AUSTRALIA

Patents Act 1990

NOTICE OF ENTITLEMENT

669325

I (~~We~~) Josef Schreyögg

~~authorised by~~

of Landhaus 42, D-87724 Ottobeuren, Germany

the applicant and nominated person in respect of an application for a patent for an invention entitled Emulsion fuel feeding apparatus and method

filed under Australian Application No. 11772/92 , state the following:

PART 1 – *Must be completed for all applications.*

The person(~~s~~) nominated for the grant of the patent

~~[ ] is (are) the actual inventor(s)~~

or

[x] has, for the following reasons, gained entitlement from the actual inventor(~~s~~)

The nominated person is the assignee of the invention from the basic applicant which is the assignee of the invention from the actual inventor.

PART 2 – *Must be completed if the application is a Convention application.*

The person(s) nominated for the grant of the patent is (are):

[ ] the applicant(s) of the basic application(s) listed on the patent request form

or

[ ] entitled to rely on the basic application(~~s~~) listed on the patent request form by reason of the following:

The basic application(s) listed on the request form is (are) the first application(s) made in a Convention country in respect of the invention.

PART 3 – *Must be completed if the application was made under the PCT and claims priority.*

The person(s) nominated for the grant of the patent is (~~are~~):

~~[ ] the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT~~

or

[x] entitled to rely on the application(~~s~~) listed in the declaration under Article 8 of the PCT by reason of the following:

The nominated person is the assignee of the basic application

The basic application(~~s~~) listed in the declaration made under Article 8 of the PCT is (~~are~~) the first application(~~s~~) made in a Convention country in respect of the invention.

Dated this 14th day of June 19 94

Signed

Status (individual person)

Signatory's Name Josef Schreyögg

F.B. RICE & CO PATENT ATTORNEYS

FBR/9-93/P1

AU9211772

(12) PATENT ABRIDGMENT (11) Document No. AU-B-11772/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 669325

(54) Title
OIL WATER EMULSION FORMATION APPARATUS

International Patent Classification(s)
(51)[5] F02D 019/12 F02M 025/02

(21) Application No. : 11772/92 (22) Application Date : 23.01.92

(87) PCT Publication Number : WO93/10347

(30) Priority Data

(31) Number	(32) Date	(33) Country
4137179	12.11.91	DE GERMANY

(43) Publication Date : 15.06.93

(44) Publication Date of Accepted Application : 06.06.96

(71) Applicant(s)
JOSEF SCHREYOGG

(72) Inventor(s)
ALFRED KESSLER

(74) Attorney or Agent
F B RICE & CO , 28A Montague Street, BALMAIN NSW 2041

(56) Prior Art Documents
EP 392545
US 4831970

(57) Claim

1. An oil-water emulsion formation apparatus comprising:

a rotationally symmetrical inlet chamber;

an oil inlet passage and a recycling charging passage opening into said inlet chamber in a tangential direction;

a water jet nozzle disposed at one of the ends of said inlet chamber in an axial direction, subjected to electric opening/closing control, and jetting water into said inlet chamber;

a pump chamber formed at the other end of said inlet chamber in the axial direction;

a pump impeller having a radial shape, fitted coaxially with the axis of said inlet chamber inside said pump chamber and being surrounded by a cylindrical wall of said pump chamber along the outer periphery of said pump impeller, said pump impeller being driven for rotation by a driving source;

a notch portion formed in said wall of the said pump chamber;

an emulsion outlet opening to a direction parallel to the axis of rotation of said pump impeller in the proximity of the end portion of said

.../2

notch portion on the downstream side in the rotating direction of said pump impeller; and

a terminal end wall for intercepting the emulsion flow flowing inside said notch portion in the rotating direction of said pump impeller.

OPI DATE 15/06/93 APPLN. ID 11772/92
AOJP DATE 19/08/93 PCT NUMBER PCT/EP92/00140

AU9211772

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :
F02D 19/12, F02M 25/02

A1

(11) International Publication Number: WO 93/10347

(43) International Publication Date: 27 May 1993 (27.05.93)

(21) International Application Number: PCT/EP92/00140

(22) International Filing Date: 23 January 1992 (23.01.92)

(30) Priority data:
P 41 37 179.8 12 November 1991 (12.11.91) DE

(71) Applicant *(for all designated States except US)*: ~~HARRIER GMBH GESELLSCHAFT FÜR DEN VERTRIEB MEDIZINISCHER UND TECHNISCHER GERÄTE [DE/DE]; Prälat-Zistl-Str. 6, D-8000 München 2 (DE).~~

(72) Inventor; and
(75) Inventor/Applicant *(for US only)* : KESSLER, Alfred [CH/CH]; Rainacker 328, CH-5274 Dürrenäsch (CH).

