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(71) Applicant *(for all designated States except US)*: **ILLINOIS TOOL WORKS INC.** [US/US]; 3600 West Lake Avenue, Glenview, IL 60026 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **COLLINS, Martin, W.** [US/US]; 3600 West Lake Avenue, Glenview, IL 60026 (US).

(74) Agent: **HAUPTMAN, Benjamin, J.**; Lowe Hauptman & Berner, LLP, 1700 Diagonal Rd., Suite 300, Alexandria, VA 22314 (US).

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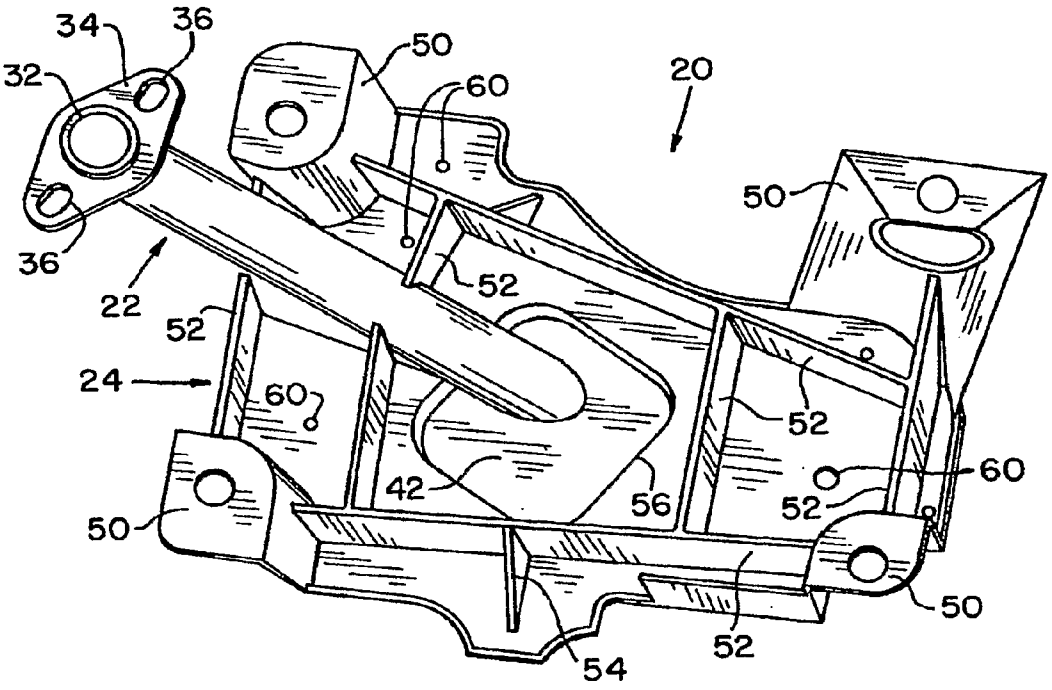
(54) **Title:** OIL PICKUP ASSEMBLY



(57) **Abstract:** An oil pickup assembly for a lubricating system of an automobile includes a plastic oil pickup pipe and a plastic oil pan baffle plate integrally formed with each other.

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OIL PICKUP ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[01] The present regular United States Patent Application claims the benefits of United States Provisional Application Serial No. 60/788,635, filed on April 3, 2006.

FIELD OF THE INVENTION

[02] The present invention relates generally to internal combustion engine lubrication systems and, more particularly, the invention relates to oil pickup pipe assemblies found in automobile lubrication systems.

BACKGROUND OF THE INVENTION

[03] In known vehicle lubrication systems an oil reservoir, often referred to as an oil pan, is located on the underside of the vehicle and contains a volume of lubricating oil that is circulated through the engine for lubrication. An oil pickup assembly includes a tube extending into the oil pan and secured at one end to an engine block or pump device and at the other end is disposed within the volume of oil in the oil pan. The oil pump causes oil from the oil pan to flow to various engine components for lubrication. A metal baffle plate is positioned around the end of the pipe placed near the bottom of the oil pan. The baffle plate inhibits splashing or splattering of the oil in the oil pan to ensure that a sufficient volume of oil remains in the bottom of the oil pan to keep the pickup end of the pickup pipe submerged under the oil surface, to ensure a proper flow of oil to the various engine components. Typically, the baffle plate is secured in place to the oil pan with a multitude of metal fasteners, sometimes as many as ten or more such fasteners. The oil pipe extends from its connection to the engine or oil pump at the top of the oil

pan through an opening in the baffle plate and includes an inlet end submerged beneath the surface of the oil.

[04] As is generally known in the assembly of automobiles, it is desirable to reduce weight of the various components to increase fuel economy. In the lubrication system structure described above, the metal pipe, metal baffle plate and metal fasteners of known assemblies add undesirable weight to the automobile.

[05] Further, during assembly of automobiles, it is desirable to provide efficient assembly procedures to reduce manufacturing costs. Another disadvantage of known assemblies pertains to the fastening of the metal baffle plate to the oil pan. Threading of a multitude of fasteners adds undesirable assembly time to the overall automobile assembly.

[06] Known pickup pipes of metal can be complex to manufacture. Cutting and brazing or welding is time consuming and expensive. Metal pipes have been bent as necessary to extend from the engine connection location, into the oil pan, through the baffle and to an appropriate low point in the oil pan at which the inlet end of the pipe is submerged in the oil. Bending pipes along a somewhat complex path can result in flow variation from one pipe to the next pipe seemingly bent in the same pattern. Thus, flow performance can vary from one assembly to the next. Steel pipes also experience "bend reduction" during the forming process, further inhibiting flow performance.

[07] Accordingly, it is desirable to reduce the weight of oil pickup assemblies and to simplify the assembly thereof, while providing consistent performance from one assembly to the next assembly.

