US 20130146524A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0146524 A1

(43) Pub. Date: Jun. 13, 2013

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(54) **FUEL FILTER OF AN INTERNAL COMBUSTION ENGINE AND FILTER ELEMENT OF A FUEL FILTER**

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(21) Appl. No.: **13/709,360**

(22) Filed: **Dec. 10, 2012**

(30) **Foreign Application Priority Data**

Dec. 9, 2011 (DE) 102011120648.9

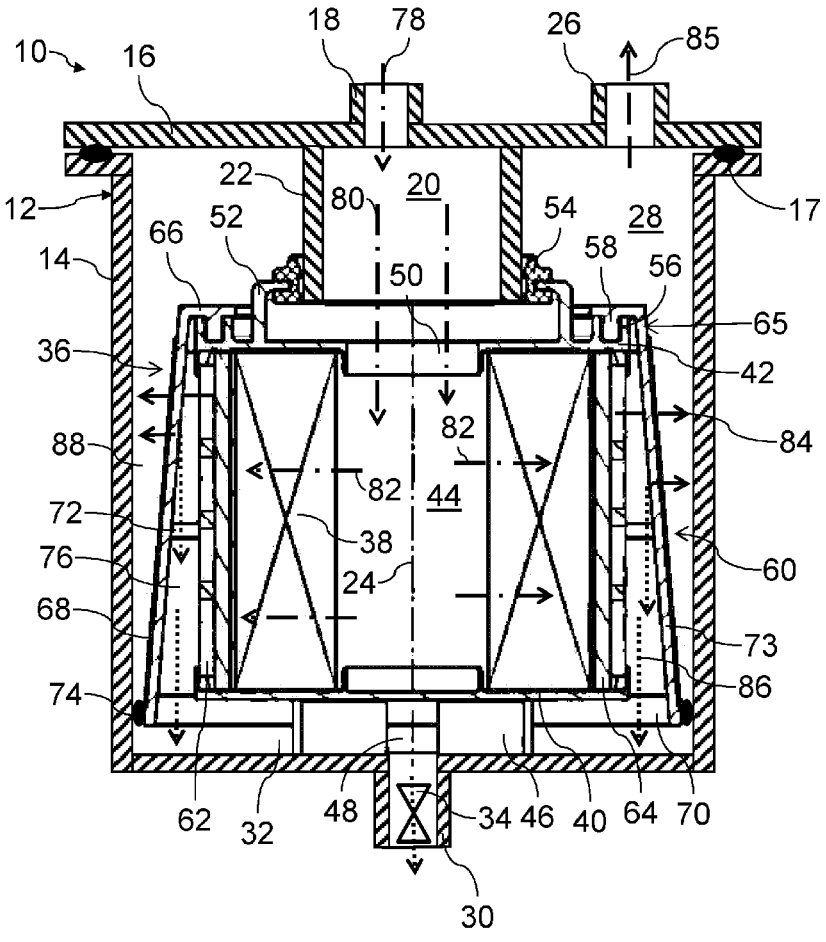
Publication Classification

(51) **Int. Cl.**
F02M 37/22 (2006.01)

(52) **U.S. Cl.**
CPC *F02M 37/221* (2013.01)
USPC **210/300**; 210/315

(57) **ABSTRACT**

A fuel filter of an internal combustion engine has a housing with a fuel inlet, a fuel outlet for cleaned fuel, and a water outlet for water separated from the fuel. A filter element is arranged in the housing and separates fuel inlet and fuel outlet seal-tightly. The filter element has a filter medium configured as a hollow member for filtering the fuel and further has a hydrophobic fuel-permeable separating medium embodied as a hollow member for separating water from the fuel. The separating medium is arranged in flow direction of the fuel downstream of the filter medium and is positioned inside the filter medium or surrounds the filter medium. Between the filter medium and the separating medium a precipitation slot is realized that has a conical shape and is connected with the water outlet. The separating medium extends at least across the entire extension of the filter medium.



