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Gogots et al.

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[54] **ENGINE WIRING HARNESS SUPPORT WITH INTEGRAL OIL SPILL DEFLECTOR**

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[51] **Int. Cl.**[6] **F02B 77/00**

[52] **U.S. Cl.** ..... **123/198 R**; 123/196 R

[58] **Field of Search** ..... 123/90, 37, 196 R, 123/198 R, 446

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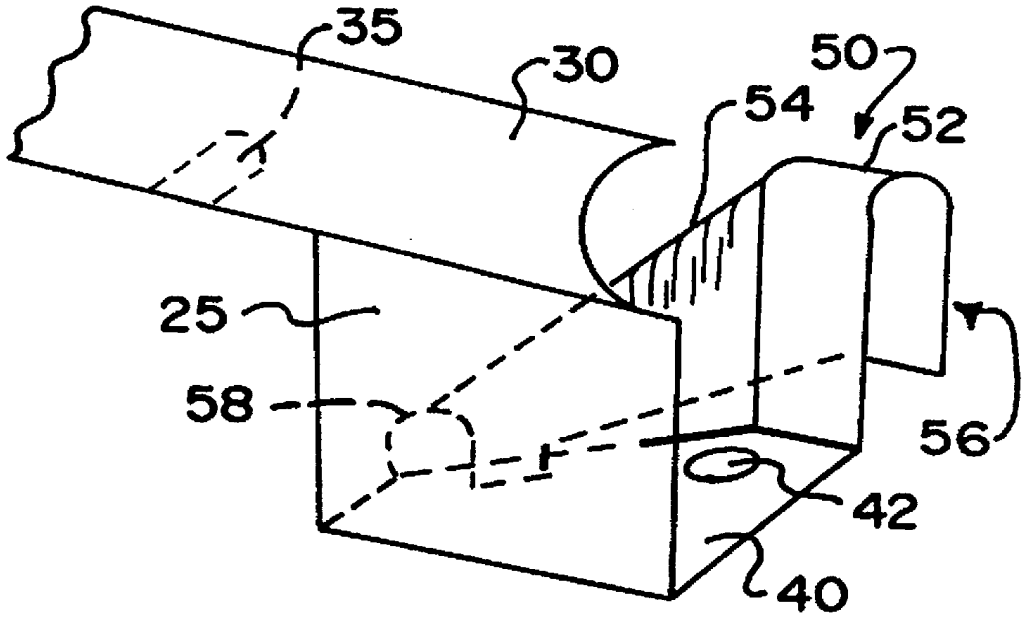
[57] **ABSTRACT**

A wiring harness support and under valve cover oil deflector formed from a single sheet metal blank that is connected to each individual injectors, by a single bolt, of a Hydraulically-actuated Electronically-controlled Unit Injector (HEUI) system for a diesel engine. This combined wiring harness support and oil deflector aligns itself when mounted in the proper tapped holes in the unit injectors.