SUMMARY OF THE INVENTION

[08] The present invention addresses the problems identified above and other disadvantages of known systems by providing a plastic pickup pipe that is integral with a plastic baffle plate.

[09] In one aspect thereof, the present invention provides an oil pickup assembly for an engine lubricating system with a pickup pipe having an inlet end, an outlet end and a length between the inlet end and the outlet end; and a baffle plate integrally formed with the pickup pipe and connected thereto along the pipe length.

[10] In another aspect thereof, the present invention provides an integral oil pickup assembly with a plastic baffle plate; and a plastic oil pickup pipe integrally formed with the baffle plate.

[11] In a still further aspect thereof, the present invention provides an oil lubrication system with a plastic pickup pipe having an inlet end and an outlet end, a screen assembly on the inlet end, and a plastic baffle plate integrally connected to a length of the pipe between the inlet and outlet ends of the pipe.

[12] An advantage of the present invention is providing an oil pickup assembly in a vehicle lubrication system that is lighter in weight than known assemblies.

[13] Another advantage of the present invention is providing an oil pickup assembly that has fewer individual parts requiring installation to complete the assembly.

[14] Still another advantage of the present invention is providing an oil pickup assembly that can be assembled quickly and easily compared to known assemblies.

[15] A further advantage of the present invention, in one form thereof, is providing a molded screen cap that is adapted for a snap fit connection to an oil pickup pipe, without the need for welding, brazing, coining or the like.

[16] Yet another advantage of the present invention is providing an oil pickup assembly having a relatively straight pickup pipe compared to known designs, and a more consistent flow of oil from one pickup pipe to another of the same type and configuration.

[17] Other features and advantages of the invention will become apparent to those skilled in the art upon review of the following detailed description, claims and drawings in which like numerals are used to designate like features.

BRIEF DESCRIPTION OF THE DRAWINGS

[18] Fig. 1 is a perspective view of an oil pickup assembly in accordance with the present invention;

[19] Fig. 2 is a perspective view of the oil pickup assembly shown in Fig. 1, the view being shown from an angle different than that of Fig. 1;

[20] Fig. 3 is a plan view from the top of the oil pickup assembly;

[21] Fig. 4 is a perspective view of the bottom of the oil pickup assembly shown in the previous drawings;

[22] Fig. 5 is a plan view of the bottom of the oil pickup assembly;

[23] Fig. 6 is an elevational view from the side of the oil pickup assembly;

[24] Fig. 7 is a cross-sectional view through the oil pickup assembly;

[25] Fig. 8 is a perspective view of the oil pickup pipe of the assembly;

[26] Fig. 9 is a perspective view of one form of screen assembly for the oil pickup assembly;

[27] Fig. 10 is a perspective view of a second embodiment of a screen assembly for the oil pickup assembly;

[28] Fig. 11 is a fragmentary cross-sectional view of a portion of an assembled screen assembly in accordance with the present invention;

[29] Fig. 12 is a perspective view of a portion of the screen shown in Fig. 10; and

[30] Fig 13 is a perspective view of a further embodiment of the present invention.

[31] Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use herein of "including", "comprising" and variations thereof is meant to encompass the items listed thereafter and equivalents thereof, as well as additional items and equivalents thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[32] Referring now more specifically to the drawings and to Fig. 1 in particular, an automobile lubrication system oil pickup assembly 20 in accordance with the present invention is shown. Oil pickup assembly 20 includes an oil pipe 22 and a

baffle plate 24 integrally formed therewith. A detachable screen assembly 26 (Fig. 4) is connected to oil pipe 22.

[33] Oil pipe 22 and baffle plate 24 are cast from plastic material as a single, integral, monolithic unit. Oil pipe 22 and baffle plate 24 can be made from the same material or can be molded from different materials, as required, in an overmolding process. Nylon, such as Polyamide 66 from DuPont Engineering Polymers with between about 30% to 35% $\pm$ 2% glass fibers is believed to be a suitable material for both oil pipe 22 and baffle plate 24. Other glass filled resins also are believed to be suitable, such as, for example and not by way of limitation, Polyamide 6 with about 15% glass fibers. HTN nylons also may provide advantageous characteristics of heat resistance and strength.

[34] Oil pipe 22 has an inlet end 30 configured for engaging screen assembly 26 and an outlet end 32 having a mounting flange 34 for attachment to an oil pump (not shown) or other engine component as required. Flange 34 includes bolt holes 36 for purposes of attaching flange 34 to the oil pump (not shown) or other engine component with bolts (not shown) extending therethrough. Oil pipe 22 defines a substantial length 38 between inlet end 30 and outlet end 32 and, in the exemplary embodiment, defines an elbow 40 from length 38 to outlet end 32. Length 38 can be substantially straight as compared to the more complex configurations commonly found with known structures including oil pipes and baffles discrete from one another. In the past, it was known to design an oil pan and baffle independently, and to thereafter "fit" an oil pipe to the existing structure. As a result, the shape of the oil pipe was often complex, having numerous bends and turns. By molding oil pipe 22 together with baffle plate 24 as an integral unit, each can be designed to accommodate the other efficiently. Accordingly, the structure of the present invention provides an efficient flow path for oil, and performs consistently from one

unit to the next, since the interior shape is defined by the precision of a mold in which the pipe is cast. Since the relationship between the pipe and baffle plate 24 is defined in the mold, a suitable relationship can be selected to facilitate flow of oil through oil pipe 22, which can lead to a relatively straight configuration of oil pipe 22, together with a precisely formed elbow 40. Engine design requirements for oil pipe approach angles can be accommodated by adjusting elbow locations in the oil pickup assembly. Injection molding can maintain a consistent pipe profile and bore diameter shot to shot after final design. The pipe can be formed with no bend reduction as occurs in typical bending or thermo forming techniques used for metal pipes. Accordingly, fluid flow through oil pipe 22 can be optimized and will be consistent from one pipe 22 to another pipe 22.

