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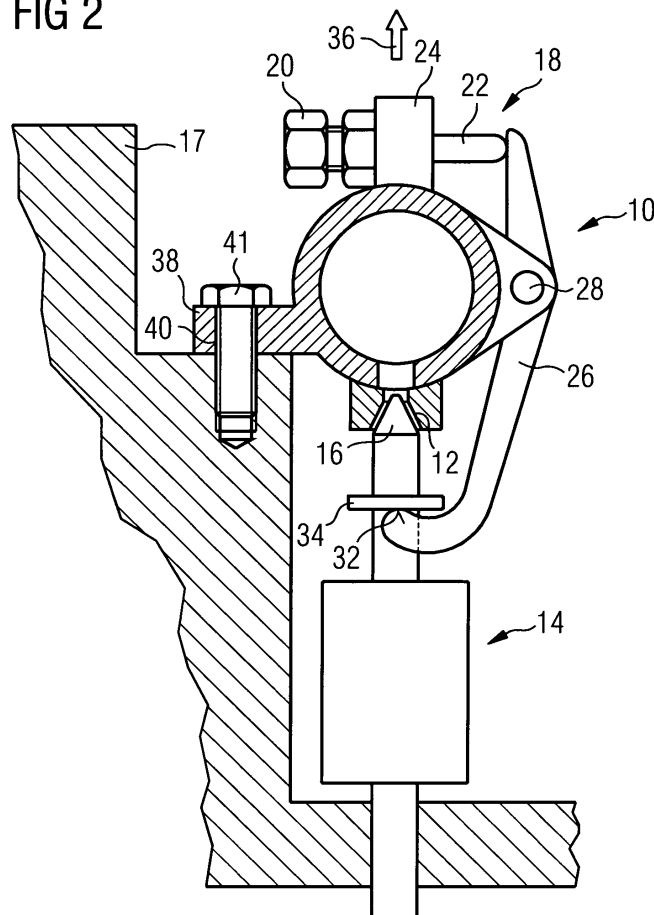
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57121 Livorno (IT)**(54) **Verbindung und System**

(57) A system comprises at least one connector and at least one connecting device (14) with a counter connecting part (16). The connector (10) has a connecting part (12) being designed for mating with a counter connecting part (16) of the connecting device (14). The connector (10) comprises at least one lever being pivotally arranged in the connector (10) and being mechanically

coupled to a lifting unit (18), such that a change in lift of the lifting unit (18) is transformed into a pivoting movement of the lever. The lever is designed and arranged such, that the pivoting movement results in an axial displacement in an axial direction of the connecting part (12) of a coupling area (32) of the lever being provided for being coupled with the connecting device (14).

FIG 2

Description

[0001] The invention relates to a connector that is suitable for connecting to a connector device. The invention further relates to a system with the connector and the connecting device. The connector and the system are in particular suitable for use in a fuel supply device of an internal combustion engine.

[0002] From WO 01/71179 A2, an injection valve for an internal combustion engine is known and the arrangement of the injection valve in a fuel feed device of an internal combustion engine. The injection valve has a connecting element that is fitted into a tubular recess of a connection of a fuel rail. The connecting element of the injection valve also has a tubular recess. The injection valve has a sealing ring that is arranged radially around the connecting element. Furthermore, a thread, a mating thread, a ring and a taper are provided that interact with each other in such a way that when the thread is screwed onto the mating thread the ring tensions the taper radially in the direction of the connecting element of the injection valve and thus fixes the connecting valve. To use this arrangement for fuel feed devices with very high pressures, such as for example occur in internal combustion engines with direct fuel injection, where pressures of 180 bar occur for gasoline and up to 2000 bar for diesel, the individual elements must be very precisely manufactured to guarantee a good seal.

[0003] An object of the invention is to provide a connector which is reliable and also simple. It is a further object of the invention to provide a system which is reliable and simple.

[0004] The object is achieved with regard to the connector by the features of independent claim 1. The object is achieved with regard to the system by the features of claim 7.

[0005] Advantageous embodiments of the invention are given in the sub claims.