5 Claims, 3 Drawing Sheets



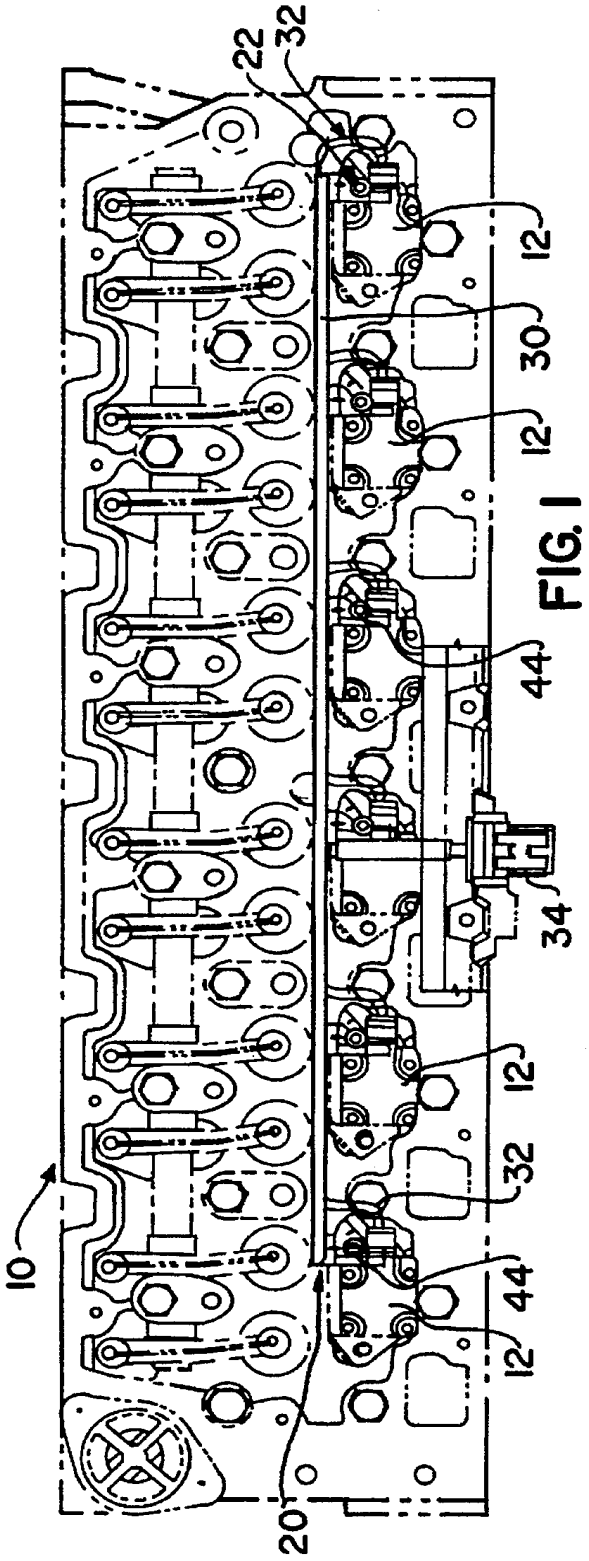


FIG. 1

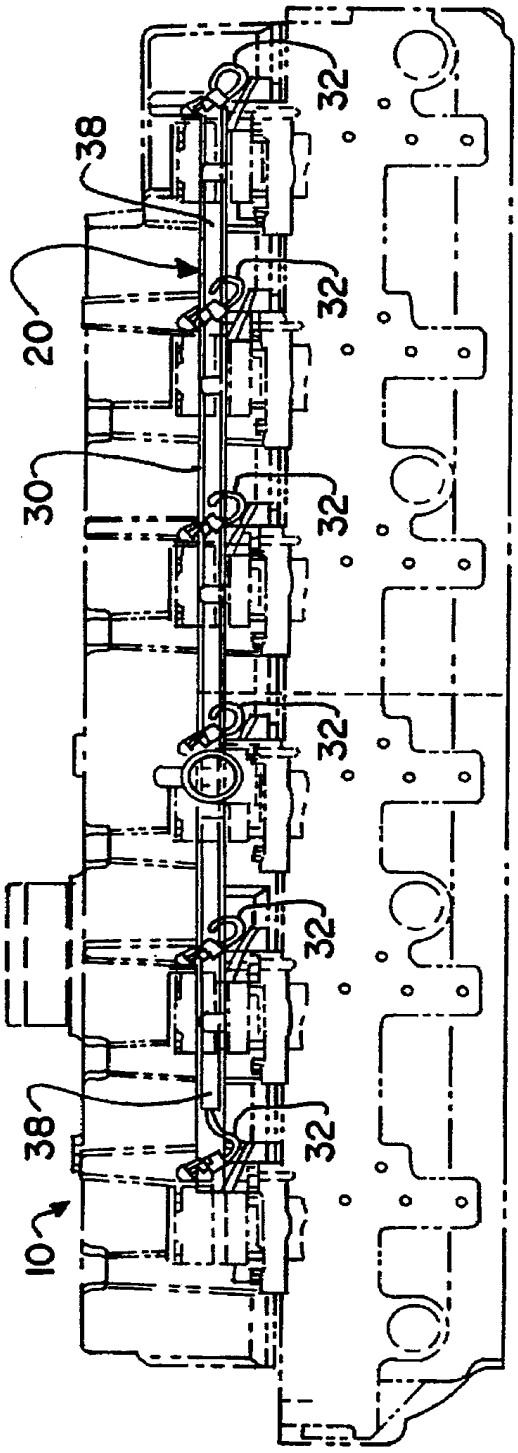


FIG. 2

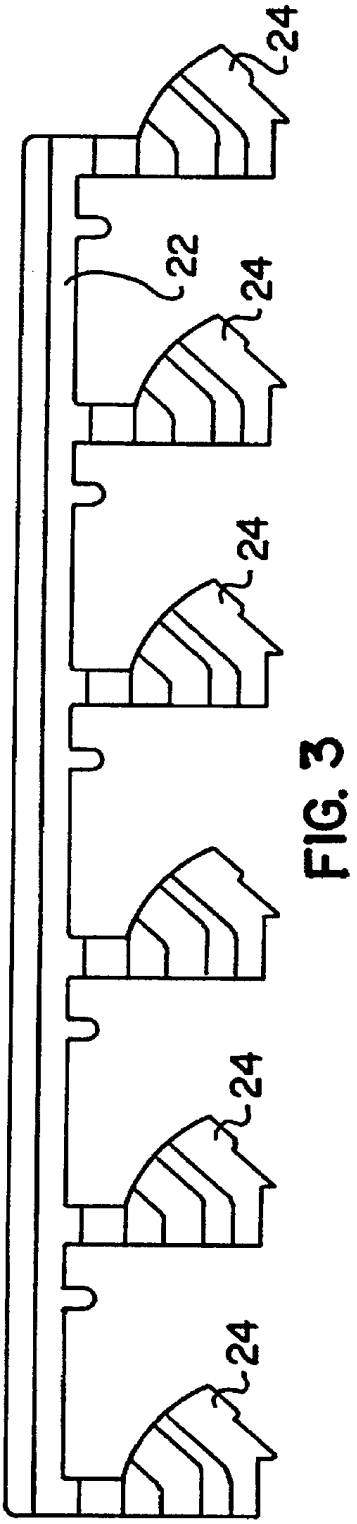


FIG. 3

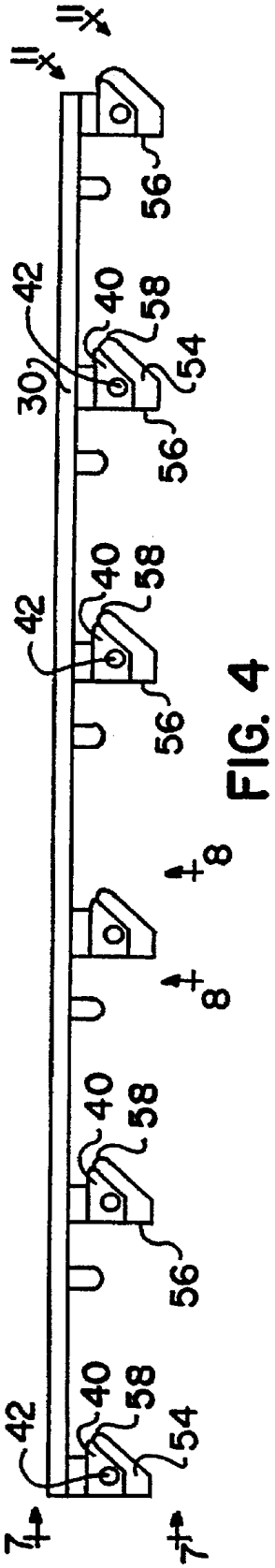


FIG. 4

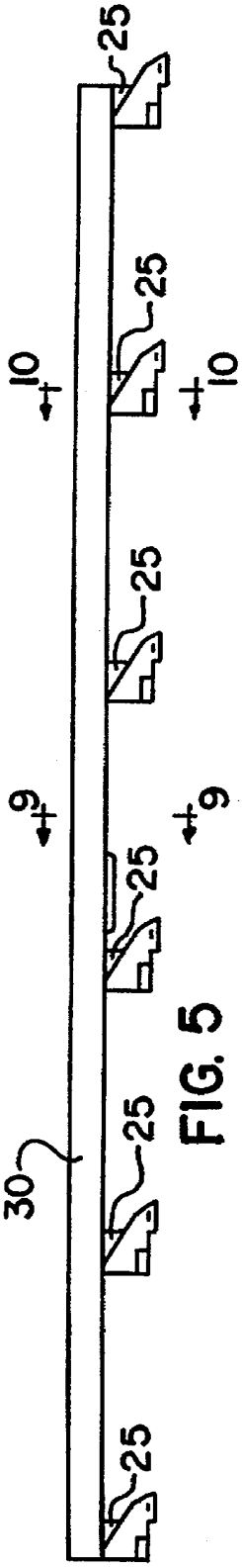


FIG. 5

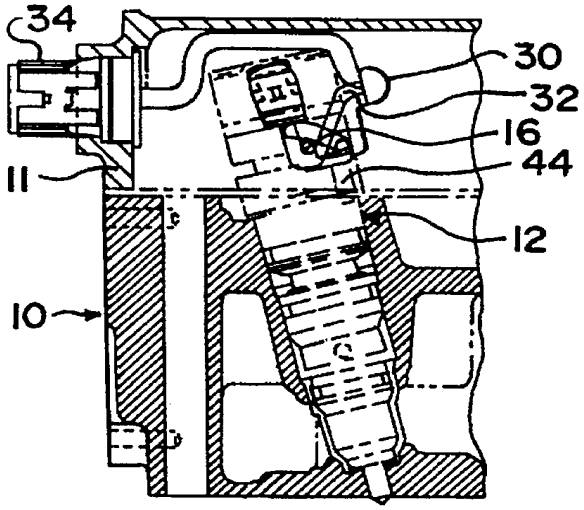


FIG. 6

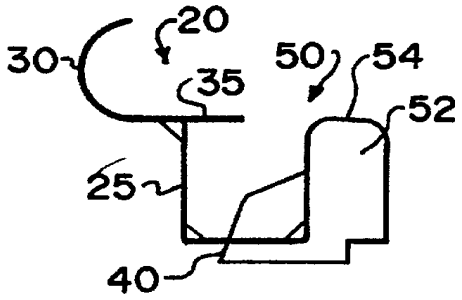


FIG. 7

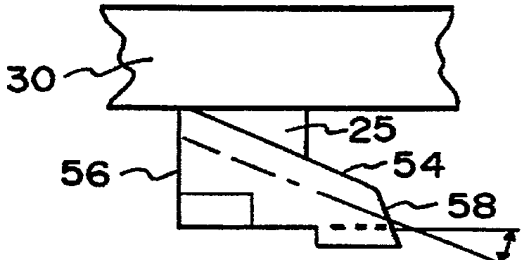


FIG. 8

FIG. 9

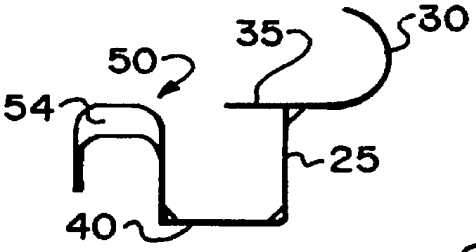


FIG. 10

FIG. 11

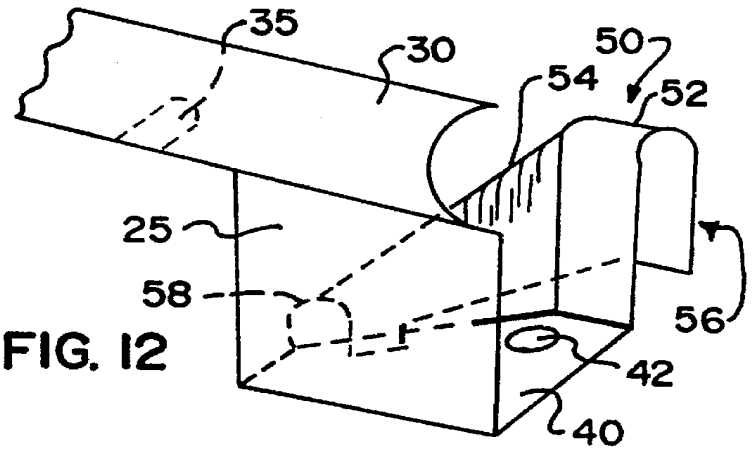


FIG. 12

ENGINE WIRING HARNESS SUPPORT WITH INTEGRAL OIL SPILL DEFLECTOR

BACKGROUND OF THE INVENTION

Hydraulically-actuated Electronically-controlled Unit Injectors (HEUI) for diesel engine fuel systems use hydraulic energy of pressurized oil to cause injection of the fuel into the engine cylinder. However, both the start and end of the fuel injection is electronically controlled through a solenoid on the injector. When an injector solenoid is energized it causes the injector poppet valve to lift off its seat which enables high pressure oil to enter the fuel injector causing injection of diesel fuel into the engine cylinder. When the injector solenoid is de-energized the injector oil discharge port is closed. Injection of fuel stops when the electrical signal to the solenoid stops which causes the injector poppet valve to close and the injector oil discharge port to open. Thus, each time an injector of a HEUI system fires it receives electronic signals and discharges oil under high pressure.