(74) Agents: JENTSCHURA, Rolf et al.; Steinsdorfstr. 6, D-8000 München 22 (DE).

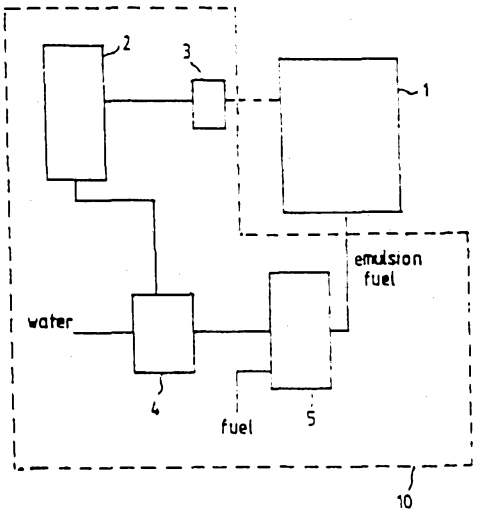
(71) SCHREYÖGG, Josef
Landhaus 42
D-87724 Ottobeuren
Allemagne Germany

(81) Designated States: AT, AU, BB, BG, BR, CA, CH, CS, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MW, NL, NO, PL, RO, RU, SD, SE, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LU, MC, NL, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG).

Published
With international search report.

669325

(54) Title: Oil water emulsion formation apparatus



(57) Abstract

In order to prevent the increase of NOx due to an excessively high combustion temperature and the increase of HC and CO due to an excessively low combustion temperature, by feeding an emulsion of a fuel oil and water having a water content suitable for the combustion state in cylinders to a Diesel engine, there is proposed: a combustion parameter sensor (3) for detecting combustion parameters inside cylinders such as an internal pressure of the cylinder, an engine knock, an exhaust gas, etc. and a water charging quantity judgement/regulation circuit (2) for setting a water charging quantity to a fuel are disposed in a Diesel engine (1). A water charging quantity controller (4) feeds water to an emulsion formation apparatus (5) in a quantity corresponding to a water charging signal from the water charging quantity judgement/regulation circuit (2). Accordingly, an emulsion fuel having a water content in accordance with the combustion state inside the cylinder is formed by, and fed from the emulsion formation apparatus (5) to the engine (1).

Oil-water emulsion formation apparatus

This invention relates to an oil-water emulsion formation apparatus especially for use for a diesel engine.

It is generally known that NOx components in an exhaust gas can be reduced and an engine knock can be prevented by lowering the combustion temperature inside cylinders by feeding a fuel comprising an emulsion of a fuel oil and water to a Diesel engine.

Various methods and apparatuses have also been proposed as the apparatus for forming the emulsion of the fuel oil and water. For preparing such an emulsion it is already known (EP 0 392 545 A1) to use a rotationally symmetric vortex chamber in the Form of a hollow pear having a tangential inlet and a tapering axial outlet, the vortex chamber being surroundet by a ring channel into which an oil inlet passage opens in tangential direction and which in turn is connected to the vortex chamber via tangential inlet slots. The water is jetted by a water jet nozzle into the ring channel or the vortex chamber. The tapering outlet of the vortex chamber opens via a stepped enlargement into the suction chamber of a radial-flow pump comprising a radial-flow pump impeller in a pump chamber and an emulsion outlet passage extending in parallel with the axis of the impeller and directing the prepared emulsion to the injection pump and into a recycling inlet passage, which in turn is tangentially opening into the ring channel. It is reached by the recycling of the emulsion into the vortex chamber and by the sudden enlargement at the outlet of the vortex chamber and by the change of direction of the flow at the exit of the radial-flow impeller, that an emulsion with an average droplet size of 2 to 4 micron are formed, whereby a fine and homogeneous emulsion results being well suitable for the operation of diesel engines. By using an electromagnetic water injection nozzle the water content of the emulsion can be controlled in dependence on the operating state of the diesel engine.