[0006] According to a first aspect the invention is distinguished by a connector having a connecting part being designed for mating with a counter connecting part of a connecting device. The connector comprises at least one lever being pivotably arranged in the connector. The lever is mechanically coupled to a lifting unit such that a change in lift of lifting unit is transformed into a pivoting movement of the lever. The lever is designed and arranged such, that the pivoting movement results in an axial displacement in an axial direction of the connecting part of a coupling area of the lever. The coupling area of the lever is provided for being coupled with the connecting device. In this way a torque stress free connection between the connecting part and the counter connecting part is enabled. This further enables to dimension the parts more compact due to the absence of the need to over dimension parts and order to withstand high torque stress.

[0007] The connector further is distinguished by, that the connector device may be pre-assembled with the connector by changing the lift of the lifting unit in the given

first way and then when finally assembling the connector with the connecting device further changing the lift in order to reach a final assembly position.

[0008] According to a preferred embodiment of the first aspect of the invention the lifting unit comprises a screw for setting the lift of the lifting unit. This renders the lifting unit very simple and at the same time effective.

[0009] According to further preferred embodiment of the first aspect of the invention the connector comprises at least a first and a second lever being arranged such that a corresponding transversal displacement perpendicular to the axial direction resulting from the pivoting movement is in opposite directions of the first and respectively second lever. In this way a transversal torque may be minimized with the consequence of minimizing a possible disalignment in respect to the axial direction.

[0010] According to a further preferred embodiment of the first aspect of the invention the connector comprises a fuel rail and the connecting device comprises a fuel injector. This enables to connect the fuel rail in a simple way with the fuel injector.

[0011] In a further preferred embodiment of the first aspect of the invention the connector comprises more than one connecting part. Respective levers are associated to the respective connecting parts. The lifting unit is associated to respective levers associated to multiple connecting parts. This may be very cost effective as less lifting units compared to levers are needed.

[0012] In this respect it is particular advantageous, if the connector is provided with adjustment elements being associated to the respective levers and being in their effect interposed between the lifting unit and the respective lever. This enables to compensate for individual differences in the levers or respectively the connecting part of the counter connecting part or the connecting device.

[0013] According to a second aspect of the invention a system is provided comprising at least one connector according to the first aspect of the invention and at least one connecting device with a counter connecting part. The advantages of the system correspond to the advantages of the first aspect of the invention. Also the preferred embodiments correspond to each other.

[0014] Exemplary embodiments of the invention are explained in the following with the aid of schematic drawings. These are as follows:

Figure 1 an internal combustion engine with a fuel feed device,

Figure 2 a system with a connector and

Figure 3 a further embodiment of the connector.

[0015] Elements of the same design or function that occur in different illustrations are identified by the same reference character.

[0016] A fuel feed device is assigned to an internal combustion engine (Figure 1). The fuel feed device is

designed for use in internal combustion engines with direct metering of the fuel to the cylinders of the internal combustion engine at high pressure, for example 200 bar. It includes a fuel tank 1, that is connected via a first fuel line to a low-pressure pump 2. At its output the low-pressure pump 2 is connected to an inlet 4, of a high-pressure pump 5. Furthermore, at the output of the low-pressure pump 2, a mechanical regulator 3 is provided, the output of which is actively connected via a further fuel line to the fuel tank 1. The inlet 4 is connected to the high-pressure pump 5 that at its output pumps fuel to the fuel rail 6. The high-pressure pump 5 is usually driven by the crankshaft or camshaft of the internal combustion engine and thus at a constant speed of the crankshaft delivers a constant fuel volume to the fuel rail 6.

[0017] Injection valves 8 are actively connected to the fuel rail 6. The fuel is thus fed to the injection valves 8 via the fuel rail 6. The injection valves 8 have a sealed connection to the fuel rail 6.