Each injector in a HEUI fuel injection system requires a pair of electrical wires for energizing its poppet valve. The electrical wires are connected to the top portion of the injectors that is located under the valve cover. It is the practice to have a bundle of wires, supported by a plurality of individual wire clamps, that are spaced along the length of the valve cover from which a pair of wires branches off to each injector. The individual wire clamps must be secured to the engine block adjacent each injector. The high pressure oil is discharged near the top of the injectors under the valve cover. The discharged high pressure oil must be returned to the low pressure engine sump through a drain. Since the oil is under considerable pressure it is discharged in a pressurized stream that must be controlled by deflecting it downwardly to prevent carryover and excessive lubrication of the valves stems, springs and rocker arms. This oil then flows downwardly to the engine sump. It has been the practice in the past to provide an individual deflector for each of the injectors which must be individually mounted on each injector hold down clamp under the valve cover.

Thus supporting the under valve cover wire harness and providing deflectors for the discharge oil requires numerous parts which must be individually secured to the injector hold down clamp. Each individual component must be properly aligned to insure that it performs as is intended. As a result, these individual components, as well as the assembly time devoted to these components, contribute a sizeable portion to the assembly cost of the engine. Also, when maintaining the engine, each of these individual components must be removed and then properly aligned and reassembled. This contributes considerable to the cost of some repair jobs.

Reference is hereby made to U.S. Pat. No. 5,245,970 for a disclosure of a HEUI system which patent is hereby included by reference as a part of this disclosure.

For the foregoing reasons, there is a need for an improved and more economical ways of supporting the under valve cover wiring harness and for deflecting the discharge oil from the HEUI injectors.

SUMMARY OF THE INVENTION

The present invention is directed to a device that satisfies the need for an improved and more economical way of supporting the under valve cover wiring harness and for deflecting the discharge oil from the HEUI injectors.

This invention of a wiring harness support with integral oil spill deflectors has the advantage of reducing the number of individual parts, each of which required individual alignment and an individual connector, with a single part that requires only a single connector per injector and aligns itself when mounted in the proper tapped holes.

The apparatus consists of a single stamping that functions to support and mount the wiring harness and also to deflect the injector by-pass oil flow.

The present invention is directed to a unitary device that provides a channel for the wiring harness and also deflectors for each injector that is simple and fast to install on an engine head.

The present invention consist of a unitary device including a single channel wiring harness support having integral spill deflectors that is connected to each unit injector by a single bolt.

For the foregoing reasons there is a need for an inexpensive device that can be easily and quickly assembled on the engine block for supporting the under valve cover wiring harness and for deflecting the injector by-pass oil flow.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top view of an embodiment of the invention mounted on the top of a cylinder head having six unit injectors in which the cylinder head and the engine components are shown in broken lines.

FIG. **2** is a side view of the embodiment of the invention shown in FIG. **1**.

FIG. **3** is a plan view of the sheet metal blank from which the engine wiring harness and oil spill deflector is formed.

FIG. **4** is a top view of the embodiment of the invention seen in FIG. **1** that is isolated from the cylinder head and engine components.

FIG. **5** is a side view of the embodiment of the invention seen in FIG. **2**.

FIG. **6** is an enlarged cross sectional view of a unit injector taken along lines **6—6** of FIG. **1**.

FIG. **7** is an enlarged end view of the isolated engine wiring harness and oil spill deflector taken along lines **7—7** of FIG. **4**.

