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OIL PAN AND DRAIN PLUG ASSEMBLY

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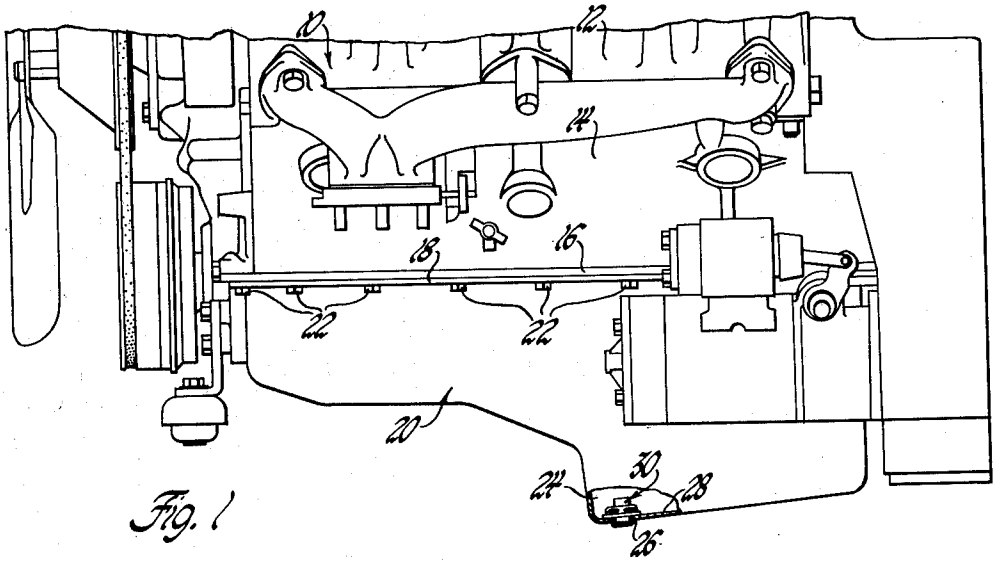



Fig. 1

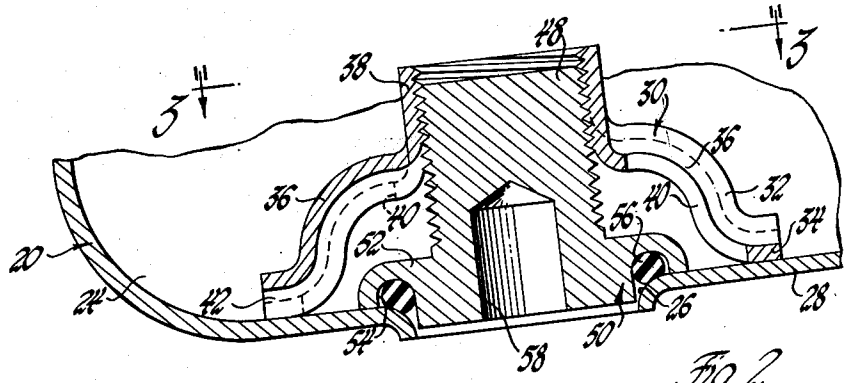



Fig. 2

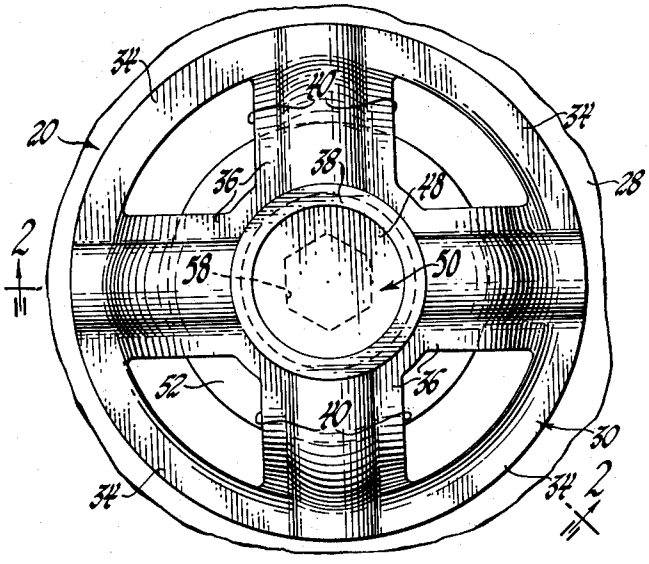



Fig. 3

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# OIL PAN AND DRAIN PLUG ASSEMBLY

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This invention relates to an internal combustion engine and more particularly to an oil pan and drain plug assembly for an engine adapted for use in a motor vehicle.

The oil pan of an automative type internal combustion engine is generally of a relatively thin wall construction depending from the crankcase defining side walls of the engine block. The sump of such a thin wall oil pan usually has a drain opening defined by a threaded protrusion adapted to receive a suitable pipe-threaded drain plug. Such a protrusion necessarily decreases the engine and vehicle road clearance or requires a corresponding increase in the mounting height of the engine relative to the vehicle frame and road level. Such drain plug protrusions are vulnerable to terrain obstacles which may tear or fracture the oil pan or otherwise result in failures of the oil pan and drain plug seals. Such conventional drain plug arrangements are also susceptible to improper tightening with resultant oil loss due to thread leakage and loosening and loss of the drain plug.

The instant invention contemplates an improved oil pan and drain plug arrangement which eliminates the normal oil pan drain plug protrusion, provides adequate sealing with minimal plug tightening effort, and prevents loosening and loss of the plug under engine operating conditions.