[0018] A system (figure 2) comprises a connector 10 with a connecting part 12. It further comprises a connecting device 14 with a counter connecting part 16. The connector 10 preferably comprises the fuel rail 6. The connecting device 14 preferably comprises the injection valve 8. The connecting part 12 and the counter connecting part 16 are sealingly coupled with each other in an assembled state of the system and in this way enable a fluid flow, in particular a fuel flow, from the fuel rail into the fuel injector for dosing a fuel to a combustion chamber of an internal combustion engine. Preferably the system is mounted on a cylinder head 17 of the internal combustion engine.

[0019] The connector 10 comprises a lifting unit 18 with a screw, that is partly taken in by a reception unit 24 and a pin 22, that may be a separate part from the screw 20 but may also be formed in one part with the screw 20. The pin 22 is mechanically coupled to a lever 26, 42, 44, 46. The lever 26, 42, 44, 46 is pivoted in a bearing 28 and is pivotable along an axis of the bearing 28. Therefore a change in a lift of the lifting unit 18 is transformed into a pivoting movement of the lever 26, 42, 44, 46. The lever 26, 42, 44, 46 is designed and arranged such, that the pivoting movement results in an axial displacement in an axial direction, denoted by the arrow 36, results in an axial displacement in an axial direction of the connecting part 12 of a coupling area 32 of the lever 26, 42, 44, 46.

[0020] The coupling area 32 of the lever 26, 42, 44, 46 is provided for being coupled with the connecting device. For this purpose the connecting device 14 may be provided with a ledge 34.

[0021] When the screw 20 is turned in way, that the pin 22 is moved in direction towards the lever 26 the resulting pivoting movement results in an increase of a force directed in the axial direction of the connecting part 12. This increases the force acting on the connecting device 14 and pushes it towards the connecting part 12 with its counter connecting part 16. At the same time the coupling area 32 of the lever 26, 42, 44, 46 slides trans-

versally along the ledge 34 of the connecting device 14.

[0022] The system may be assembled by first of all turning the screw 20 in a way to enable an insertion of the connecting device 14, which may comprise the fuel injector 8. After inserting the connecting device 14 the screw 20 is turned in a way in order to at least loosely fix the connecting device with its counter connecting part 16 with the connecting part 12.

[0023] The connector 18 may comprise further levers 42, 44, 46, which may be coupled to further connecting devices. In this case also the other connecting devices may be coupled to the connector 10 in this pre-assembly step.

[0024] In the next step the connector may be fixed into the cylinder head 17 by inserting a screw 41 into a recess 40 of a fixing bracket (38) and threading it into the cylinder head 17. After that preferably the screw 20 is further turned in order to tightly and sealingly fix the counter connecting part 16 to the connecting part 12. The connector 18 preferably comprises the fuel rail 6 and the connecting device 14 preferably comprises the fuel injector 8. In this way fluid may flow from the fuel rail 6 into the fuel injector 8 in order to be dosed into a combustion chamber of the internal combustion engine.

[0025] This way of assembling the system enables in a simple way to pre-assemble the fuel injectors 8 with the fuel rail 6 prior to mounting it on to the cylinder head 17. In a preferred embodiment first and second levers are associated to each respective connecting device. They are arranged such that a corresponding transversal displacement perpendicular to the axial direction resulting from the pivoting movement when increasing the force between the connecting part 12 and the counter connecting part 16, is in opposite direction for the first and respectively the second lever. In this way a possibly resulting transversal torque or force may be minimized.

[0026] In a further alternative embodiment one lifting unit 18 is associated to multiple levers being themselves associated to various connecting devices. In this embodiment it is preferred to have a plate 48 being coupled with the screw 20 and transmitting the lift of the lifting unit to the various levers 26, 42, 44, 46. It is in this context preferred to have adjusting elements 52, 54, 56, 58 in order to compensate for individual differences between the various connecting devices and possibly the various connecting parts 12 or levers 26, 42, 44, 46.