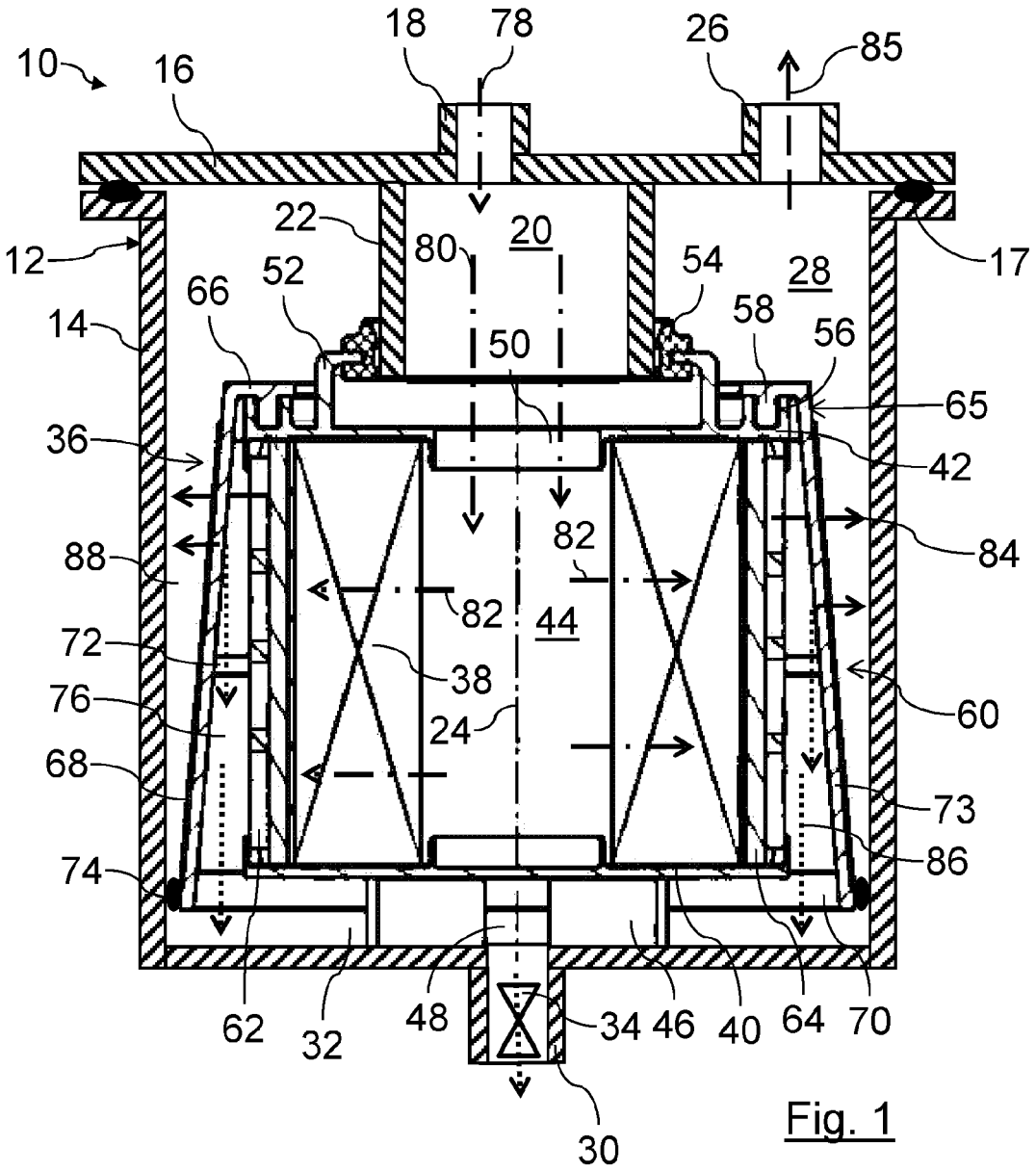

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Fig. 1

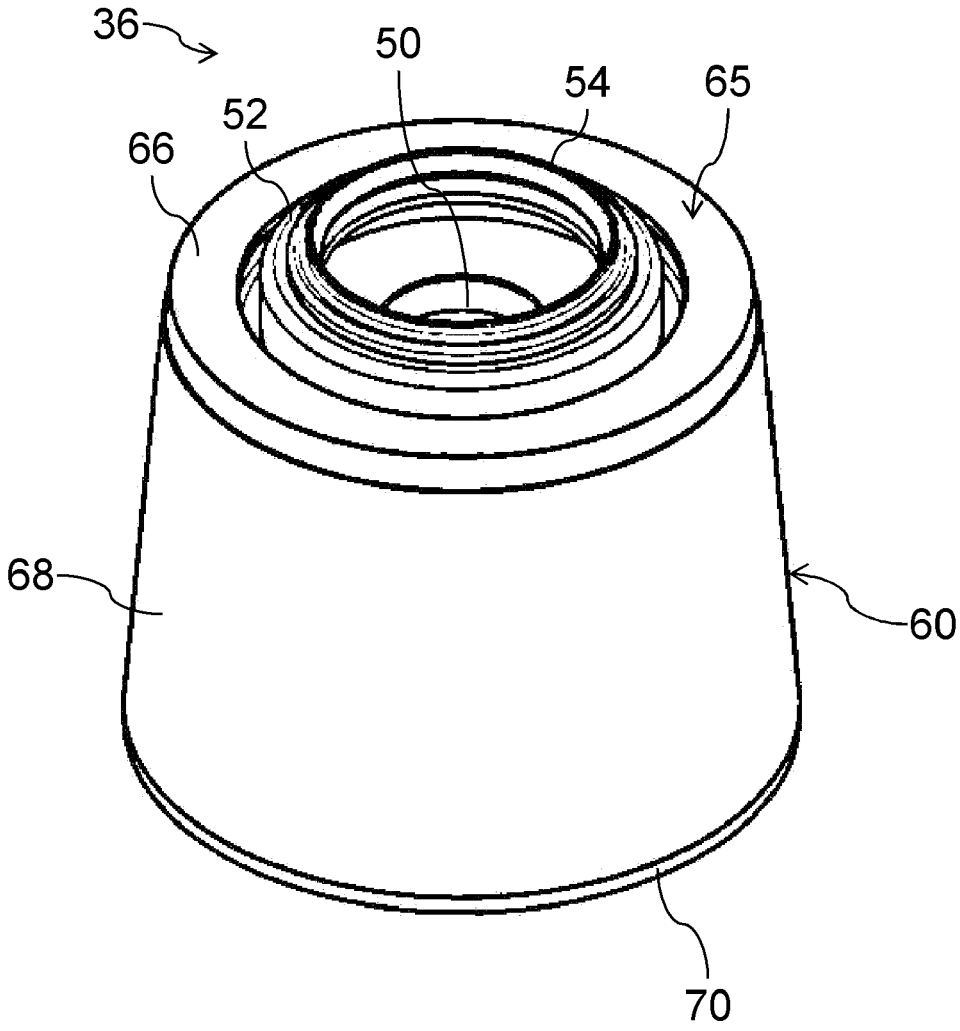

Fig. 2

FUEL FILTER OF AN INTERNAL COMBUSTION ENGINE AND FILTER ELEMENT OF A FUEL FILTER

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of foreign application DE 102011120648.9 filed in Germany on Dec. 9, 2011, and which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] The invention concerns a fuel filter of an internal combustion engine, in particular of a motor vehicle, comprising a housing comprising at least one fuel inlet for the fuel to be cleaned, at least one fuel outlet for the cleaned fuel, and at least one water outlet for water separated from the fuel, and in which a filter element is arranged that separates the fuel inlet seal-tightly from the fuel outlet, that comprises a filter medium configured as a hollow member for filtering the fuel and, in flow direction of the fuel downstream of the filter medium, in its interior or surrounding it, comprises a hydrophobic fuel-permeable separating medium embodied as a hollow member for separating water contained in the fuel, that are arranged such that between the filter medium and the separating medium a precipitation slot is realized that widens conically and that is connected with the water outlet.

[0003] Moreover, the invention concerns a filter element of a fuel filter of an internal combustion engine, in particular of a motor vehicle, which can be arranged in a housing of the fuel filter so that it separates a fuel inlet of the housing seal-tightly from a fuel outlet, that comprises a filter medium configured as a hollow member for filtering the fuel and, in flow direction of the fuel downstream of the filter medium, in its interior or surrounding it, comprises a hydrophobic fuel-permeable separating medium embodied as a hollow member for separating water contained in the fuel, that are arranged such that between the filter medium and the separating medium a precipitation slot is realized that widens conically and that is connectable to a water outlet of the housing.