[35] Inlet end 30 defines an enlargement 42 for receiving and engaging screen assembly 26. Enlargement 42 provides adequate surface area so that when assembled with a screen there is sufficient open area within the mesh of the screen to accommodate required oil flow therethrough. The features thereof will be described more fully hereinafter along with a more detailed description of screen assembly 26.

[36] Baffle plate 24 is configured as necessary to fit in the interior volume of a specific oil pan configuration in which it is to be used. Accordingly, the outer shape of baffle plate 24 can vary from one installation of the present invention to an installation for a different engine and oil pan. Baffle plate 24 includes a plurality of mounting features 50 for receiving fasteners such as bolts (not shown) to secure oil pickup assembly 20 in an oil pan or engine block (not shown). The reduced weight of oil pickup assembly 20 of the present invention reduces the need for attachment and stabilization of the assembly relative to an oil pan. The rigid, integral attachment of oil pipe 22 and baffle plate 24 provides rigidity and strength between

them. Strategic ribbing and gussets are designed into the parts and produced during the molding process to provide the desired and required rigidity. With the baffle plate integral with the oil pipe, the rigid connection between flange 34 and the engine or oil pump also helps to rigidify, strengthen and position baffle plate 24. Accordingly, fewer mounting features and correspondingly fewer fasteners are required, thereby reducing weight and facilitating efficient assembly.

[37] Baffle plate 24 includes a stiffening framework including a plurality of elongate, wall-like ribs 52 and gussets 54 to rigidify baffle plate 24. At least some of the ribs 52 can be integrally formed and connected to oil pipe 22 such as along length 38 thereof. Depending on the size and orientation of oil pipe 22 relative to baffle plate 24, more or fewer connection points can be provided between oil pipe 22 and baffle plate 24. For example, reinforcement ribs can be added between pipe 22 and baffle plate 24 around or near a hole 56 in baffle plate 24 through which oil pipe 22 extends. Fig. 13 illustrates four ribs 58 interconnecting ribs 52 and oil pipe 22 to further control the deflection and inertia of screen assembly 26 that extends beneath the baffle plate. Sufficient ribs and connection points between baffle plate 24 and oil pipe 22 are provided to stabilize the assembly to withstand vibration and temperature characteristics commonly associated with oil pans and vehicle engine vibrations.

[38] Oil is allowed to drain through baffle plate 24 via hole 56 and a plurality of apertures 60. The number, size and locations of apertures 60 and/or other openings through baffle plate 24 are selected to provide the desired and necessary drainage through baffle plate 24.

[39] Screen assembly 26 provides an initial barrier to prevent contaminants from entering oil pipe 22. Screen assembly 26 can include a metallic, plastic or other screen element 62 and a separate metal or plastic ring 64. Screen element 62 and

ring 64 can be of known suitable materials including metal or plastic, including plastic similar to that used for pipe 22 and baffle plate 24. Alternatively, as shown in Fig. 10, screen assembly 26 can include a monolithic plastic cap 70, including a screen portion 72 and a ring portion 74.

[40] In the exemplary embodiment shown, screen assembly 26 is snap fit to enlargement 42, such as by using a plurality of deflectable tabs received in openings. It should be understood that the deflectable tabs and openings can be provided in one or the other of enlargement 42 and rings 64 or 74. For example, ring 64 is shown having receiving holes 80, whereas ring portion 74 is shown having deflectable tab 82 to be received in a receiving hole 84 (Fig. 11). Those skilled in the art will readily understand that the arrangement and location of suitable deflectable tabs and receiving holes are provided and aligned for connection of screen assembly 26 to enlargement 42. Again, by way of example and not limitation, Fig. 9 illustrates two such configurations on opposite sides of ring 64, whereas ring portion 74 illustrates a single such configuration on each side thereof. Further, while shown as substantially square, it should be understood that enlargement 42 and screen assembly 26 can be of different shapes, such as round, oblong or oval, or other more complex shape. The attachment of ring 64 or ring portion 74 to enlargement 42, whether of plastic or metal, can also be by welding, brazing, coining, adhesion or other suitable connecting arrangement.

[41] Fig. 10 illustrates yet another feature of the present invention. It has been observed in known assemblies that if a user of an automobile runs over a foreign object, such as a curb or the like, the oil pan can be crushed inwardly. Since clearance between the bottom of the oil pan and screen assembly 26 can be relatively small, inward deflection of the bottom of the oil pan can further limit the space between the oil pan and screen assembly 26, and subsequently reduce oil flow

therebetween. The vacuum generated during use can cause a seal to form between screen assembly 26 and the inwardly deflected oil pan. If this occurs, proper oil flow into oil pipe 20 can be affected adversely in such a way that insufficient oil is circulated to ensure proper lubrication of the engine. As illustrated in the embodiment of Fig. 10, a bottom surface 90 of the screen assembly is of a corrugated or wavy form. Contoured bottom surface 90 promotes oil flow into inlet 30 even if the oil pan is deflected inwardly toward surface 90 by maintaining a minimal space between at least portions of surface 90 and the oil pan.

[42] Variations and modifications of the foregoing are within the scope of the present invention. It is understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text and/or drawings. All of these different combinations constitute various alternative aspects of the present invention. The embodiments described herein explain the best modes known for practicing the invention and will enable others skilled in the art to utilize the invention. The claims are to be construed to include alternative embodiments to the extent permitted by the prior art.

[43] Various features of the invention are set forth in the following claims.

CLAIMS

WHAT IS CLAIMED IS:

1. An oil pickup assembly for an engine lubricating system, comprising:

a pickup pipe having an inlet end, an outlet end and a length between said inlet end and said outlet end; and

a baffle plate integrally formed with said pickup pipe and connected thereto along said pipe length.