FIG. **8** is an enlarged side view of a portion of the engine wiring harness and oil spill deflector taken along lines **8—8** of FIG. **4**.

FIG. **9** is an enlarged cross section view of the engine wiring harness and oil spill deflector taken along lines **9—9** of FIG. **5**.

FIG. **10** is an enlarged cross section view of the engine wiring harness and oil spill deflector taken along lines **10—10** of FIG. **5**.

FIG. **11** is an end view of the engine wiring harness and oil spill deflector taken along lines **11—11** of FIG. **4**.

FIG. **12** is schematic sketch of a portion of the engine wiring harness and oil spill deflector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** is a top view and FIG. **2** a side view of a cylinder head **10** for a six cylinder in-line engine. Although this invention is illustrated mounted on a six cylinder in-line engine it should be understood that the invention could be used with other type engines such as V-type engines and the sets of cylinders could be more or less than has been illustrated herein. As is conventional there are exposed valve stems, springs and rocker arms on top of the cylinder head

which require lubrication. As is conventional a valve head cover is provided which functions to confine the lubricant to this area from which it can drain to the engine sump. The engine wiring harness and oil spill deflector **20** shown in FIG. **1** is connected by bolts **44** to each of the six unit injectors **12**. Individual pairs of wires **32** extend from a bundle of wires **38**, that are supported in the wiring harness section **30** of the engine wiring harness and oil spill deflector **20**, to each of the six unit injectors **12**. A bundle of wires **38** is supported in the wiring harness section **30** which are connected to the engine's electrical system through the connector **34**. Bolts **44** extend through apertures **42** formed in the mounting section **40** of the engine wiring harness and oil spill deflector **20**. The oil spill deflector section **50** of the engine wiring harness and oil spill deflector **20** is supported by and extends upwardly from the mounting section **40** such that it receives oil from the discharge ports **16** of the unit injectors **12** and deflects it downwardly to prevent excessive lubrication of the valve stems and then return the oil to the engine sump.

FIG. **6**, is a cross section view taken along lines **6—6** of FIG. **1**, that discloses a unit injector **12** that is mounted in the engine cylinder head. The engine wiring harness and oil spill deflector **20** is shown in cross section as well as the bolt **44** securing it to the unit injector **12**. The wiring harness section **30** that carries the bundle of wires **38** as well as the individual wires **32** that extend from the bundle **38** to the unit injector **12** are clearly shown in this Figure. Also seen in this view is the section of the bundle of wires **38** that extends from the wiring harness section **30** to the connector **34** that is carried by the cylinder head cover **11**.

FIG. **3** is a plan view of a sheet metal blank from which the engine wiring harness and oil spill deflector are formed. Fold lines are indicated on the sheet metal blank. The sheet metal blank is made up of a longitudinal extending segment of material **22**, that extends across the complete set of unit injectors **12** that are to be served by the engine wiring harness and oil spill deflector, and a unit injector segment **24** for each unit injector. The unit injector segments **24** extends from the longitudinal extending segment of material **22**. A set of progressive dies are used to stamp the engine wiring harness and oil spill deflector from the sheet metal blank seen in FIG. **3** into the shaped device seen in FIGS. **4** and **5**.

FIG. **4** is an isolated top view and FIG. **5** an isolated side view of the engine wiring harness and oil spill deflector that is seen and discussed above with reference to FIGS. **1** and **2**.

FIG. **7** is an enlarged end view of the engine wiring harness and oil spill deflector **20**. In this view the C-shaped wiring harness section **30** is clearly shown along with the fasteners or tabs **35** that can be bent up to secure the bundle of wires **38** in the C-shaped wiring harness **30**. An arm **25** extends down from the wiring harness section **30** at each unit injector segment **24** from which the mounting section **40** extends. An aperture **42** (see FIG. **4**) is formed in the mounting section **40** through which bolt **44** extends to connect each unit injector segment **24** to its corresponding unit injector **12**. The portion of the unit injector segment **24** beyond the mounting section **40** is formed into the oil spill deflector section **50**. The oil spill deflector section **50** includes a downwardly opening trough **52** having a closed top **54**. The downwardly opening trough **52** extends from a first end **56** to a second end **58** (see FIG. **4**). The closed top **54** of the downwardly opening trough **52** extends downwardly from the first end **56** to the second end **58**. Also the downwardly opening trough **52** includes a dog-leg turn back toward the wiring harness section **30** as it extends from the first end **56** to the second end **58** (see FIG. **4**).