[0004] EP 1 233 173 A2 discloses a liquid filter for fuels as it is used for cleaning diesel fuel. The liquid filter has a filter housing with an inlet connector for diesel fuel to be cleaned and an outlet connector for cleaned diesel fuel. Moreover, the liquid filter has a central tube that is used for removing water that has been separated from the diesel fuel. In the interior of the housing a filter element is arranged in such a way that is disposed between the inlet connector and the outlet connector. The filter element has a star-shaped insert that is flowed through in radial direction from the exterior to the interior. In the upper area of the interior of the star-shaped insert, a separating insert is arranged that has a conical shape. This separating insert is comprised preferably of a water-repellent material in order to improve the water separation at the clean side of the star-shaped insert. The diesel fuel to be cleaned flows via the inlet connector to the dirt side in the filter housing. From here, it flows radially from the exterior to the interior through the star-shaped insert and reaches in cleaned form the clean side. Water particles that reach the clean side in this way sink in the interior of the star-shaped insert as a result of their greater density in downward direction and reach a water storage chamber where the separated water will collect. The cleaned diesel fuel flowing in the interior of the star-shaped insert in upward direction passes through the separating insert that by means of a water-repellent material assists water separation significantly. Downstream of the separating insert, the diesel fuel exits the filter housing via the outlet connector. Between the conical separating insert and the radial inner side of the star-shaped insert a precipitation slot is realized that widens conically in downward direction. This precipitation slot extends across less than half of the axial extension of the star-shaped insert.