2. The oil pickup assembly of claim 1, said pipe and said baffle being plastic.

3. The oil pickup assembly of claim 1, including a screen assembly attached to said inlet end.

4. The oil pickup assembly of claim 3, said screen assembly having a bottom face and said bottom face having a contoured surface.

5. The oil pickup assembly of claim 3, said screen assembly being snap fit on said inlet end.

6. The oil pickup assembly of claim 5, said pipe and said baffle plate being plastic.

7. The oil pickup assembly of claim 5, said screen assembly including a plastic molded screen portion.

8. The oil pickup assembly of claim 7, said pipe and said baffle plate being plastic.

9. An integral oil pickup assembly comprising:

a plastic baffle plate; and

a plastic pickup oil pipe integral with said baffle plate.

10. The integral oil pickup assembly of claim 9, including a screen assembly attached to said oil pipe.

11. The integral oil pickup assembly of claim 10, said screen assembly having a bottom face, and said bottom face having a contoured surface.

12. The integral oil pickup assembly of claim 10, said screen assembly being snap fit on said oil pipe.

13. The integral oil pickup assembly of claim 12, said screen assembly including a plastic cap having a plastic molded screen portion and a ring portion.

14. The integral oil pickup assembly of claim 9, said pipe having first and second ends, and said baffle plate positioned and connected to said pipe along a length between said first and second ends.

15. An oil lubrication system, comprising:

a plastic pickup pipe having an inlet end and an outlet end;

a screen assembly on said inlet end; and

a plastic baffle plate integrally connected to a length of said pipe between said inlet and outlet ends of said pipe.

16. The oil lubrication system of claim 15, said screen assembly including a plastic molded screen.

17. The oil lubrication system of claim 16, said screen assembly being snap fit to said inlet end of said pipe.

18. The oil lubrication system of claim 17, one of said inlet end and said screen assembly defining a deflectable tab and the other of said inlet end and said screen assembly defining an opening for receiving said tab.

19. The oil lubrication system of claim 15, one of said inlet end and said screen assembly defining a deflectable tab and the other of said inlet end and said screen assembly defining a hole for receiving said tab.

20. The oil lubrication system of claim 15, said screen assembly including a screen element held by a ring on said inlet end of said pipe.

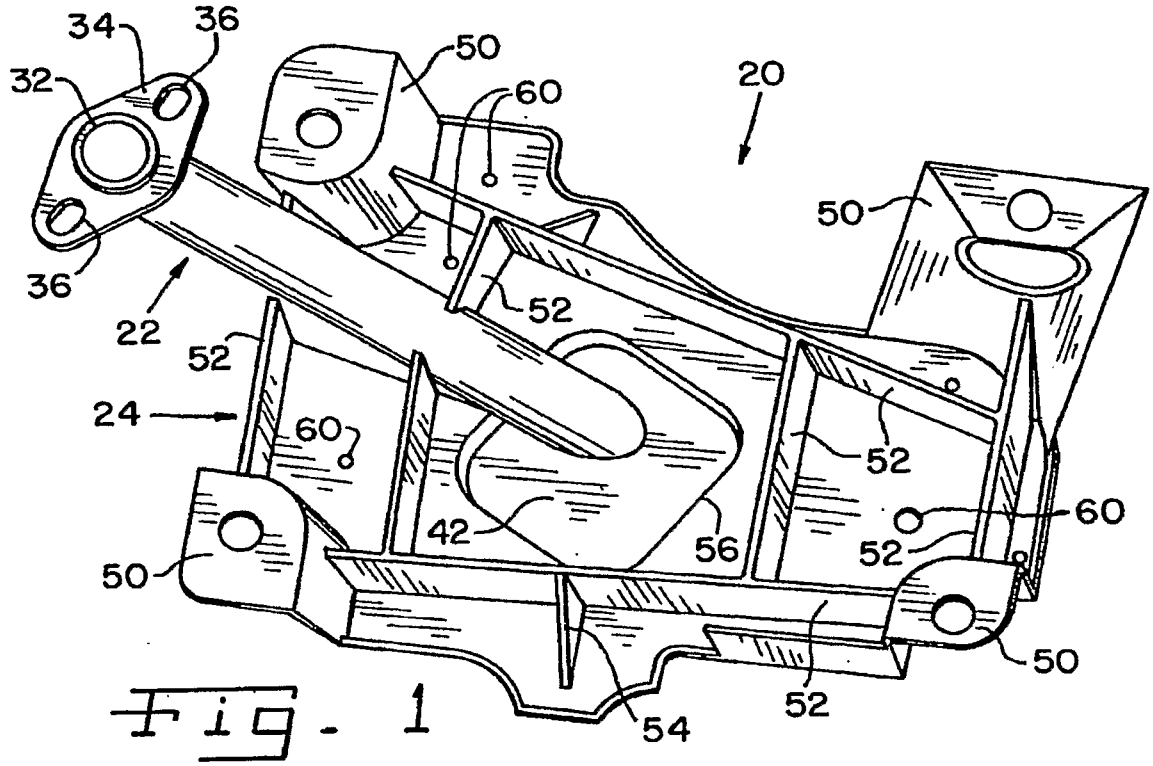
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Fig. 1