By the invention the problem is solved to provide for a constructionally simpler apparatus ensuring nevertheless a good

emulsion formation.

This is achieved according to the invention by an oil-water emulsion formation apparatus comprising:

a rotationally symmetrical inlet chamber;

an oil inlet passage and recycling charging passage opening into said inlet chamber in a tangential direction;

a water jet nozzle disposed at one of the ends of said inlet chamber in an axial direction, subjected to electric opening/closing control, and jetting water into said inlet chamber;

a pump chamber formed at the other end of said inlet chamber in the axial direction;

a pump impeller having a radial shape, fitted coaxially with the axis of said inlet chamber inside said pump chamber and being surrounded by a cylindrical wall of said pump chamber along the outer periphery of said pump impeller, said pump impeller being driven for rotation by a driving source;

a notch portion formed in said wall of the said pump chamber;

an emulsion outlet opening to a direction parallel to the axis of rotation of said pump impeller in the proximity of the end portion of said notch portion on the downstream side in the rotating direction of said pump impeller; and

a terminal end wall for intercepting the emulsion flow flowing inside said notch portion in the rotating direction of said pump impeller.

In a preferred embodiment, the terminal end wall surrounding the outflow port of the emulsion outlet has a semicylindrical shape and ends in a sharp edge at its radially inner end.

Conveniently the flat bottom of the notch portion is inclined in such a way that the depth of the notch portion increases toward the outflow port of the emulsion outlet.

Preferably the notch portion extends along a center angle of he impeller of about 60°.

The present invention also embraces the use of oil-water emulsion formation apparatus according to the present invention for supplying the emulsion to the injection pump of a diesel engine.

Fig. 1 is a sectional view showing an embodiment of an emulsion formation apparatus.

Fig. 2 is a bottom view of the portion A of Fig. 1.

Fig. 3 is a plan view of the portion B of Fig. 1.

Fig. 4 is a side view of the portion B of Fig. 1.

An embodiment of the emulsion formation apparatus of the present invention will be explained with reference to Figs. 1 to 4.

Fig. 1 is a longitudinal sectional view of the emulsion formation apparatus 30. As shown in Fig. 1, the emulsion formation apparatus of this embodiment is equipped with a cylindrical pump housing 31, and this pump housing 31 is divided in an axial direction into three units, that is, a suction portion A, a pump portion B and a motor portion C that are mutually coupled in the axial direction by bolts.

Fig. 2 is a bottom view of the suction portion A of Fig 1, Fig. 3 is a top view of the pump portion B of Fig. 1 and Fig. 4 is a side view of the pump portion B of Fig. 1. As shown in Figs. 1 to 4, a cylindrical pump chamber 33 is defined inside the pump portion B, a radial impeller 35 is disposed inside the pump chamber 33 and an electric motor 50 fixed to the motor portion C drives the impeller 35 for rotation.

A cylindrical inlet chamber 37 of the emulsion formation apparatus 30 forming a suction chamber for the impeller 35 is defined coaxially with the radial impeller 35 inside the suction portion A as shown in Fig. 1.

As shown in Figs. 1 and 2, an oil charging pipe 38 and a recycling charging pipe 39 are connected to the upper side surface of the inlet chamber 37 in a tangential direction with respect to the section of the inlet chamber 37. A fluid flowing into the inlet chamber 37 in the tangential direction from the oil charging pipe 38 and the recycling charging pipe 39 is allowed to generate a swirling flow inside the suction chamber.

rotating in the same direction as the rotating direction or the radial impeller. A water jet valve 40 which is opened and closed electromagnetically is disposed at the upper part of the inlet chamber 37 on its axis.

A cylindrical wall 34 is formed in the pump chamber 33. This wall 34 is extended with a small clearance in the radial direction with respect to the outer periphery of the radial impeller 35 and its height in the axial direction is substantially equal to the thickness of the radial impeller 35 in the axial direction.

As shown in Figs. 3 and 4, a notch 41 having a fanshaped section with respect to the center of the pump chamber 33 is formed on the wall 34. The center angle 47 of this notch 41 is within the range of 45° to 120° but preferably is about 60°.