[0005] The invention has the object to design a fuel filter and a filter element of a fuel filter of the aforementioned kind where filtering of particles from the fuel and the separation of water contained in the fuel are further improved.

SUMMARY OF THE INVENTION

[0006] This object is solved in accordance with the invention in that the separating medium extends at least across the entire extension of the filter medium.

[0007] According to the invention, the separating medium completely covers the clean side of the filter medium so that the precipitation slot extends across the entire clean side of the filter medium. In this way, water separation can occur across the entire extension of the clean side of the filter medium. The separating efficiency of the filter element is improved in this way. When it is advantageously provided that the filter medium is flowed through in radial direction from the interior to the exterior, the separating medium is located outside of the filter medium and surrounds it. When in the alternative it is provided that the filter medium is flowed through from the exterior to the interior, the separating medium is arranged in an interior of the filter medium.

[0008] In the multi-stage filter element in particular particles that contaminate the fuel are filtered out in the filter medium. At the separating medium water droplets which are contained in the fuel are retained. The water droplets are precipitated in the precipitation slot and sink to the bottom as a result of their density. When a fuel is cleaned whose density is greater than that of the water, the water droplets will rise analogously. For this purpose, the filter element can be arranged in reverse. Also, the fuel inlet, the fuel outlet, and the water outlet can be arranged accordingly. Advantageously, the water can be collected in particular in a water collecting chamber that is connected to the water outlet. By widening the precipitation slot, it can be achieved that the local flow speed of the fuel is less than the precipitation speed of the water droplets.

[0009] A gradient of the flow speed of the fuel in the precipitation slot, depending on the flow direction from bottom to top or from top to bottom, can be counteracted so that the flow speed across the entire height of the filter medium remains almost constant. By means of the uniform flow speed in the precipitation slot it is prevented that water droplets are entrained by the fuel downstream of the separating medium in the flow direction. When the separating medium is conical and surrounds the filter medium, moreover a conically widened space between the separating medium and an inner wall of the housing can be realized. Accordingly, a constant flow speed can also be achieved at the drain side of the separating medium; this has a positive effect on the water separation. Because of the extension of the separating medium across the entire axial length of the filter medium and circumferentially, a correspondingly large surface area to be flowed through is achieved. In this way, the water separation is improved.

[0010] Moreover, the flow speed of the fuel is reduced which has a positive effect on the water separation. The sepa-

rating medium that is at a slant relative to the filter medium improves moreover coalescing of the water droplets at the separating medium.

[0011] In an advantageous embodiment, the precipitation slot can point with its large cross-section in the flow direction of the water, in particular in downward direction, and can be connected there with the water outlet. The quantity of the water that is separated across the vertical height of the precipitation slot increases along its path that is predetermined due to the difference of the density relative to fuel, in particular in downward direction. In this way, the increase of the total quantity of separated water along the flow path can be compensated in a simple way so that a uniform flow speed of the water droplets can be realized.

[0012] Advantageously, between the filter medium and the separating medium a coalescing medium, in particular embodied as a hollow member, can be arranged that surrounds the filter medium or the separating medium. Advantageously, the coalescing medium delimits the precipitation slot at the side of the filter medium. At the coalescing medium, even smallest water droplets contained in the fuel can be separated and combined to larger water droplets. Large water droplets can precipitate downstream of the coalescing medium in the flow direction of the fuel in the precipitation slot, in particular sink to the bottom. In this way, the water separation can be improved.

[0013] Moreover, advantageously the filter medium, the separating medium, and optionally the coalescing medium can be arranged coaxially and the precipitation slot can widen conically in axial direction. A coaxial arrangement saves space. Moreover, in a coaxial arrangement the course of the flow of the fuel from the exterior to the interior in radial direction or from the interior to the exterior in radial direction can be optimized in a simple way.

[0014] Moreover, advantageously the filter medium and optionally the coalescing medium can be cylindrical and the separating medium can be conical. Advantageously, the coalescing medium can adjoin flat the clean side of the filter medium. Because of the cylindrical configuration the filter medium and the optional coalescing medium can be produced in a simple way. A conical separating medium can also be produced in a simple way.