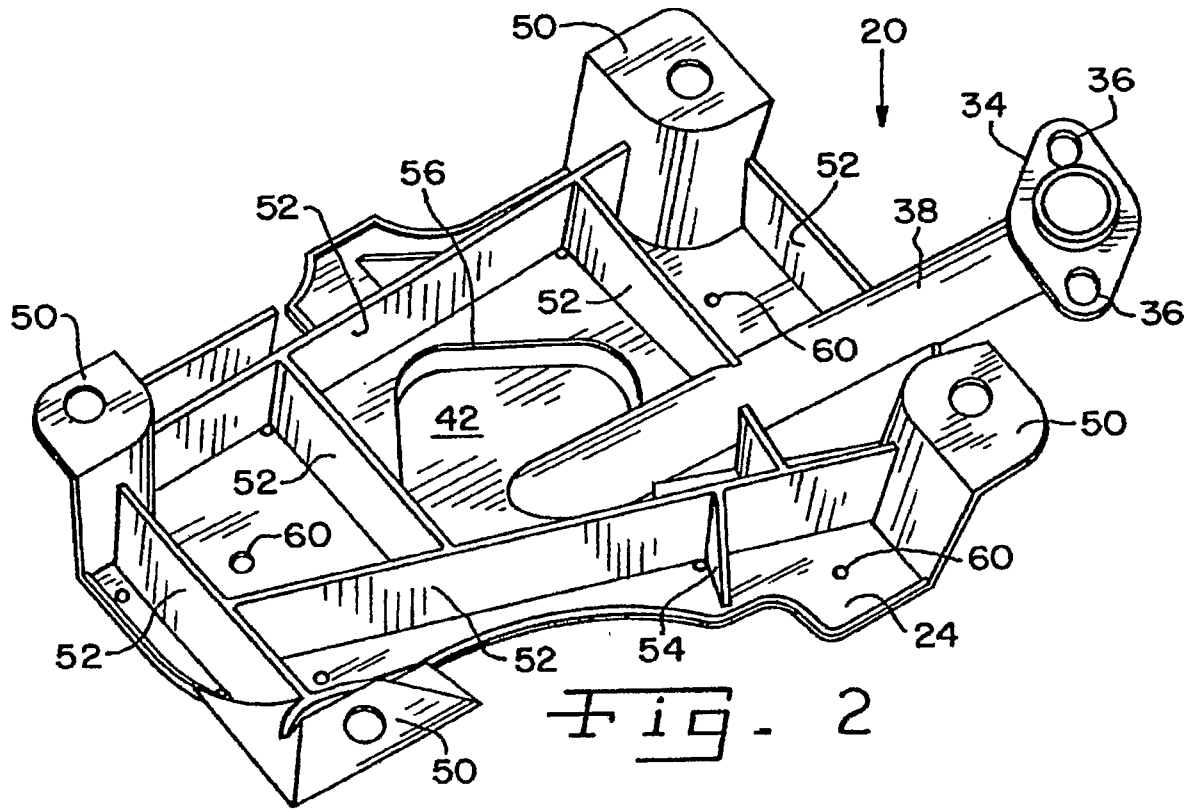
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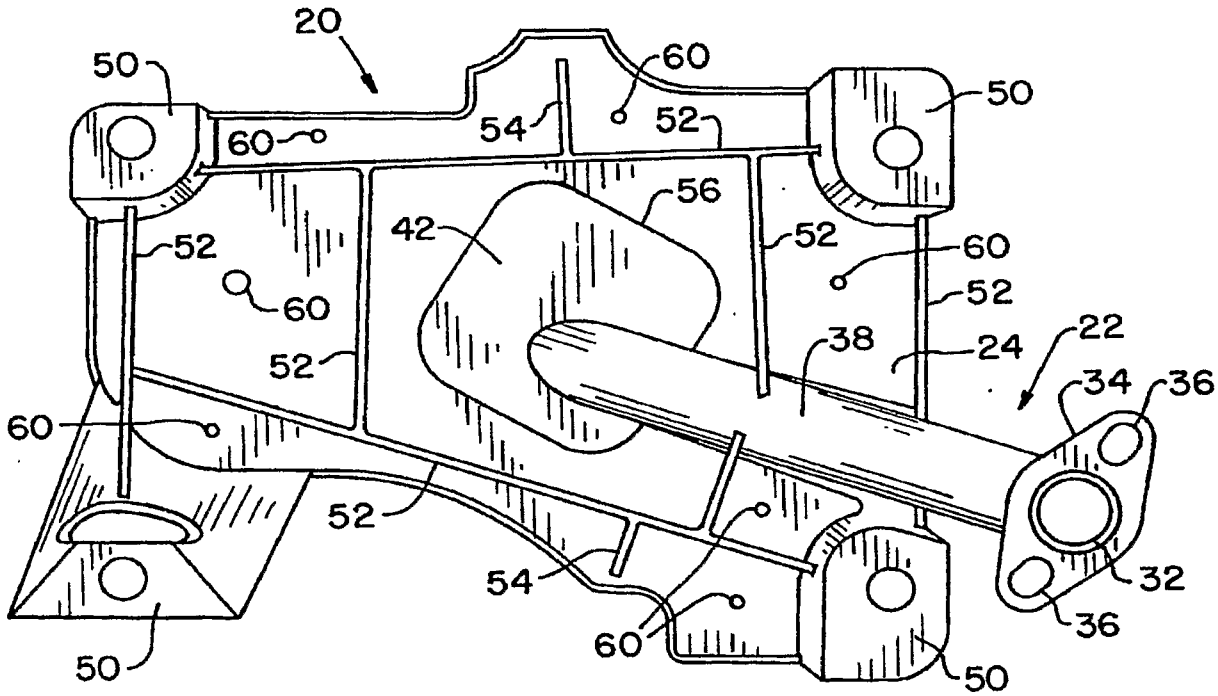
Fig. 2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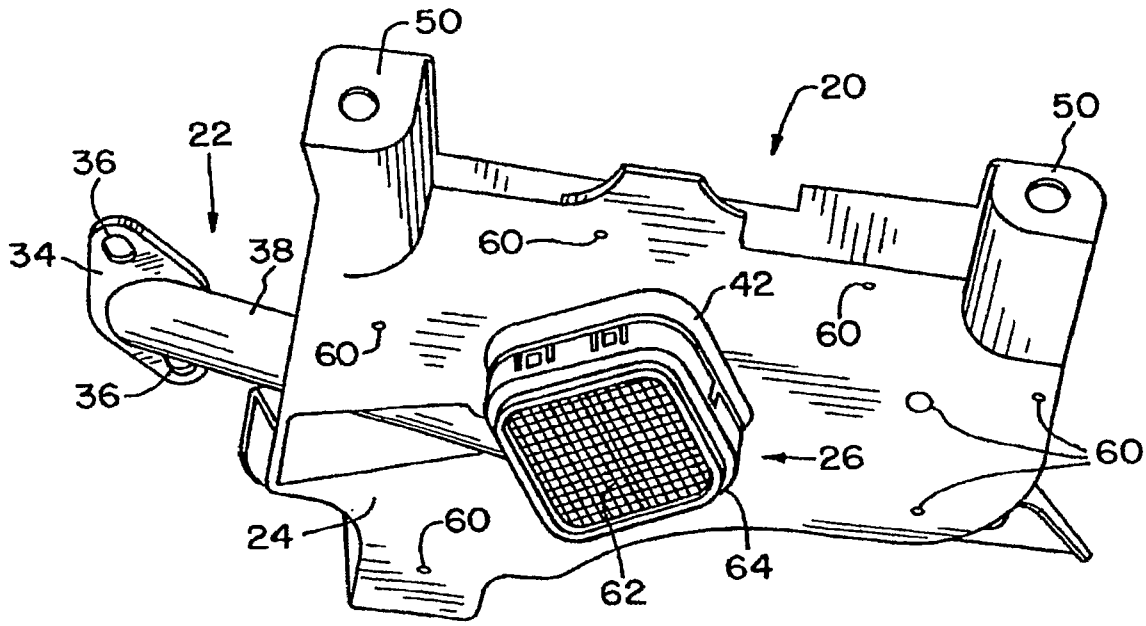
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Fig. 4

