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(54) Integrated supply unit for internal combustion engines

(57) Integrated supply unit for internal combustion engines, of the type in which the throttle unit (1) of the adjusted fuel supply to the engine comprises, steadily associated therewith, an electronic unit (6) controlling the various functions connected with the starting and the running of the engine (ECU), idle speed adjustment means (10), throttle unit position sensor means (7), and pressure and temperature sensor means (8, 9), characterised in that said sensors (7, 8, 9) are steadily associated with the board which makes up said electronic unit (6) and protrude therefrom perpendicularly to the main plane thereof.

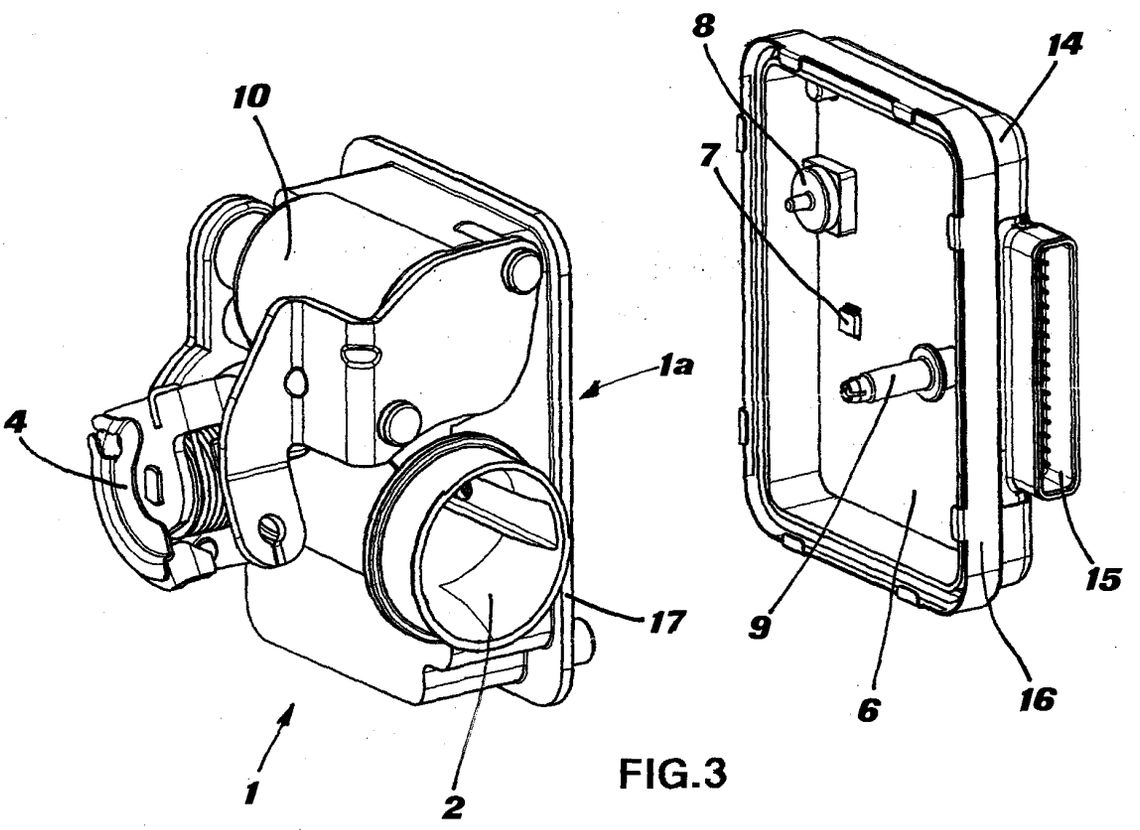

FIG.3

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Description

[0001] The present invention relates to an integrated supply unit for internal combustion engines.

[0002] In engine technology, so-called throttle bodies are already well-known, which are assemblies bringing together - for the supply of fuel-injected internal combustion engines - an air supply intake and a throttle valve for adjustment of the supplied air flow.

[0003] It is equally known to associate with these throttle bodies devices apt to control the different functions connected with the starting and running of the engine in the most diverse conditions and at any engine running speed, giving way to so-called integrated supply units.