An outflow port 43 to an emulsion outflow pipe 36 is so disposed as to open to the terminal end portion of the fanshaped notch 41 on its downstream side along the rotating direction of the impeller. The outflow port 43 is connected to the emulsion outflow pipe 36 through an outflow pipe 44 which is extended in parallel with the axis. The outflow pipe 44 is formed in the pump portion B of the housing 31 by drill machining, or the like. The diameter of the outflow pipe 44 is smaller than the width of the fanshaped notch 41 in its radial direction and this pipe 44 is disposed at the position as close as possible to the terminal end portion of the notch 41. To increase the sectional area of the outflow port 43, the outflow port 44 may have an elliptic sectional shape. The flat bottom surface 46 of the notch 41 is inclined towards the outflow port 43, and the height of the notch is equal to the thickness of the impeller 35 in the axial direction at the position of disposition of the outflow port 43 of the outflow pipe 44.

On the side of the outflow port 43 of the notch 41, on the other hand, the wall 34 defines a semicylindrical terminal end wall 42 in such a manner as to cover the half of the outflow port 43 along the open shape of the outflow port 43.

The emulsion flowing out from the impeller 35 impinges against this terminal end wall 42, changes its direction in the axial direction and flows into the outflow pipe 44 from the

outflow port 43.

Though the terminal end wall 42 is shown formed in the semicylindrical shape so as to cover the half of the outflow port 43, it may consist of a cylindrical surface encompassing a quarter of the outflow port 43 and a flat surface extending in the radial direction while comming into contact with the former. In such a case, it is preferred that the outflow port 43 be formed as near as possible to the center of the pump chamber 33 so that the end portion of the cylindrical surface of the termial end wall 42 forms a knife edge 49. This knife edge 49 cuts off the emulsion flowing out from the radial impeller 35 from its outer periphery, and a substantially full quantity of the emulsion flows into the outflow port 43.

The radial impeller 35 has a disc shape as shown in Fig. 1 and a radial cover disc 57 is fitted to the impeller 35 on the side of the motor 50. A plurality of impeller blades 52 are fixed onto the cover disc 57.

When the apparatus of the present invention is used for a Diesel engine, the fuel pump discharge pipe of the engine is connected to the oil injection pipe 38, and high pressure water is fed from a water feed circuit to the water jet valve 40 through a high pressure pump. A feed pipe of the fuel injection pump of the engine is connected to the outlet of the emulsion outflow pipe 36 and the recycling fuel pipe from the fuel injection pump is connected to the recycling injection pipe 39.

The radial impeller 35 is preferably rotated at a constant speed of 3,000 r.p.m., for example, by the motor 50. The oil is injected by the fuel pump into the inlet chamber 37 in the tangential direction at a pressure of 1 to 3 bars, for example. Water is pressurized to 10 to 15 bars, for example, by a high pressure pump which is electrically or mechanically driven by the engine. This pressure is reduced to 5 to 7 bars by a pressure reducing valve, and is jetted into the inlet chamber 37 while being intermittently controlled by the jet valve 40 which is electromagnetically operated. The emulsion flowing out from the radial impeller 35 flows into the notch 41, is then intercepted by the terminal end wall 42 and flows into the outflow pipe 44 of the emulsion outflow pipe 36 in the axial

direction. At this time, the emulsion is cut off from the emulsion portion inside the radial impeller 35 by the sharp edge 49. The excessive fuel recycling from the fuel injection pump is returned into the inlet chamber 37 through the recycling injection pipe 39, where it is mixed again with the new oil and water injected afresh. The feed of the new oil and water is carried out while being controlled so that the overall recycling circuit is always filled as completely as possible without any bubbles in accordance with recycling.

The water jet valve 40 can control the water charging quantity into the inlet chamber 37 as its opening/closing interval is changed. A water charging quantity judgement/regulation circuit sets the water content of the emulsion in accordance with the combustion state in the cylinder, calculates the required water charging quantity from the quantity of the fuel oil fed from the fuel pump into the emulsion formation apparatus and from the set water content, and charges a required quantity of water by controlling the opening/closing interval of the water jet valve 40.