[0015] Advantageously, the separating medium can be embodied like a screen. A screen-like, in particular, woven separating medium has the advantage that the water droplets are retained at the screen fibers and in particular will drip downwardly. On a screen-like separating medium the water is optimally retained. The mesh openings of a screen-like fabric can be predetermined in an easy and defined way. It can be designed to be optimally permeable for the fuel. The pressure loss can be minimized with a screen-like separating medium.

[0016] In other respects, the housing can be openable and the filter element can be exchangeably arranged in the housing. The filter element can thus be removed for exchange or for maintenance purposes from the housing.

[0017] The object is solved according to the invention moreover by the filter element in that the separating medium extends across the entire extension of the filter medium. The advantages and features that have been listed above in connection with the inventive fuel filter apply in the same way to the filter element according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further advantages, features and details of the invention result from the following description in which one embodiment of the invention will be explained in more detail with the aid of the drawing. A person of skill in the art will consider the features disclosed in combination in the drawing, the description and claims expediently also individually and combine them to other meaningful combinations.

[0019] FIG. **1** shows a longitudinal section of a fuel filter with an exchangeable three-stage filter element.

[0020] FIG. **2** shows an isometric illustration of the filter element of FIG. **1**.

[0021] In the Figures same components are provided with same reference characters.

[0022] DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] In FIG. **1**, a fuel filter **10** of a fuel system of an internal combustion engine of a motor vehicle is illustrated in longitudinal section. The fuel filter **10** serves for cleaning the fuel that is used for operating the internal combustion engine, for example, diesel fuel. Moreover, the fuel filter **10** serves for separating water contained in the fuel.

[0024] The fuel filter **10** comprises a two-part housing **12** with a cup-shaped filter pot **14** and a filter cover **16** that is arranged on the filter pot **14** so as to be separable therefrom. Between the filter pot **14** and the filter cover **16** an annular seal **17** is arranged.

[0025] In the cover **16** approximately centrally an inlet socket **18** for the fuel to be cleaned is arranged which is connected outside of the housing **12** to a fuel supply line shown in FIG. **1**. In the interior of the housing **12** the inlet socket **18** opens into an inlet chamber **20** in an interior of a connecting socket **22**. The connecting socket **22** extends on the side of the cover **16** that is facing the interior of the housing **12** coaxially to a filter axis **24**. The terms "axial", "radial", "coaxial" and "circumferential" relate to the filter axis **24**, if nothing else is indicated.

[0026] In radial direction outside of the connecting socket **22** the cover **16** has moreover an outlet socket **26** which is connected to the drainage chamber **28** in the housing **12**. External to the housing **12**, this outlet socket **26** is connected to a fuel outlet line, not illustrated in FIG. **1**, for the cleaned fuel.

[0027] At the bottom of the filter pot **14** a water discharge socket **30** is arranged coaxial to the filter axis **24**. The water discharge socket **30** is connected to a water collecting chamber **32** at the bottom of the housing. External to the housing **12** the water discharge socket **30** is connected to a water discharge line, not illustrated, by means of which the water separated from the fuel is discharged from the housing **12**. In the water discharge socket **30** a water discharge valve **34** with a water level sensor is arranged. At rest, the water discharge valve **34** is closed so that no liquid can escape from the water collecting chamber **32** through the water discharge socket **30** from the housing **12**. Upon reaching a predetermined maximum water level in the water collecting chamber **32**, the water discharge valve **34** opens automatically so that the separated water can be discharge through the water discharge socket **30**.

[0028] In the housing **12** a filter element **36** is arranged. The filter element **36** separates the inlet socket **18** seal-tightly from the outlet socket **26**. The filter element **36** comprises a star-shape folded filter medium **38** with which in particular particles are filtered from the fuel to be cleaned. The filter medium **38** has the shape of a coaxial circular cylinder. At an

end face that is facing the bottom of the filter pot **14** the filter medium **38** is connected seal-tightly with a closure end disk **40**. At the opposite end face that is facing the cover **16** the filter medium **38** is connected seal-tightly to the end disk **42**.

[0029] The end disk **40** is of a continuous closed configuration. On its side that is facing the interior **44** of the filter medium **38** the closure end disk **40** has a support collar for the filter medium **38**. On the exterior side that is facing the bottom of the filter pot **14**, the closure end disk **40** has four support webs **46** which extend in uniform distribution about a coaxial imaginary circular cylinder wall. The imaginary circular cylinder wall surrounds the water outlet socket **30**. With the support webs **46** the filter element **36** is supported on the bottom of the filter pot **14**. Between the support webs **46** there are outlet openings **48** by means of which the water can flow from water collecting chamber **32** into the water outlet socket **30**.