Claims

1. Connector having a connecting part (12) being designed for mating with a counter connecting part (16) of a connecting device (14), with the connector (10) comprising at least one lever (26, 42, 44, 46) being pivotably arranged in the connector (10), being mechanically coupled to a lifting unit (18) such that a change in lift of the lifting unit (18) is transformed into a pivoting movement of the lever and the lever (26,

42, 44, 46) being designed and arranged such, that the pivoting movement results in axial displacement in an axial direction of the connecting part (12) of the coupling area (32) of the lever (26, 42, 44, 46) being provided for being coupled with the connecting device (14). 5

2. Connector according to claim 1, with the lifting unit (18) comprising a screw (20) for setting the lift of the lifting unit (18). 10
3. Connector according to one of the previous claims, with the connector (10) comprising at least a first and a second lever being arranged such that a corresponding transversal displacement perpendicular to the axial direction resulting from the pivoting movement is in opposite directions for the first and respectively second lever (26,42,44,46). 15
4. Connector according to one of the previous claims, comprising a fuel rail (6) and with the connecting device (14) comprising a fuel injector (8). 20
5. Connector according to one of the previous claims, comprising more than one connecting part (12) and the lifting unit (18) being associated to respective levers (26,42,44,46) associated to multiple connecting parts (12). 25
6. Connector according claim 5, being provided with adjustment elements (52, 54, 56, 58) being associated to the respective levers (26,42,44,46) and being in their effect interposed between the lift unit (18) and the respective lever. 30
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7. System comprising at least one connector (10) according to one of the previous claims and at least one connecting device (14) with a counter connecting part (16). 40