The experiments carried out by the present Applicant reveal that an extremely fine and homogeneous water particle emulsion can be formed when the pressure difference between the pressure of water fed to the water jet valve 40 and the pressure of the oil supplied to the inlet chamber 37 (water pressure - oil pressure) is at least 0.5 bars irrespective of the existence of the radial impeller if an ordinary nozzle diameter (about 0.5 mm) is used for the water jet valve 40, and the corrosion property can be drastically reduced in comparison with an ordinary oil-water emulsion.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS;

1. An oil-water emulsion formation apparatus comprising:

a rotationally symmetrical inlet chamber;

an oil inlet passage and a recycling charging passage opening into said inlet chamber in a tangential direction;

a water jet nozzle disposed at one of the ends of said inlet chamber in an axial direction, subjected to electric opening/closing control, and jetting water into said inlet chamber;

a pump chamber formed at the other end of said inlet chamber in the axial direction;

a pump impeller having a radial shape, fitted coaxially with the axis of said inlet chamber inside said pump chamber and being surrounded by a cylindrical wall of said pump chamber along the outer periphery of said pump impeller, said pump impeller being driven for rotation by a driving source;

a notch portion formed in said wall of the said pump chamber;

an emulsion outlet opening to a direction parallel to the axis of rotation of said pump impeller in the proximity of the end portion of said notch portion on the downstream side in the rotating direction of said pump impeller; and

a terminal end wall for intercepting the emulsion flow flowing inside said notch portion in the rotating direction of said pump impeller.

2. An oil-water emulsion formation apparatus according to claim 1, wherein the terminal end wall surrounding the outflow port of the emulsion outlet has a semicylindrical shape and ends in a sharp edge at its radially inner end.

3. An oil-water emulsion formation apparatus according to claim 1 or 2, wherein the notch portion has a flat bottom which is inclined in such a way that the depth of the notch portion increases toward the outflow port of the emulsion outlet.

4. An oil-water emulsion formation apparatus according to any of claims 1 to 3, wherein the notch portion extends along a center angle of the impeller of about 60°.

5. Use of the oil-water emulsion formation apparatus according to any of claims 1 to 4 for supplying the emulsion to the injection pump of a diesel engine.

6. A fuel oil water emulsion formation apparatus substantially as hereinbefore described with reference to Figures 1 to 4 of the drawings.

DATED this 29th day of March 1996

JOSEF SCHREYOGG
Patent Attorneys for the Applicant:

F.B. RICE & CO.

