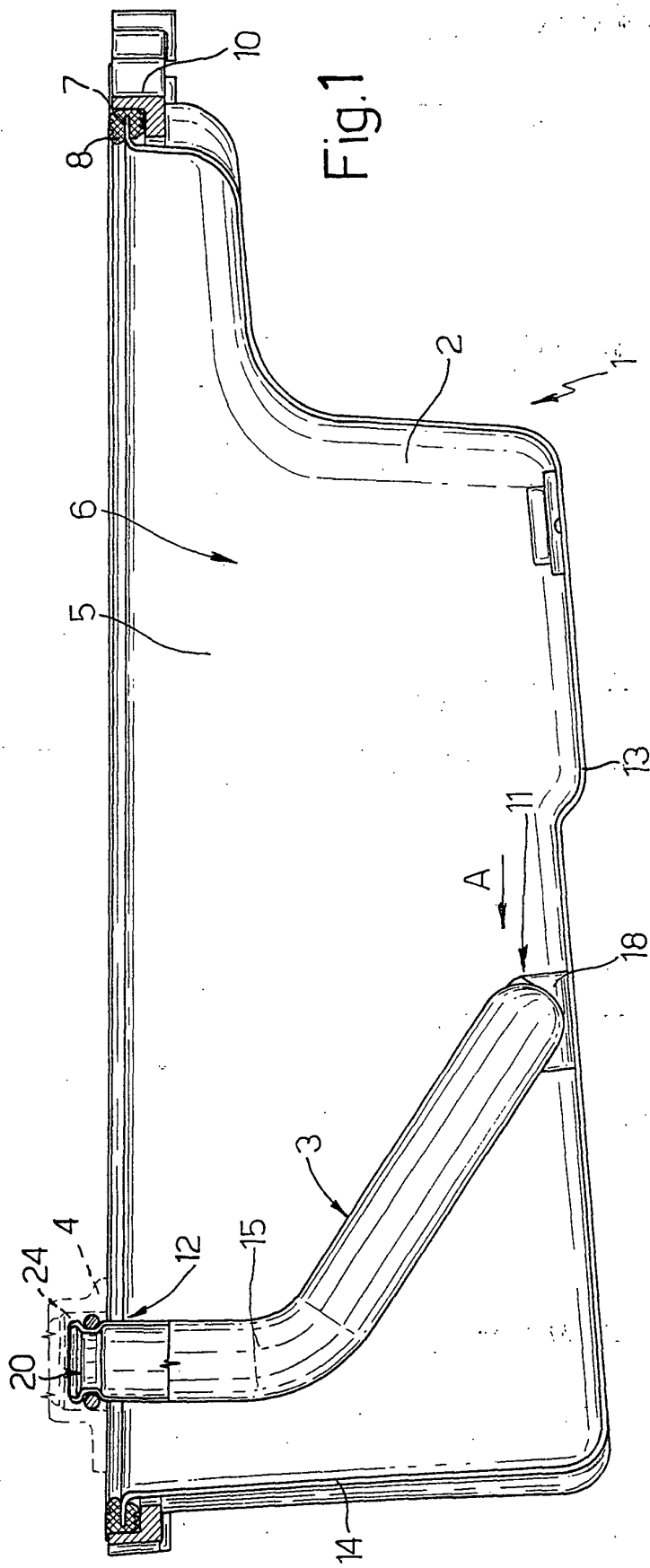


Fig.1

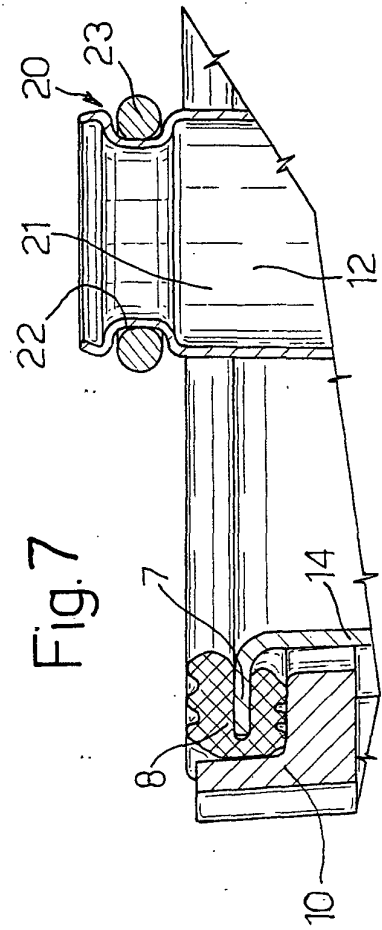


Fig.7

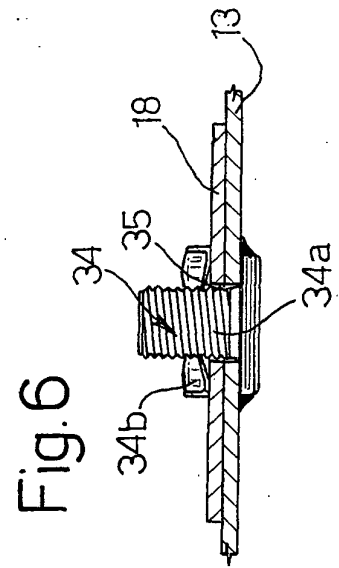


Fig.6