[0030] The connector end disk **42** has a coaxial inlet opening **50** which connects the inlet chamber **20** with the interior **44**. The inlet opening **50** is surrounded by a central collar of the connector end disk **42** which extends coaxially into the interior **44** and on which is resting the radial inner side of the filter medium **38**.

[0031] On the exterior side which is facing the cover **16** the connector end disk **42** has a coaxial connecting socket **52** that is coaxial to the filter axis **24**. The connecting socket **52** is bent at its free end face by 90 degrees in radial direction inwardly. On the radial inner rim of the connecting socket **52** a profiled ring seal **54** is seated. Into the connecting socket **52** the connecting socket **22** of the cover **16** is inserted in such a way that the connection is sealed by the profiled ring seal **54**.

[0032] In radial direction outwardly, on the connector end disk **42** two circumferential projections are arranged that are coaxial to the filter axis **24** and form a receiving groove **56** for an annular insertion web **58** of a separating unit **60** of the filter element **36**.

[0033] In radial direction outwardly, the filter medium **38** is surrounded by a fluid-permeable coaxial support tube **62** that connects the connector end disk **42** stably with the closure end disk **40**.

[0034] Between the radial outer circumferential side of the filter medium **38** and the support tube **62** there is a coaxial coalescing medium **64**. The coalescing medium **64** is closed circumferentially and extends between the connector end disk **42** and the closure end disk **40**. The coalescing medium **64**, for example, a nonwoven, serves for combining even smallest water droplets in the fuel to larger water droplets.

[0035] The separating unit **60** comprises a support cage **65** with a connecting section **66**, which also comprises the insertion web **58**, and a separating medium **68**. The connecting section **66** is approximately cup-shaped with a central opening at its bottom through which the connecting socket **52** passes. Its inner diameter is somewhat greater than the outer diameter of the connector end disk **42**. The separating unit **60** is inserted with the separating medium **68** leading onto the connector end disk **42**. At the side facing the closure end disk **40**, the separating unit **60** is open toward the water collecting chamber **32**.

[0036] The separating medium **68** is comprised of a hydrophobic screen fabric. It extends along a coaxial conical wall surface from the connector end disk **42** to the closure end disk **40**. The base surface of the corresponding cone is arranged at the end of the closure end disk **40**. The separating medium **68** projects past the closure end disk **40** in axial direction. It is circumferentially closed. It extends as a whole across the entire extension of the filter medium **38** and of the coalescing medium **64** at the clean side of the filter medium **38**. It covers the filter medium **38** and the coalescing medium **64** completely when viewed in radial direction.

[0037] The support cage **65** at the open side that is facing away from the connecting section **66** has a coaxial lower support ring **70**. Axially arranged between the lower support ting **70** and the connecting section **66** there is a coaxial central support ring **72**. The connecting section **66**, the central support ring **72** and the lower support ring **70** are connected to each by four axial webs **73** arranged in a circumferentially distributed arrangement. The separating medium **68** is resting against the radial outer sides of the connecting section **66**, of the central support ring **72**, of the lower support ring **70** and the axial webs **73**.

[0038] At the radial outer circumferential side of the lower support ting **70**, a ring seal **74** is also arranged which is supported in radial direction outwardly at the inner circumferential side of the filter pot **14**. The annular seal **74** seals the drainage chamber **28** relative to the water collecting chamber **32**.

[0039] Between the separating medium **68** and the filter medium **38** there is a precipitation slot **76**. The precipitation slot **76** is an annular chamber that has a conical shape, i.e., widens conically in axial direction relative to the water collecting chamber **32**. The precipitation slot **76** is delimited in radial direction inwardly by the hollow cylindrical coalescing medium **64** and in radial direction outwardly by the conical separating medium **68**. In the illustrated vertical orientation of the filter axis **24** the precipitation slot **76** therefore widens conically in downward direction, i.e, the end with the large cross-section is positioned at the bottom and the end with the small cross-section at the top.

[0040] In operation of the fuel filter **10**, the fuel to be cleaned is supplied from the fuel supply line, indicated by arrow **78**, through the inlet socket **18** to the inlet chamber **20**. From here, the fuel passes in the direction of arrows **80** through the inlet opening **50** into the interior **44** of the filter medium **38**.