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FIG 1

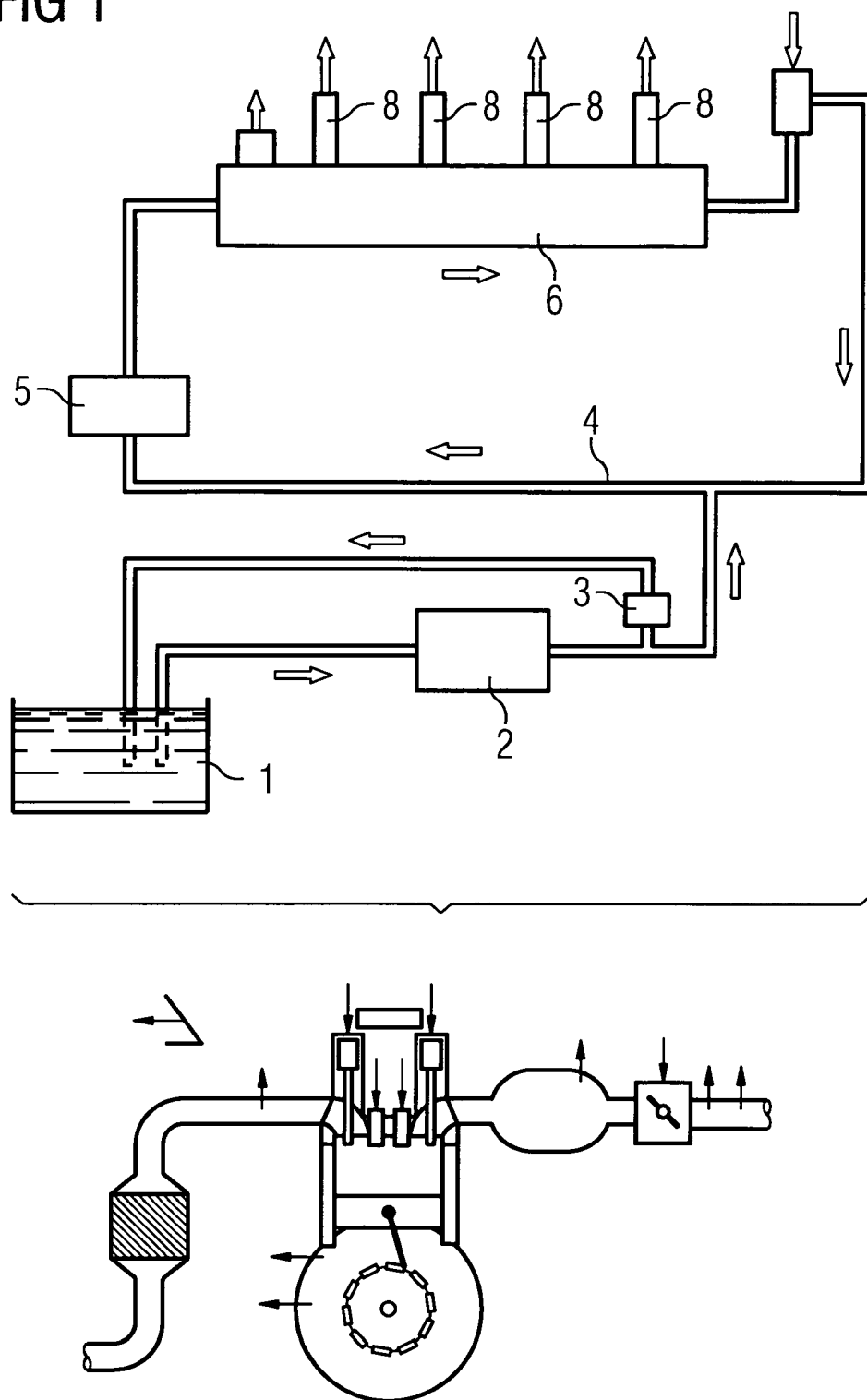


FIG 2

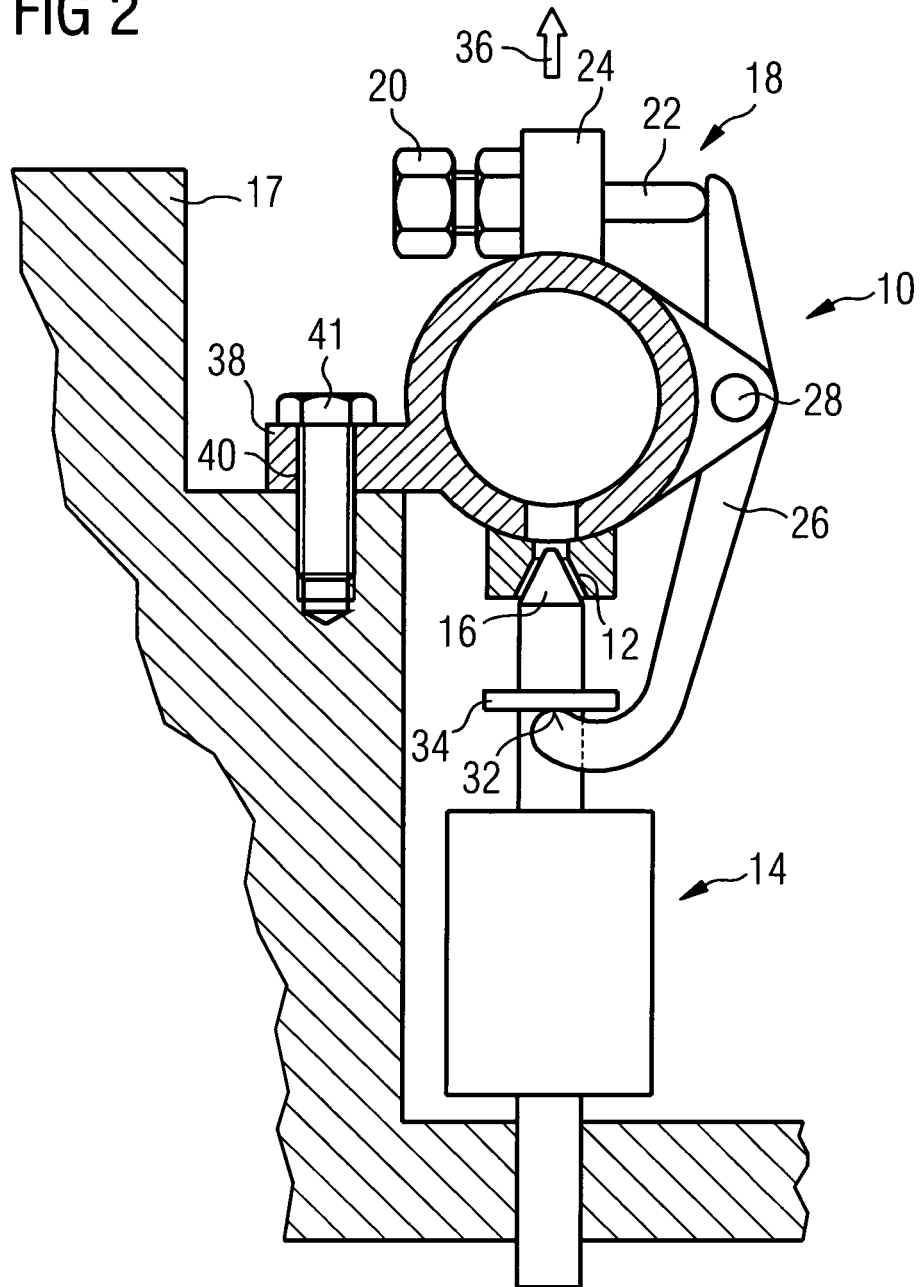
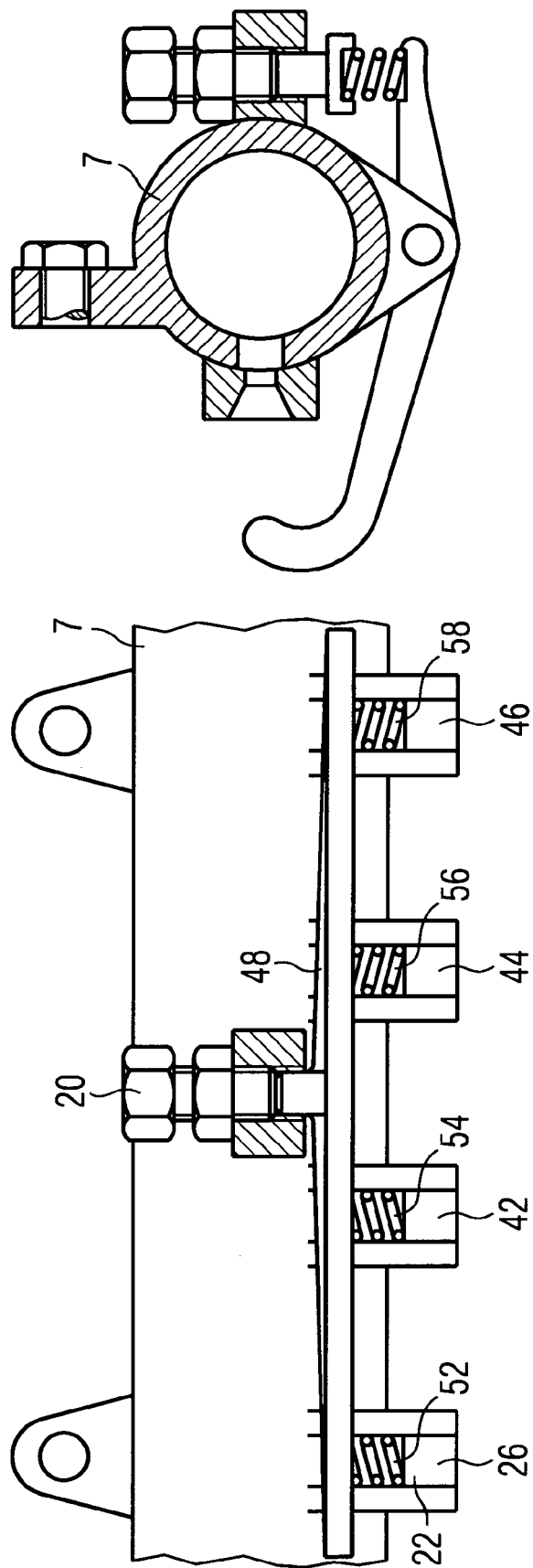


FIG 3





Europäisches
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EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 05 01 5671

EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.7)
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EPO FORM 1503 03.82 (P04C03)

**ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT
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In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am
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07-10-2005

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Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82

REFERENCES CITED IN THE DESCRIPTION

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