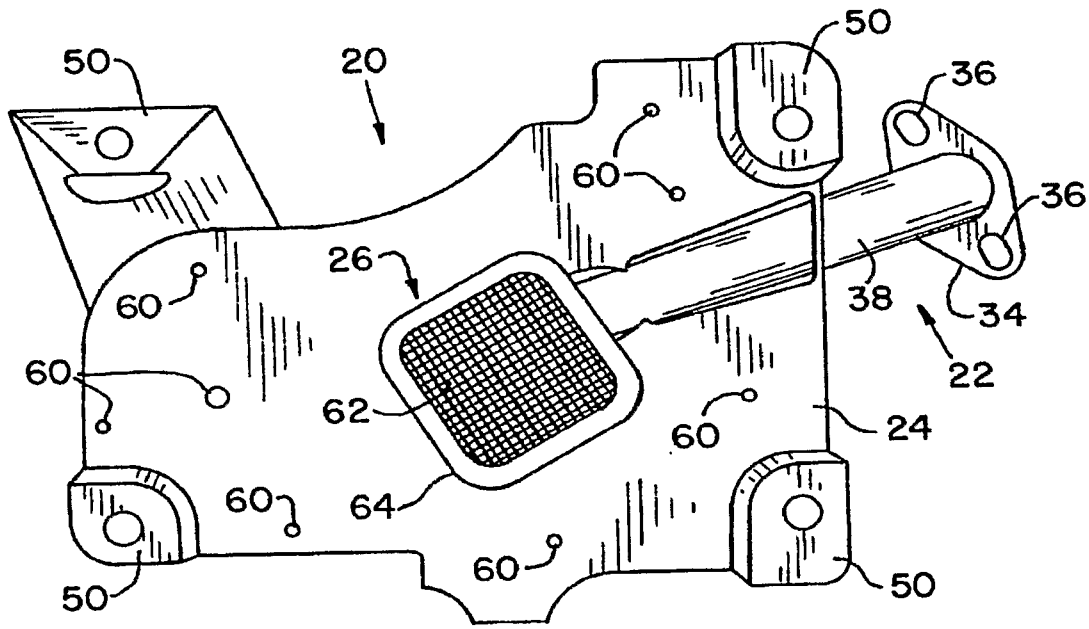
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Fig. 5