[0041] The fuel passes through the filter medium **38**, indicated by arrows **82**, from its raw side, in radial direction inward, to its clean side, in radial direction outward. Particles are removed thereby from the fuel. The filter medium **38** forms a first stage of the, in total, three-stage fuel filter **10** for cleaning/water separation. At the clean side the fuel from which the particles have been removed passes through the coalescing medium **64** in radial direction from the interior to the exterior. In doing so, even smallest water droplets that are contained in the fuel are caught and combined to larger water droplets. The coalescing medium **64** forms a second stage for cleaning/water separation.

[0042] The fuel and the large water droplets flow through the openings of the support tube **62** and pass into the precipitation slot **76**.

[0043] The fuel flows through the separating medium **68**, which forms a third stage for cleaning/water separation, in radial direction from the interior to the exterior, indicated by arrows **84**, and passes into the drainage chamber **28**. The conical widening of the precipitation slot **76** counteracts the tendency of the cleaned fuel to flow already in the upper area, in the area of the connector end disk **42**, out of the precipitation slot **76** into the discharge chamber **28**. In this way, a uniform fuel flow is achieved even through the filter medium

38. The uniform fuel flow in the filter medium **38** effects a uniform loading with particles which increases the service life of the filter element **38**. Because of the separating medium **68**, the flow speed of the fuel is also reduced. Because of the conical widening of the separating medium **68** and of the precipitation slot **76**, it is achieved that the flow speed of the fuel, viewed in axial direction, is almost constant.

[0044] Between the separating medium **68** and the inner side of the circumferential wall of the filter pot **14** there is moreover an outer slot **88** which widens conically, opposite to the precipitation slot **76**, in upward direction, i.e., away from the water collecting chamber **32**. Because of this widening of the outer slot **88** the flow cross-section increases in upward direction so that the fuel flow is also calmed within the outer slot **88**.

[0045] The cleaned fuel from which water has been also removed exits the discharge chamber **28** via the discharge socket **26**, indicated by an arrow **85**, and is supplied to the fuel discharge line.

[0046] The water droplets are retained by the separating medium **68**. Along the separating medium **68** that extends at a slant to the filter axis **24** the water droplets are moved in spiral swirls to the surface and then away from it. In this way, the water droplets collide and combine to even larger water droplets. As soon as sufficiently large droplets sizes have been reached for precipitation, the water droplets sink in downward direction. indicated by arrows **86**, as a result of their greater density in comparison to fuel into the water collecting chamber **32**. Since the precipitation slot **76** widens in downward direction, i.e., in flow direction of the separated water, a compensation of the accumulation of the separated water in downward direction across the axial height of the coalescing medium **46** is provided. The flow cross-section for the water increases so that the flow speed remains constant. This leads to a calming action of the water flow and thus also to improved separation of water. By calming of the water flow and of the fuel flow in the precipitation slot **76** it is prevented that water droplets are entrained by the fuel away from the precipitation slot **76** and pass through the separating medium **68**.

[0047] As soon as the water level sensor of the water drainage valve **34** has detected that the predetermined maximum water level has been reached, the water drainage valve **34** is automatically opened. The water exits the water collecting chamber **32** through the water outlet socket **30** and flows into the water discharge line.

[0048] For maintenance purposes, for example, for exchanging or cleaning the filter element **36**, the cover **16** is removed in axial direction from the filter pot **14**. The filter element **36** is then axially pulled out of the filter pot **14**.

[0049] For installation, the filter element **36** with the closure end disk **40** leading is inserted in axial direction into the filter pot **14**. Subsequently, the cover **16** with the connecting socket **22** leading is inserted in axial direction into the open side of the filter pot so that the connecting socket **22** projects seal-tightly into the profiled ring seal **54**.

[0050] In the above described embodiment of a fuel filter **10** and of a filter element, the following modifications are possible **36** inter alia.

[0051] The invention is not limited to a fuel filter **10** of an internal combustion engine of a motor vehicle. Instead, it can be used also for different kinds of internal combustion engines, for example, industrial motors.

[0052] Instead of being used with diesel fuel, the fuel filter **10** can also be used for cleaning/water separation in connection with a different liquid fuel. When a fuel is used whose density is greater than that of water, the water droplets will rise analogously. In this case, the filter element **36** can be arranged in reverse. Also, the fuel inlet, the fuel outlet, and the water outlet can be arranged accordingly.

[0053] The filter medium **38**, instead of being folded in a star shape, can also be designed as a different hollow member, for example, a hollow cylinder or hollow cone, for example, with round, oval or angular base surface.

[0054] Instead of the nonwoven, also a different coalescing medium **64**, for example, a screen, a fabric or a granular material can be provided.