[0004] Although different integrated supply units for fuel-injected internal combustion engines have been devised - accomplishing such association ever more efficiently - the need in the industry to make such units more compact and simple is still felt, so as to be able to have particularly small-sized products, suitable for engines to be mounted on two-wheel vehicles, and also less expensive and less subject to malfunctioning.

[0005] The present invention addresses this need through a unit according to the invention, which is of the type in which the throttle unit of the adjusted fuel supply to the engine comprises, steadily associated therewith, an electronic unit controlling the various functions connected with the starting and the running of the engine (ECU), idle speed adjustment means, throttle unit position sensor means, and pressure and temperature sensor means. This unit is characterised in that all said sensors are steadily associated with the board which makes up said electronic unit and project therefrom perpendicularly to the main plane thereof.

[0006] Preferably, said sensors are associated with said board through soldering and said board is steadily associated with the throttle unit through a plastic cover and a metal ring which is tightened in a suitable seat at the periphery of the body itself.

[0007] The invention will now be described in greater detail hereunder, with reference to one of its currently preferred embodiments, illustrated in the accompanying drawings, wherein:

[0008] Figs. 1 and 2 are two perspective views from the same side, but with different angles, of the unit according to the invention;

[0009] Fig. 3 shows the same unit of figs. 1 and 2 in a perspective view according to the same angle of fig. 2 with parts removed;

[0010] Fig. 3A is a section view, in a slightly reduced scale over that of figs. 1 to 3, which shows in detail assembling of the electronic-board unit and of the cover therefor in the unit of said figures;

[0011] Fig. 4 is a perspective view with parts removed of the unit according to the invention of figs. 1 to 3, from the side opposite to that of the previous drawings; and

[0012] Fig. 5 is a perspective view with parts removed of the unit according to the invention of figs. 1 to 4, from a side different from those of the previous drawings.

[0013] With reference to the drawings, an integrated supply unit according to the invention is described, specifically designed for motorcycles applications, of the type developing around a mechanically-operated throttle unit, with the gas control directly operated by the driver through a wire. However, it is intended that by applying modest construction changes, the unit described can be applied on other types of vehicles, in particular on cars and/or be developed around an electro-mechanically-operated throttle unit, with the gas control indirectly controlled by the driver, through a small electric motor and a potentiometer for the control thereof.

[0014] As can be seen in the drawings, the integrated unit according to the invention develops around a throttle unit 1, of which the supply duct 2, the throttle 3 and the means 4 to control the movement of said throttle against the action of a return spring 5, through a wire not shown can be seen.

[0015] With the throttle unit 1 is steadily associated the electronic unit 6 controlling the various functions connected with the starting and the running at the various engine speeds (ECU), the sensor 7 of the position of the throttle 3 (TPS), the sensor 8 of the absolute pressure (MAP), the sensor 9 of the intake air temperature (IAT) and the actuator 10 for the adjustment of the engine idle speed (or idle adjuster, acting in the various conditions of idle running of the engine and also - or in particular - during starting, especially cold starting, of the engine itself). According to the invention, sensors 7, 8 and 9 are steadily associated through soldering with the board making up the electronic unit 6, from whose main plane they project at 90° therewith. When the board 6 is associated with the throttle unit 1, said sensors arrange themselves in a recess 1a (figs. 3, 4) of the body itself meant to accommodate them.

[0016] This recess 1a contains a revolving element 11 for the sensor 7 of the position of the throttle 3 and interface elements 12 and 13 which allow connection of the sensors themselves to respective housings and circuits found within said throttle unit 1. The central unit 6 is associated with throttle unit 1 - reference can be made in particular to fig. 3A - applying to said throttle unit a plastic cover 14 of the recess 1a, within which is incorporated the board 6 and which comprises an electric connector 15 which serves the whole unit. A metallic retaining ring 16 allows to steadily fasten the cover 14 to the throttle unit 1, engaging a suitable peripheral seat 17 thereof. Suitable sealing means associated with said interface elements 12 and 13 are further provided which are capable of absorbing the assembling tolerances of the sensors on the board and of preventing any possible communication between supply duct 2 and the electric and electronic components of the unit.

[0017] The sensor 7 of the throttle position (TPS) is preferably of the contact-free type, whereas the idle adjuster 10 - which preferably comprise a solenoid 18

which is driven in frequency - accomplishes modulation of the air flow in a derived circuit which connects the upstream and downstream portions of the throttle 3 of the supply duct 2. Reference 19 indicates a housing recess of the adjuster 10. In the illustrated embodiment of the adjuster 10, the solenoid 18 - whose geometric configuration may vary to suit the construction requirements of the unit according to the invention - comprises a piston-shaped element which fills a port to a greater or smaller degree to modulate the air flow.