11772/92

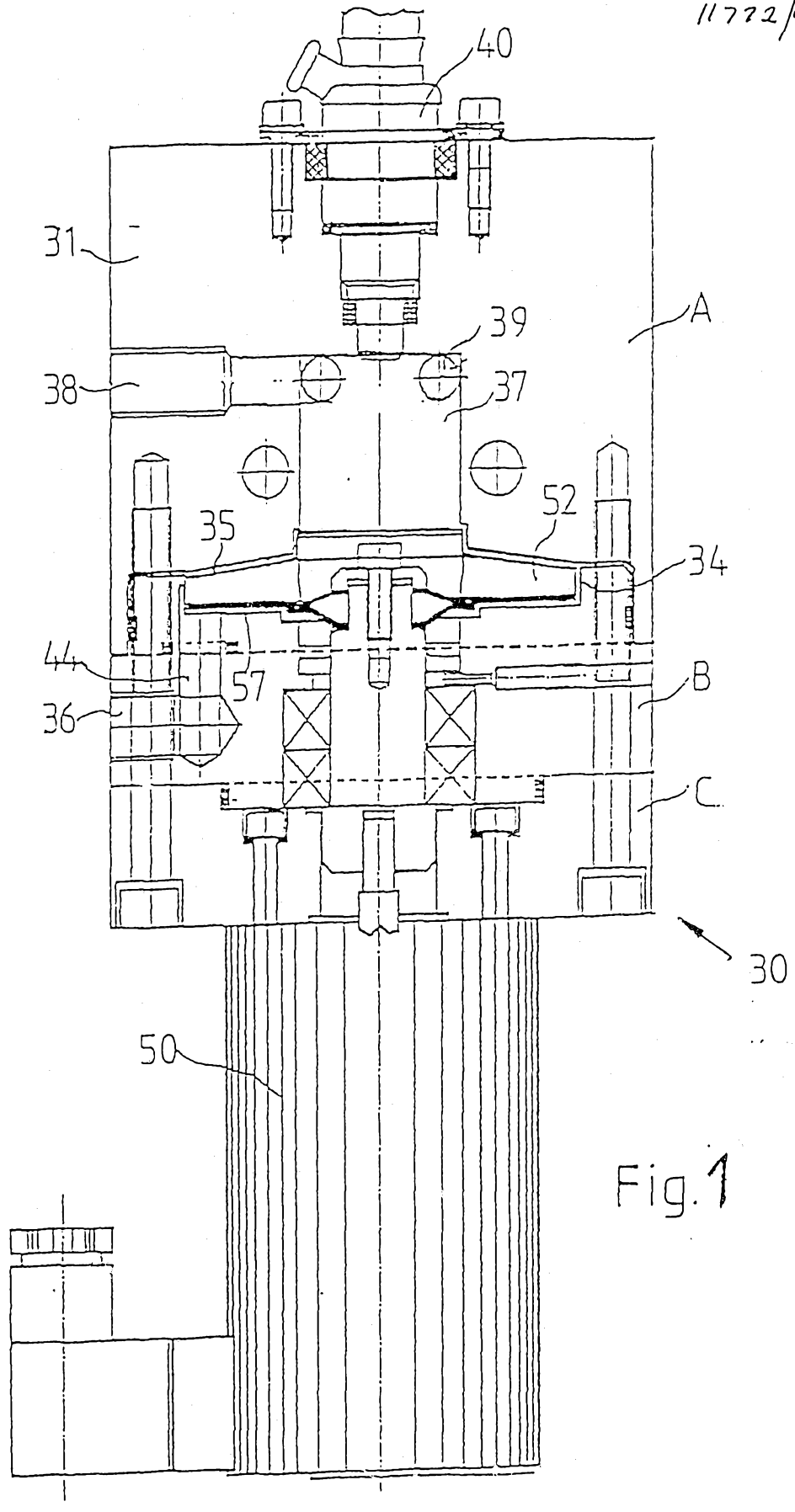


Fig. 1

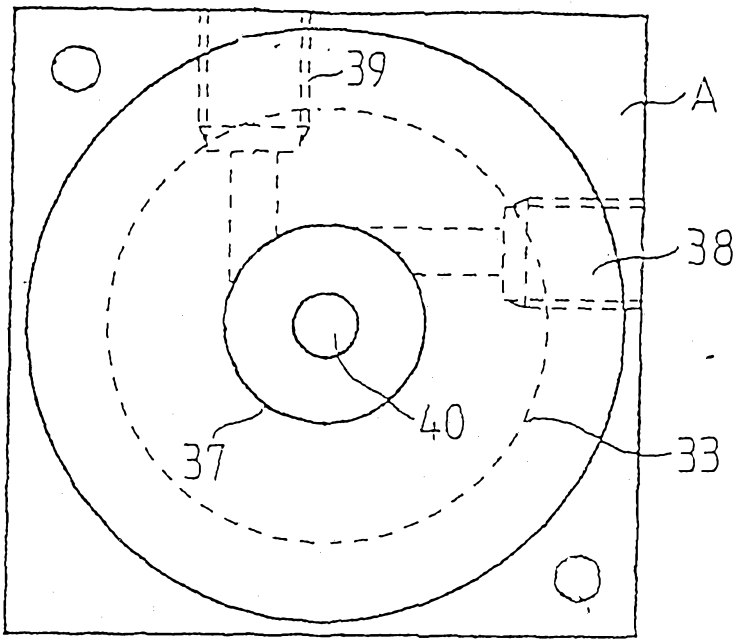


Fig. 2

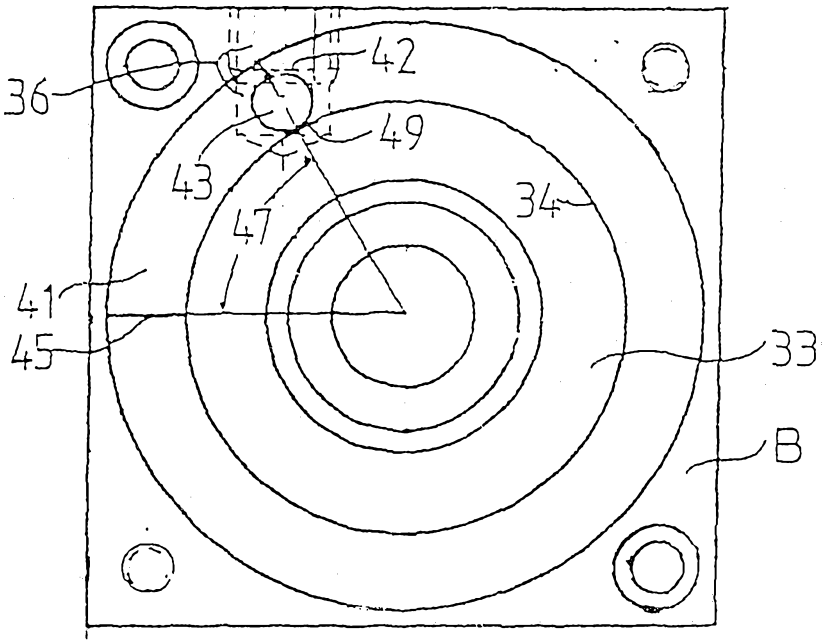


Fig. 3

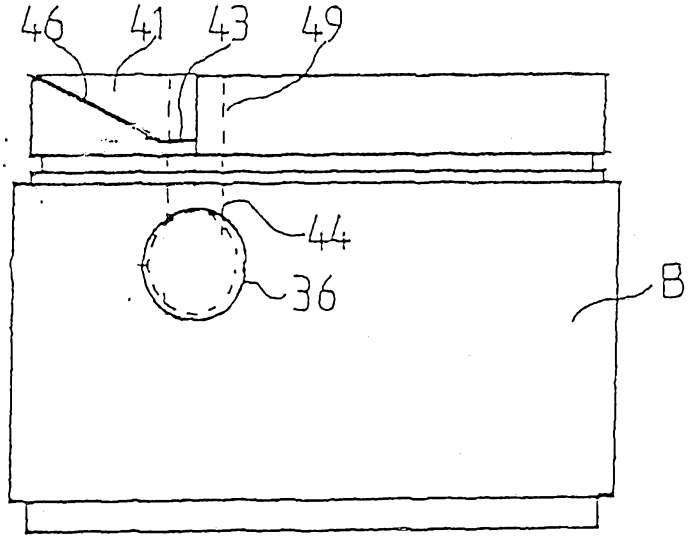


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 92/00140

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 F02D19/12; F02M25/02

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	F02M ; F02D ; F02B ; B01F F23K

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	DE,A,3 504 699 (WINKLER) 14 August 1986 see page 2, paragraph 1-3; claims 1,2 see page 2, paragraph 6 see page 3, paragraph 1 see page 3, paragraph 3	1,3
Y	see page 4, line 1 - page 5, line 4	2-5
Y	US,A,2 958 317 (MCNALLY) 1 November 1960 see column 1, line 15 - line 21 see column 2, line 13 - line 28 see column 2, line 33 - line 53 see column 3, line 59 - line 63 see column 4, line 68 - line 72 see column 7, line 38 - line 44	3,4

-/--

[10] Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

2

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
04 FEBRUARY 1993	16. 02 93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	JORIS J.C.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
Y	EP,A,0 392 545 (HARRIER GMBH) 17 October 1990 see abstract	2,5,9