FIG. **8** is an enlarged side view of one of the oil spill deflector sections. In this view the arm **25** extending down from the wiring harness section **30** as well as the closed top **54** of the downwardly opening trough **52** are clearly shown. In FIG. **8** the downward pitch of the trough **52** from the first end **56** to the second end **58** is indicated to be about 24 degrees.

FIG. **9** is a cross section view of the wiring harness section **30** taken between unit injector segments **24** and clearly illustrates the C-shaped contour of the wiring harness section **30** which carries the bundle of wires **38** as well as one of the fasteners or tabs **35**.

FIG. **10** is a cross section view of the engine wiring harness and oil spill deflector that cuts through one of the oil spill deflector sections **50**. In this view a portion of the closed top **54** of the downwardly opening trough **52** is visible as well as the wiring harness section **30**, arm **25** and mounting section **40**.

FIG. **11** is an end view of the second end **58** of the oil spill deflector section **52**. In FIG. **11** the closed top **54** of the downwardly opening trough **52** is seen as well as the open end of the trough **52** at the second end **58**.

FIG. **12** is a schematic isometric sketch of a portion of the engine wiring harness and oil spill deflector **20**. Although this sketch is not to scale it is helpful in comprehending the relative positions and locations of the various portions and sections of the engine wiring harness and oil spill deflector. As seen in FIG. **12** the discharge oil flows from the discharge port **16** (see FIG. **6**) of the unit injector **12** into the upper portion of the downwardly opening trough **52**. The stream of oil from the discharge port **16** impacts on the closed top **54** and its direction is turned downwardly toward the cylinder head deck. The excess oil is then returned to the engine sump from which it is recirculated.

The engine wiring harness and oil spill deflector **20** has an aperture **42** for each of its unit injectors **12**. When installing the wiring harness and oil spill deflector **20**, bolts **44** are inserted through the apertures **42** and threaded into the threaded bores in the unit injectors **12**. Since the apertures **42** are located with precision in the engine wiring harness and oil spill deflector **20** no further adjustment or alignment is required. When servicing the engine the engine wiring harness and oil spill deflector **20** is removed as a unit by removing the bolts **44** and can replaced by repeating this simple procedure. No special tools or information are required to remove and replace the engine wiring harness and oil spill deflector **20**.

While the invention has heretofore been described in detail with particular reference to the illustrated apparatus, it is to be understood that variations, modifications and the use of equivalent mechanisms can be effected without departing from the scope of this invention. It is, therefore, intended that such changes and modifications be covered by the following claims.

What is claimed is:

1. A wiring harness support and integral oil spill deflector for all injectors of a diesel engine having a HEUI fuel injection system comprising:

a longitudinally extending segment of material that adapted to extend the across all injectors of the HEUI fuel injection system;

said longitudinally extending segment of material including an apertured mounting section for each injector;

each apertured mounting section adapted to be secured to an injector by a connecting device extending through the aperture formed therein;

said wiring harness support and integral oil spill deflector including an oil deflector that has a downwardly opening trough with a closed top and first and second ends, said first end adapted to be at the level of the injector discharge port, said downwardly opening trough with a closed top adapted to extend downwardly from said first end to said second end such that oil flowing therethrough is directed downwardly from the injector discharge port; and

said longitudinally extending segment of material includes a coextensive channel portion that is connected to each apertured mounting section that is adapted to receive a wiring harness that includes wires extending to each injector.

2. The invention as set forth in claim 1 wherein said coextensive channel portion including fasteners for securing a wiring harness therein.

3. The invention as set forth in claim 1 wherein said coextensive channel portion is spaced above the closed top of said oil deflector.

4. The invention as set forth in claim 1 wherein said longitudinally extending segment of material is a sheet metal blank wherein said apertured mounting section, oil deflector and coextensive channel portion stamped portions of said sheet metal blank.

5. The invention as set forth in claim 4 wherein said fasteners for securing a wire harness in said coextensive channel are tabs extending from an edge of the channel that can be bent across the channel to secure the wire harness.

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