The foregoing and other objects, advantages and features of the invention will be apparent from the following description of a preferred illustrative embodiment thereof having reference to the accompanying drawing, in which:

FIGURE 1 is a side elevational view of the lower crankcase portion of an internal combustion engine with a portion of the oil pan broken away and in section to show the illustrative environment of the invention;

FIGURE 2 is an enlarged sectional view corresponding to the broken away portion of FIGURE 1 and is taken substantially in the direction of the arrows and in the plane of the line indicated at 2—2 of FIGURE 3; and

FIGURE 3 is a fragmentary elevational view taken substantially in the direction of the arrows 3—3 of FIGURE 2.

Referring more particularly to FIGURE 1, the crankcase defining portion of an internal combustion engine for a motor vehicle is partially shown and indicated generally by the reference numeral **10**. The engine includes a cylinder block **12** having side and end walls **14** defining the upper portion of the crankcase chamber and terminating in a peripheral flanged pan rail **16**. The pan rail **16** sealingly engages the mounting flange **18** of an oil pan **20** which is sealingly secured to the pan rail flange by a plurality of bolts **22**. The oil pan is of a drawn or cast thin walled construction and defines the lower portion of the crankcase chamber. An oil sump **24** is formed adjacent one end of the oil pan and has a drain port **26** opening through the bottom wall **28** thereof.

As best seen in FIGURE 2, the port **26** is flared downwardly on a slight radius and is sealable by a drain plug assembly **30**. This drain plug assembly is constructed in accordance with the invention and suitably supported by the sump defining bottom wall **28**. The drain plug assembly **30** includes a perforated support member **32** of stamped configuration having arcuate peripheral flange segments **34**. These flange segments are suitably secured to the bottom wall **28** of the sump in concentric relation to the drain port **26**. The several flange segments are intersected and separated by curved legs **36** of channeled cross-section which extend radially inwardly and upwardly to an internally threaded cylindrical support portion **38**. This cylindrical support portion is spaced concentrically of the drain port **26**. The several legs cooperate with the peripheral flange portions **34** and the bottom sump wall **28** to define a plurality of open drain ports **40** and **42**, respectively.



The upper cylindrical portion **38** of the perforated support member threadably mounts the upper shank portion **48** of a valve or drain plug member **50**. The lower end of the plug **50** is provided with a port closing head or flange **52** having an annular undercut groove **54** opening toward the port **26**. This groove mounts and retains a replaceable resilient O-ring seal **56** of suitable oil resistant material, such as neoprene. This seal is sealingly engageable with the tapered curved seat provided by the drain opening **26**. The lower flanged end of the drain plug is provided with a wrench socket **58** centrally inwardly of its O-ring mounting groove. Thus the drain plug may be opened and sealingly closed by threadable rotation relative to the support member **32** by use of a suitable wrench.

In addition to its sealing function, the O-ring **36** coacts with the hydraulic pressure applied to resiliently lock the plug **50** against rotation in a port opening direction under engine operating conditions. As indicated above, the instant drain plug assembly has further advantage in that the plug **50** cannot be removed and misplaced or lost due to improper tightening.

While the foregoing description has been limited to one illustrative embodiment of the invention, it will be readily apparent that various modifications might be made therefrom without departing from the spirit and scope of the invention as defined in the following claims.

I claim:

1. In combination with a thin wall engine oil pan defining an oil sump chamber and having a drain aperture in the bottom wall thereof, a drain closure assembly comprising a support member mounted within said oil sump chamber, and having a peripheral flange portion defining a plurality of arcuately spaced flange segments secured to said bottom wall in radially spaced concentric relation to the drain aperture, a plurality of port defining legs bent upwardly and radially inwardly from said peripheral flange portion and supporting an internally threaded cylindrical portion in coaxial spaced relation to the drain aperture, said legs cooperating with said cylindrical and peripheral flange portions to define a plurality of primary oil drain ports and said legs being upwardly and transversely bowed and cooperating with said bottom wall between said flange segments to define a plurality of secondary oil drain ports, and a drain plug member having a shank portion threadably mounted within said cylindrical support portion and a head portion having an annuler groove therein opening toward said bottom wall adjacent said aperture, a resilient seal mounted within said groove and sealingly and frictionally engageable with the bottom wall adjacent said aperture to restrain opening rotation of said drain plug member, and said head portion further sealingly engaging said bottom wall outwardly of said groove and aperture and limiting resilient deflection of said resilient seal.

2. In the combination set forth in claim 1, the head portion of said drain plug having outwardly accessible means adapted to receive a wrench element for threadably opening and closing rotation of said plug relative to said drain aperture.

3. In combination with a thin wall receptacle having a drain aperture in the bottom wall thereof, a drain closure comprising a support member mounted within said re-

ceptacle and having a peripheral flange portion defining a plurality of arcuate flange segments secured to said bottom wall in radially spaced concentric relation to the drain aperture, and a plurality of port defining legs extending upwardly and radially inwardly from said peripheral flange portion and supporting an internally threaded cylindrical portion in coaxial spaced relation to the drain aperture, said legs and said cylindrical and flange portions cooperating to define primary oil drain ports therebetween and said legs being transversely bowed upwardly and cooperating with said bottom wall between said flange segments to define a plurality of secondary oil drain ports, and a drain plug member having a shank portion threadably mounted within said cylindrical support portion and a head portion sealingly and frictionally engageable with said bottom wall adjacent said aperture to restrain opening rotation of said drain plug member.

4. In the combination set forth in claim 3, the head portion of said drain plug having an annular groove therein opening toward the bottom wall of said drain plug adjacent said aperture and a resilient seal mounted within said groove and sealingly and frictionally engageable with the bottom wall adjacent said aperture to further restrain opening rotation of said drain plug member, the sealing engagement of said head portion with said bottom wall outwardly of said groove and aperture limiting the resilient deflection imposed on said seal.



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