A	see page 5, left column, line 31 - right column, line 29; figures 1,2	6
X	DE,A,3 237 305 (MTU) 12 April 1984 see page 5, line 6 - line 7 see page 5, paragraph 3	1,3
Y	see page 6, line 7 - line 11	9
A	see page 6, paragraph 4 - page 7, paragraph 2; claims 1,4,5	4,5
X	DE,C,3 523 687 (DAIMLER-BENZ) 3 July 1986 see abstract see column 1, line 36 - line 63 see column 2, line 60 - column 3, line 18	1,3
X	GB,A,2 109 457 (DYNATROL CONSULTANTS) 2 June 1983 see abstract see page 1, line 19 - line 24 see page 2, line 5 - line 12 see page 2, line 108 - line 114 see page 2, line 130 - page 3, line 32 see page 4, line 17 - line 25 see page 4, line 31 - line 36	1,3
A	see page 4, line 45 - line 60; figures 1-3	6
X	EP,A,0 285 190 (AGIP PETROLI) 5 October 1988 see abstract see column 1, line 1 - line 13 see column 1, line 20 - line 39 see column 2, line 42 - line 44 see column 3, line 52 - column 4, line 8	9
X	US,A,4 388 893 (APFEL) 21 June 1983 see abstract see column 1, line 6 - line 11 see column 4, line 12 - line 36 see column 4, line 59 - line 64 see column 6, line 4 - line 11	1,2
X	PATENT ABSTRACTS OF JAPAN vol. 7, no. 55 (M-198)(1200) 5 March 1983 & JP,A,57 200 657 (TOYO KOGYO) 8 December 1982 see abstract	1,3