[0018] The integrated unit subject of the invention distinguishes itself for the extreme functionality and compactness of the assembly and for the utter simplicity of the electrical wiring among the various components. This last feature in turn ensures high reliability and a limited cost of the unit according to the invention, the progress and advantages of which over the known prior art appear thereby confirmed.

Claims

1. Integrated supply unit for internal combustion engines, of the type in which the throttle unit (1) of the adjusted fuel supply to the engine comprises, steadily associated therewith, an electronic unit (6) controlling the various functions connected with the starting and the running of the engine (ECU), idle speed adjustment means (10), throttle unit position sensor means (7), as well as pressure and temperature sensor means (8, 9), **characterised in that** said sensors (7, 8, 9) are steadily associated with the board which makes up said electronic unit (6) and protrude therefrom perpendicularly to the main plane thereof.

2. Integrated unit as in claim 1), wherein said sensors (7, 8, 9) are soldered to said board (6).

3. Integrated unit as in claim 1) and 2), wherein interface elements (11, 12, 13) are provided in the recesses (1a) of the throttle unit (1) which houses said sensors (7, 8, 9) associated with the board (6), in order to ensure an effective seal between the intake (2) and the electronic part of the body itself.

4. Integrated unit as in claim 1) to 3), wherein the board (6) with sensors (7, 8, 9) is steadily associated with the throttle unit (1) through a cover (14) and a metal retaining ring (16), which is tightened in a suitable seat at the periphery of the body itself.

5. Integrated unit as in claim 1) to 4), wherein a single electric connector (15) is provided which serves the entire unit.

6. Integrated unit as in claim 1) to 5), wherein said idle adjustment means (10) consist of a solenoid (18) integrated in the unit itself.

7. Integrated unit as in claim 1) to 6), wherein the throttle unit (3) is directly controlled by the driver through a cable.

8. Integrated unit as in claim 1) to 6), wherein the throttle valve (3) is controlled by an electric motor driven by the positioning sensor (7) of said valve.