[0055] The annular seal **74** can also be eliminated. Preferably, the lower support ring **70** can rest seal-tightly against the radial inner circumferential side of the filter pot **14**.

[0056] The separating medium **68**, instead of surrounding the filter medium **38** and the coalescing medium **64** in radial direction outwardly, can also be arranged in the interior **44** of the filter medium **38**. The fuel to be cleaned flows then through the filter medium **38** from the exterior to the interior in radial direction. The coalescing medium **64** should then also be arranged within the interior **44** of the filter medium **38**.

[0057] Instead of the separating medium **68** it is also possible that the filter medium **38** and the coalescing medium **64** have a conical shape. The separating medium **68** can be, for example, of a hollow cylindrical shape. In addition or as an alternative, the radial inner circumferential wall of the filter pot **14** can also be conically shaped. In this way, the shape of the exterior slot **88** can be influenced.

[0058] The fuel to be cleaned can be supplied, instead of from the top, also from the bottom to the raw side of the filter medium **38**. Then the water drainage socket **30**, instead of being centrally arranged, can also be eccentrically positioned at the bottom of the filter pot **14**.

[0059] Instead of the exchangeable filter element **36**, it is also possible to provide a filter element that is fixedly mounted within the fuel filter.

[0060] The filter medium **38**, the coalescing medium **64**, or the separating medium **68** can have, instead of a round base surface, also a different one, for example, an oval or angular base surface.

[0061] The filter medium **38**, the coalescing medium **64** and/or the separating medium **73** can also be arranged in a different way than coaxially relative to each other or to the filter axis **24**.

[0062] While specific embodiments of the invention have been shown and described in detail to illustrate the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A fuel filter of an internal combustion engine, the fuel filter comprising:

a housing comprising at least one fuel inlet for fuel to be cleaned, at least one fuel outlet for cleaned fuel, and at least one water outlet for water separated from the fuel;

a filter element arranged in the housing and separating the fuel inlet seal-tightly from the fuel outlet;

the filter element comprising a filter medium configured as a hollow member for filtering the fuel;

the filter element further comprising a hydrophobic fuel-permeable separating medium embodied as a hollow member for separating water contained in the fuel from

the fuel, wherein the separating medium is arranged in a flow direction of the fuel downstream of the filter medium and is positioned in an interior of the filter medium or surrounds the filter medium;

wherein the filter medium and the separating medium are arranged such that a precipitation slot is realized between the filter medium and the separating medium;

wherein the precipitation slot has a conical shape and is connected with the water outlet;

wherein the separating medium extends at least across the entire extension of the filter medium.

2. The fuel filter according to claim **1**, wherein the conical shape of the precipitation slot has an end with a large cross-section and an end with a small cross-section, wherein the end with the large cross-section is positioned downstream in a flow direction of the separated water and the end with the large cross-section is connected with the water outlet.

3. The fuel filter according to claim **2**, wherein the end with the large cross-section is positioned at a bottom end of the filter element.

4. The fuel filter according to claim **1**, further comprising a coalescing medium that is arranged between the filter medium and the separating medium and is embodied as a hollow member.

5. The fuel filter according to claim **4**, wherein the coalescing medium surrounds the filter medium or the separating medium.

6. The fuel filter according to claim **4**, wherein the filter medium, the separating medium, and the coalescing medium are coaxially arranged and the precipitation slot widens conically in an axial direction of the filter element.

7. The fuel filter according to claim **4**, wherein the filter medium and the coalescing medium are cylindrical and the separating medium is conical.

8. The fuel filter according to claim **1**, wherein the filter medium and the coalescing medium are coaxially arranged and the precipitation slot widens conically in an axial direction of the filter element.

9. The fuel filter according to claim **4**, wherein the filter medium is cylindrical and the separating medium is conical.

10. The fuel filter according to claim **1**, wherein the separating medium is a screen.

11. The fuel filter according to claim **1**, wherein the housing is openable and the filter element is exchangeably arranged in the housing.

12. A filter element of a fuel filter of an internal combustion engine, the filter element comprising:

a filter medium embodied as a hollow member for filtering fuel;

a hydrophobic fuel-permeable separating medium embodied as a hollow member for separating water contained in the fuel from the fuel;

wherein the separating medium is arranged in a flow direction of the fuel downstream of the filter medium in an interior of the filter medium or is arranged surrounding the filter medium;

wherein the filter medium and the separating medium are arranged such that a precipitation slot is realized between the filter medium and the separating medium, wherein the precipitation slot has a conical shape;

wherein the separating medium extends at least across the entire extension of the filter medium.

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