-/--

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	THE MOTOR SHIP vol. 70, no. 829, 1 August 1989, SUTTON (GB) pages 17 - 18 'The use of emulsified fuels' see page 17, right column, line 1 - line 6 see page 17, right column, line 23 - line 37	1,9
A	EP,A,0 392 545 (HARRIER GMBH) 17 October 1990 see column 5, line 31 - column 6, line 29; figures 1,2	6
A	GB,A,2 109 457 (DYNATROL CONSULTANTS) 2 June 1983 see page 2, line 108 - line 114 see page 2, line 130 - page 3, line 32; figures 2,3	6
A	EP,A,0 201 767 (YTRON GMBH) 20 November 1986	
A	EP,A,0 285 190 (AGIP PETROLI) 5 October 1988 see column 2, line 48 - column 3, line 3 see column 3, line 30 - line 42 see column 3, line 53 - column 4, line 8	7
A	EP,A,0 392 545 (HARRIER GMBH) 17 October 1990 see column 5, line 31 - line 47 see column 6, line 5 - line 19; figure 1	7,8
A	DE,C,3 523 687 (DAIMLER-BENZ) 3 July 1986 see column 2, line 67 - column 3, line 18; figure 1	7

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 9200140
SA 55420

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 04/02/93

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-3504699	14-08-86	DE-A-	3508577	06-11-86
US-A-2958317		None		
EP-A-0392545	17-10-90	DE-A-	3912344	18-10-90
		AU-A-	5406890	16-11-90
		CA-A-	2027576	15-10-90
		DE-A-	5900003	27-02-92
		WO-A-	9012959	01-11-90
		EP-A-	0424488	02-05-91
		JP-A-	3080926	05-04-91
		US-A-	5125367	30-06-92
DE-A-3237305	12-04-84	None		
DE-C-3523687	03-07-86	JP-B-	3027751	16-04-91
		JP-A-	62007961	14-01-87
		US-A-	4732114	22-03-88
GB-A-2109457	02-06-83	None		
EP-A-0285190	05-10-88	JP-A-	63230955	27-09-88
		US-A-	4831970	23-05-89
US-A-4388893	21-06-83	None		
EP-A-0392545	17-10-90	DE-A-	3912344	18-10-90
		AU-A-	5406890	16-11-90
		CA-A-	2027576	15-10-90
		DE-A-	5900003	27-02-92
		WO-A-	9012959	01-11-90
		EP-A-	0424488	02-05-91
		JP-A-	3080926	05-04-91
		US-A-	5125367	30-06-92
GB-A-2109457	02-06-83	None		
EP-A-0201767	20-11-86	DE-A-	3517879	20-11-86
		US-A-	4729663	08-03-88

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 9200140
SA 55420

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04/02/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0285190	05-10-88	JP-A- 63230955	27-09-88
		US-A- 4831970	23-05-89
EP-A-0392545	17-10-90	DE-A- 3912344	18-10-90
		AU-A- 5406890	16-11-90
		CA-A- 2027576	15-10-90
		DE-A- 5900003	27-02-92
		WO-A- 9012959	01-11-90
		EP-A- 0424488	02-05-91
		JP-A- 3080926	05-04-91
		US-A- 5125367	30-06-92
DE-C-3523687	03-07-86	JP-B- 3027751	16-04-91
		JP-A- 62007961	14-01-87
		US-A- 4732114	22-03-88