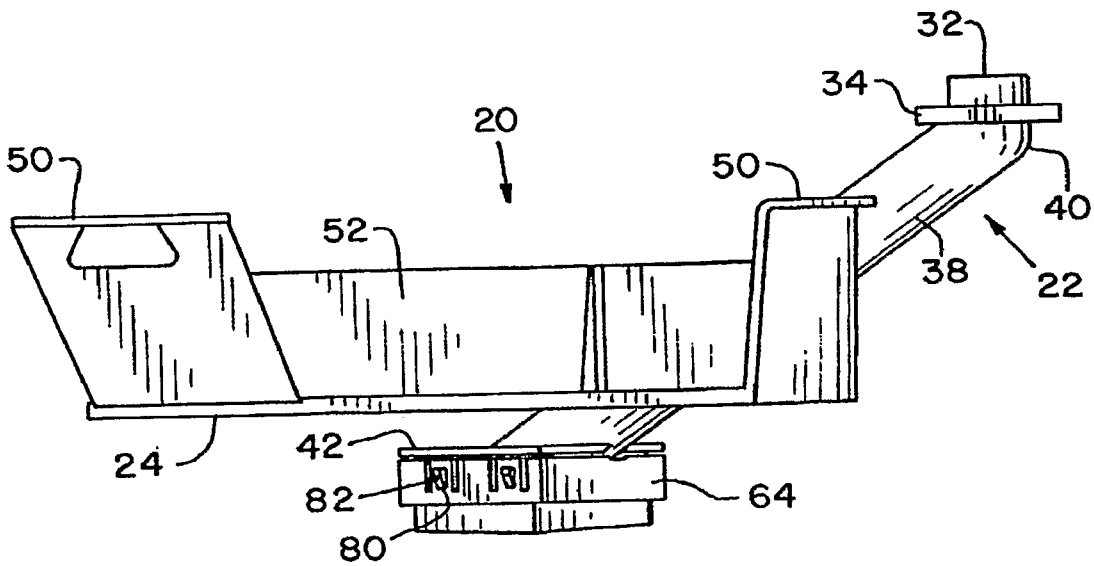
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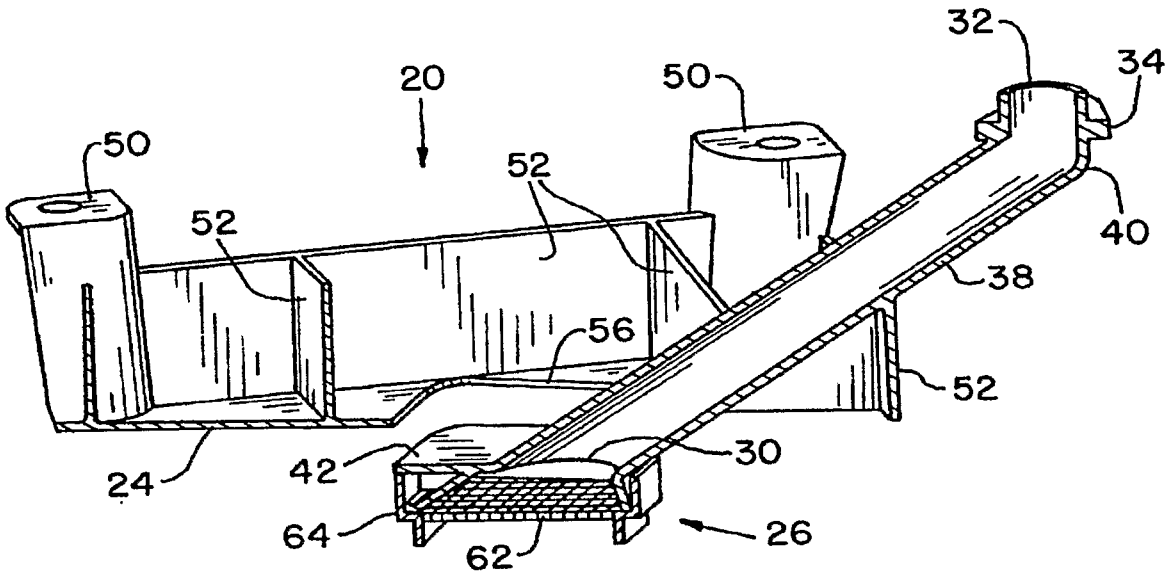
Fig. 6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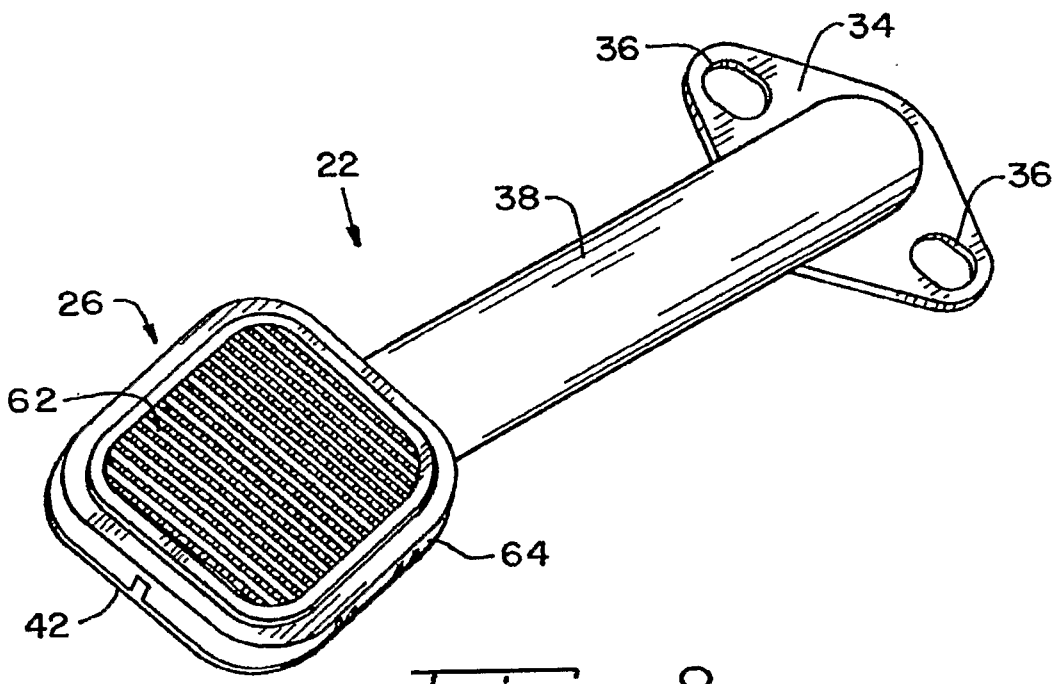
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Fig. 8