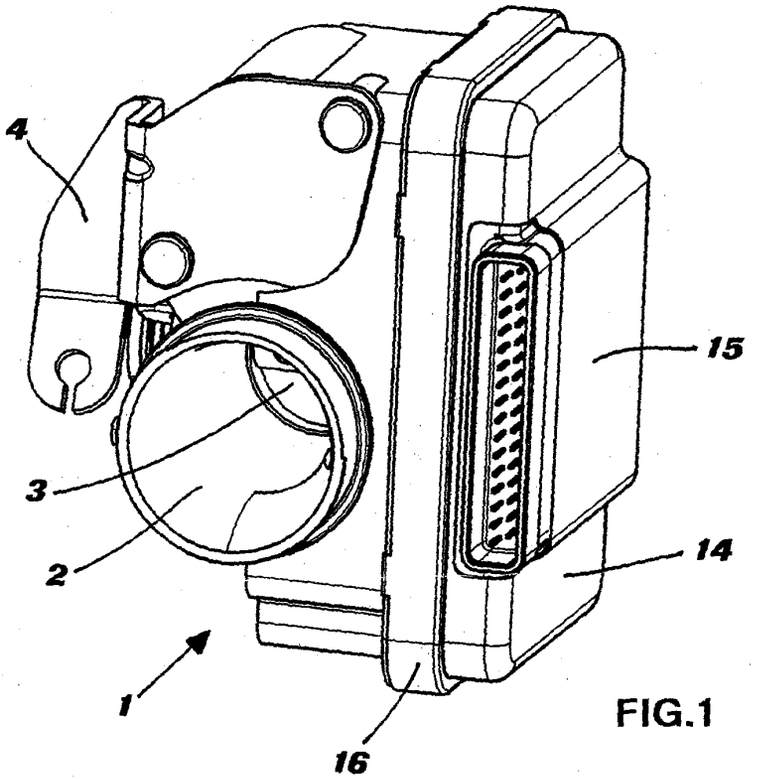

FIG.1

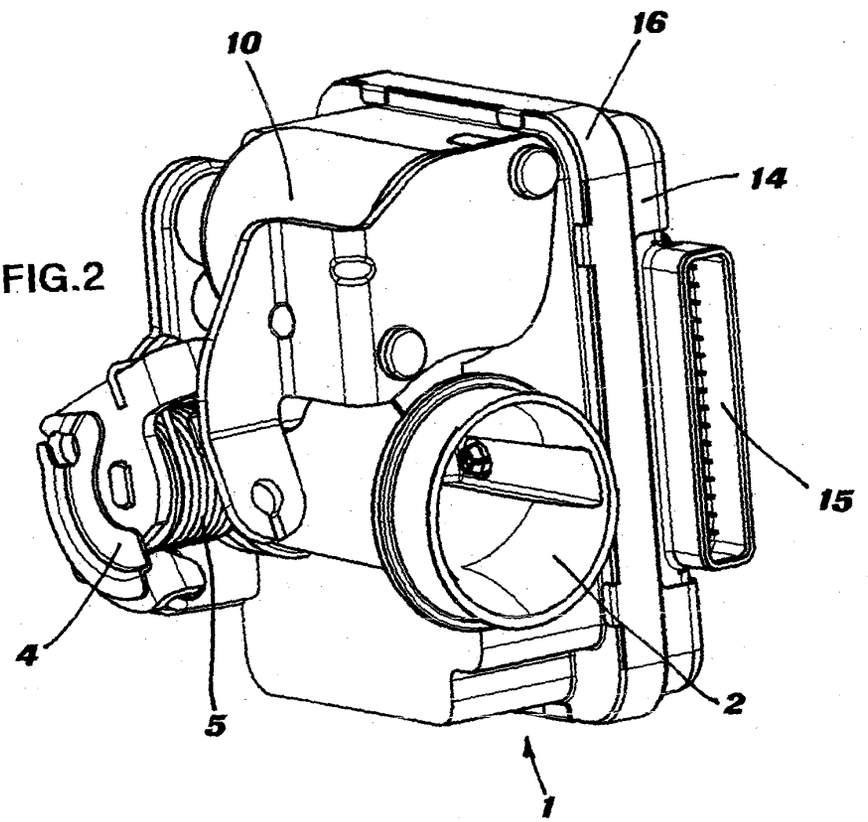

FIG.2

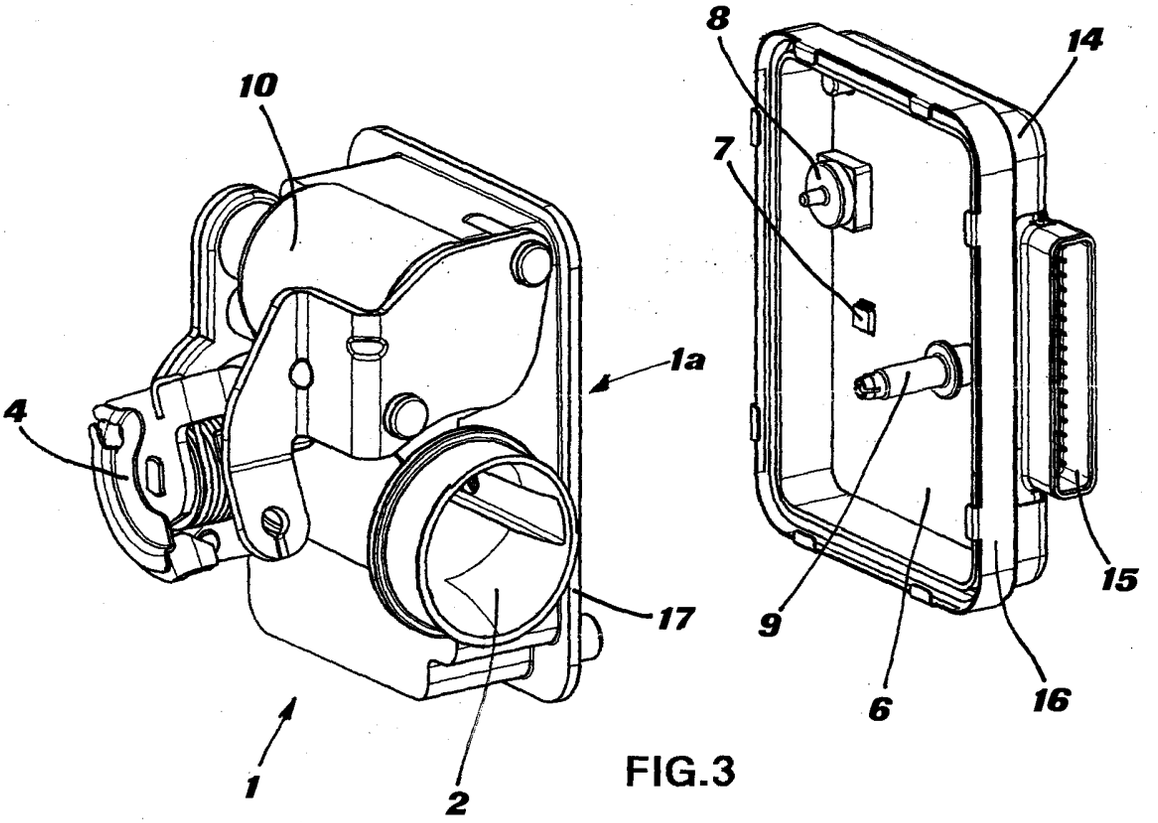

FIG.3

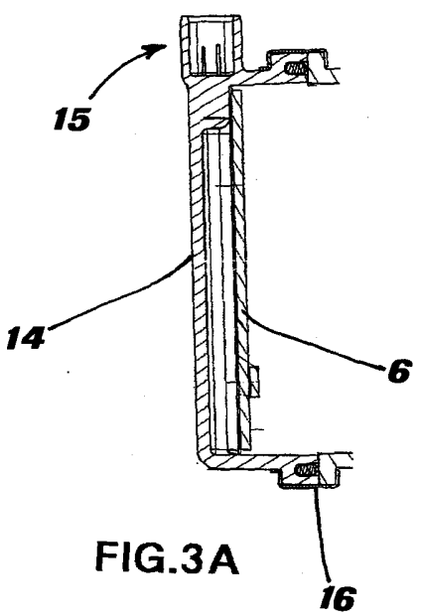

FIG.3A

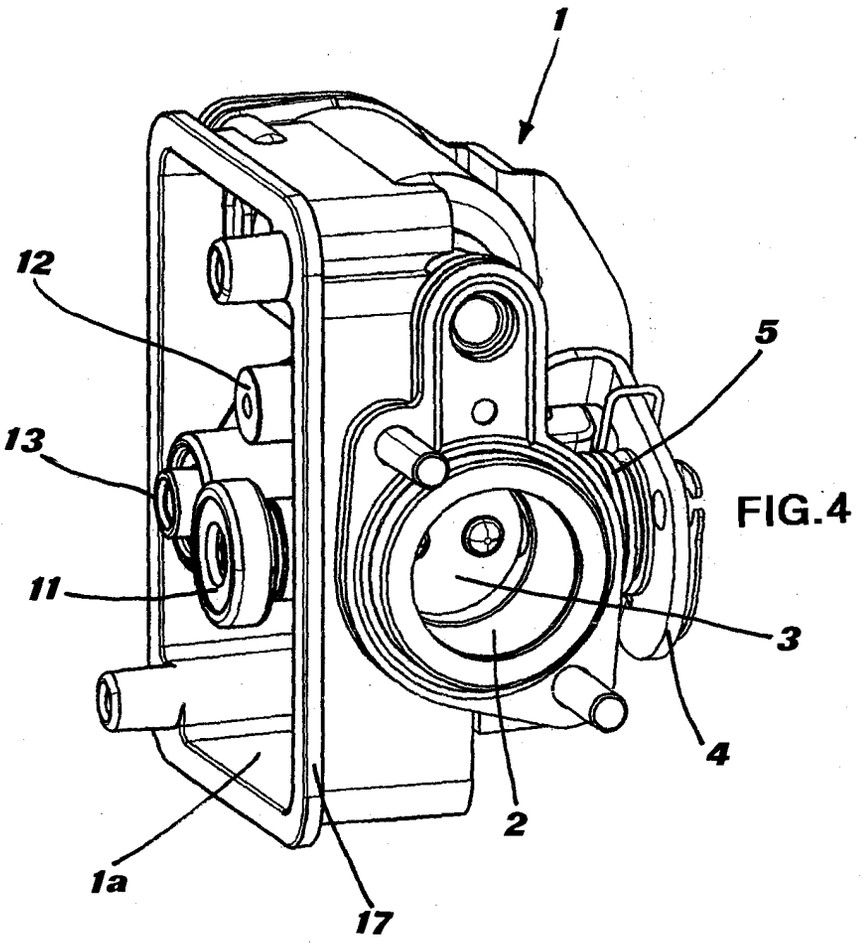

FIG.4

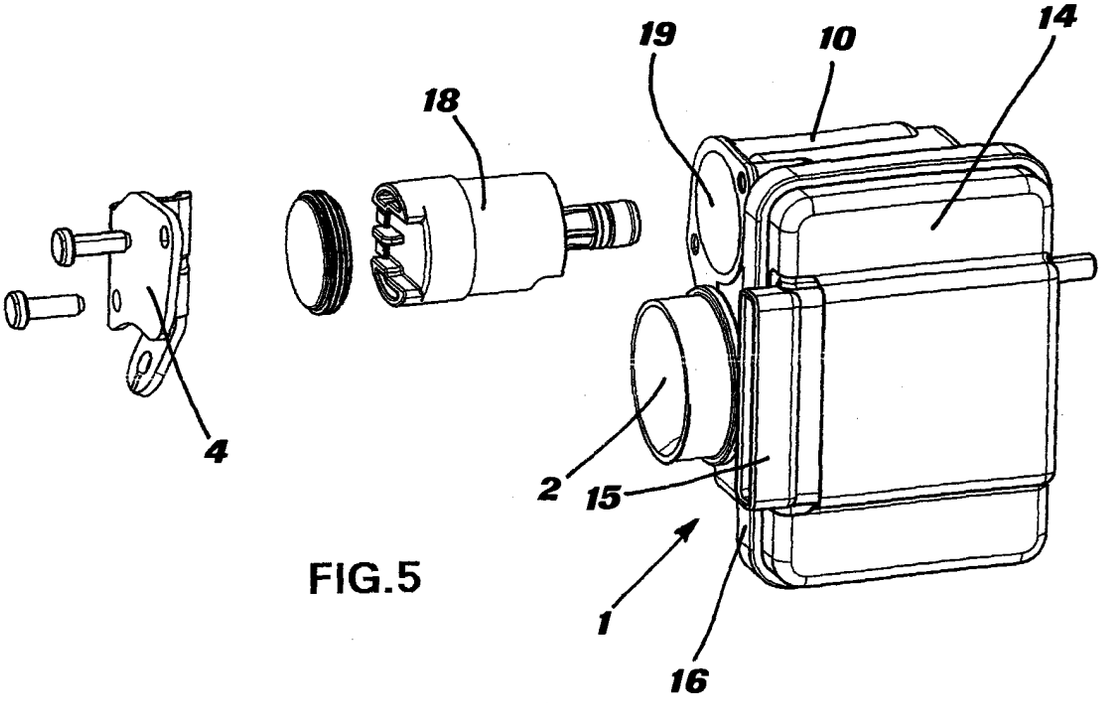

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 1356

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 07, 3 July 2003 (2003-07-03) -& JP 2003 074379 A (HONDA MOTOR CO LTD; KEIHIN CORP), 12 March 2003 (2003-03-12)	1-3,5,7	F02D9/10 F02D9/08 F02D9/02 F02D11/10
Y	* abstract *	6	
A	* figures 4,10-14 *	4	

Y	US 6 446 600 B1 (SCHERER MATTHIAS ET AL) 10 September 2002 (2002-09-10) * column 2, lines 16-22 * * column 4, line 5 - column 5, line 29 * * figures 1,2 *	1,2,5-8	

Y	US 5 711 271 A (SCHLAGMUELLER ET AL) 27 January 1998 (1998-01-27)	1,2,5-8	
A	* column 3, lines 40-46 * * column 5, line 13 - column 6, line 52 * * figures 1-5 *	3	

A	EP 1 167 724 A (HITACHI, LTD; HITACHI CAR ENGINEERING CO., LTD) 2 January 2002 (2002-01-02) * abstract * * column 6, line 38 - column 7, line 56 * * figures 1-4,13,21 *	1-5,8	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F02D F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 June 2005	Mallo Lopez, M

CATEGORY OF CITED DOCUMENTS

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