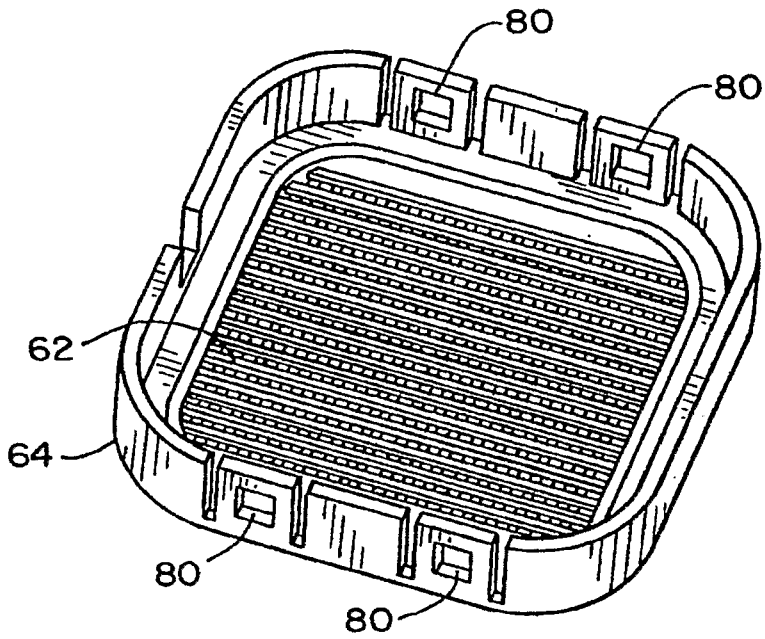

Fig. 9

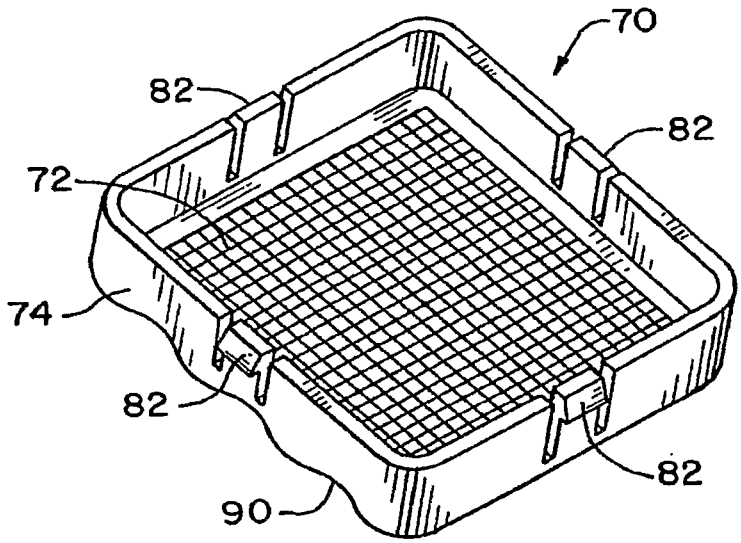

Fig. 10

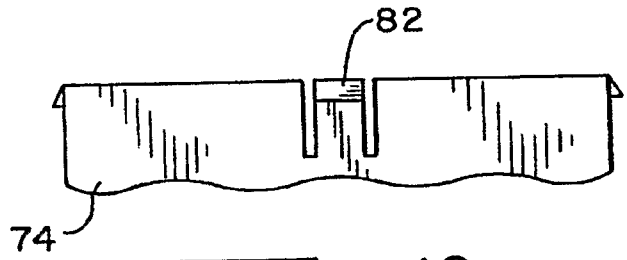

Fig. 12

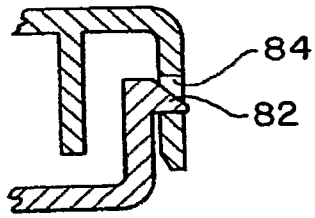

Fig. 11

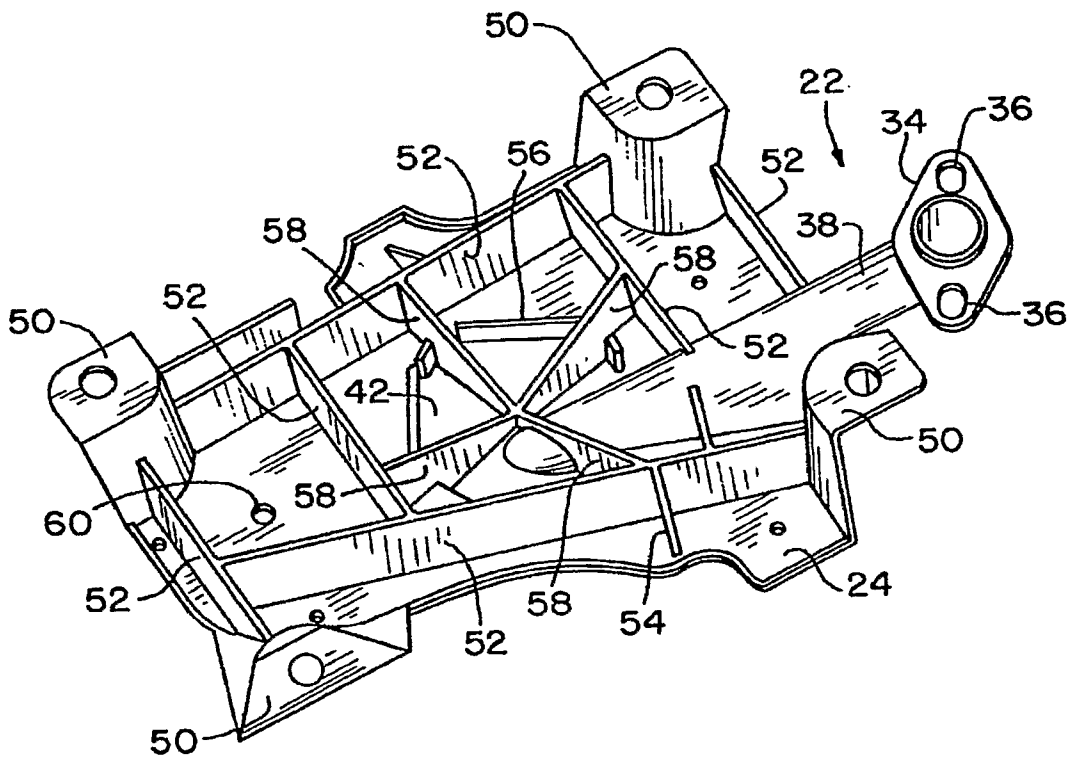

Fig. 13