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GAS/LIQUID FILTER

FIELD OF INVENTION

This invention relates to a filter for separation of liquid carried by a gas.

BACKGROUND

In applications where a flow of fluid may consist of both a gas and a liquid (in a vapour or other entrained form), it is often required that the two phases of fluid are separated. In a flow of fluid which substantially consists of a gas, a small amount of vapour may travel with the gas flow. In the displacement of combustible fluids a gas/fuel flow may exist where the flow is to be separated into a purely liquid and purely gas flow stream.

Many forms of air/fuel filters exist. By way of example, there is shown in JP 07280182 an air fuel filter which consists of three regions designed for separation of liquid fuel from a gas flow.

The flow of gas through the filter is in one direction only.

It is accordingly an object of the present invention to provide an alternative configuration of gas/liquid filter which will at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

In a first aspect the present invention consists in a filter for separation of liquid carried by a gas comprising;

a housing through which a gas flow can be established wherein

- (a) along a first region within said housing the flow path of said gas passes through a cyclone separator region of said housing where the nature of the flow path is cyclonic and at least some of the liquid is separated from the flow path of said gas and
- (b) along a second region within the housing the flow path of said gas passes through a labyrinth region which includes at least two plates of the housing

wherein some liquid can be removed from said gas flow by adherence to a surface of said plates and

- (c) along a third region of said housing the flow path of said gas passes through a fine filtration element wherein some liquid can be removed from said gas flow,

said second region being downstream in the flow path to said first region and upstream of said third region and wherein the flow path through said first region is in a generally downward direction the flow path through said second and third region is generally upward, said housing including a first opening through which flow is introduced into said housing, a second opening through which said flow leaves said housing and a third opening through which liquid separated from said flow is able to leave said housing.

Preferably said housing is a fabricated housing.

Preferably said first region includes swirl inducing inlet opening.

Preferably said swirl inducing inlet opening is provided by a conduit defining a flow path immediately upstream of the inlet opening which is in a direction not perpendicular to the wall of said first region to which said opening is most proximate to.

Preferably there are two swirl inducing inlet openings the axis of rotation of said swirl induced by said two inlet openings being common.

Preferably said at least two plates are positioned such their planes are substantially parallel.

Preferably said baffled section is defined by at least 3 plates.

Preferably said housing is divided into two compartments, a first by which said first region is defined and includes vertically extending wall surfaces by which the cyclonic flow is entrained and against which said liquid is impinged and thereby separated from said flow.

Preferably a second of said two compartments includes said second and third regions, said first region separated from said second region by a divider which extends substantially vertically and from wall to wall of said housing save for an opening defined by said divider through which said flow from said first region can pass to said second region.

Preferably said third opening allows said liquid to drain from said housing.

In a second aspect the present invention consists in a filter for the separation of liquid from gas in a multiphase flow of fluid comprising;

a housing which includes two compartments, a first with a first opening through which said multiphase flow is introduced into said housing and an outlet opening, and a second compartment with a first opening through which the multiphase flow from said first compartment is introduced into said second compartment and an outlet through which said the gas of said multiphase flow leaves said housing,

wherein said housing includes a drainage outlet at a lower region thereof through which said liquid is able to pass, and

wherein a means to induce a cyclonic flow of fluid in said first compartment is provided to separate liquid from said fluid flow and

wherein a plurality of inclined to the horizontal baffles are provided provide a labyrinth flowpath for the multiphase flow through said second compartment to separate liquid from said flow

and wherein a fine filtration element is provided within said housing through which said flow is able to pass,

said flow is generally in a downward direction through said first compartment and in a generally upward direction through said second compartment.

The invention may further be said to consist in any alternative combination of parts or features here mentioned or shown in the accompanying drawings. Known equivalents of these parts or features which are not expressly set out are nevertheless deemed to be included. A preferred form of the present invention will now be explained with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view through the filter of the present invention,

Figure 2 is a view through section B-B of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

The filter 1 consists of a housing 2 which is preferably made from a sheet material such as a sheet metal. The housing 2 is preferably fabricated by welding and/or fastening

by the use of bolts to define an enclosure. It is preferably operable for maintenance purposes.

The enclosure of the housing 2 defines three regions. A first region 3, a second region 4 and a third region 5. The first region 3 includes an inlet 6 via which a flow of fluid is introduced into the compartment. The inlet 6 will allow for a fluid which is in the form consisting of a gas and liquid to enter into the first region 3. First region 3 has the inlet positioned such that the flow into and through said first region is in a generally downward direction. Furthermore the flow in the first region is provided by the inlet such that a cyclonic flow of fluid is established. With reference to Figure 2, it can be seen that two inlet conduits 7 each provide an inlet opening 8 which will induce a rotational flow of fluid therefrom. With reference to Figure 2 it can be seen that vertically extending walls will constrain the rotational flow of air as it is directed downward through the first region 3. The flow as it will be directed outwardly from the vertical single line of the first region 3 will at least impart impinge on the vertically extending walls of the first region. The liquid being more heavier than the gas will be projected outwardly and impinge onto the surfaces whereafter it will run down the surfaces towards the bottom of the enclosure. The liquid on the walls will be aided in being driven downwards by the gas flow being in this direction also.

The first region 3 of the enclosure will allow for the gas (and any liquid) to flow to a second region 4 via an opening there between. The second region 4 provides a labyrinth flow path through which the flow of gas will pass. Such a flow path is established by the provision of baffles 9. A plurality of baffles 9 are provided which are positioned to require the flow path of the gas to make at least one and preferably two or more sudden changes in direction. The baffles as well as creating an increased length of flow path of the gas passing through the second region, also provide additional surfaces onto which the liquid carried by the gas is able to impinge. As can be seen in Figure 1, the surfaces slope relative to the horizontal. The liquid that is impinged onto the surfaces of the baffles 9 can then run along the surfaces in a downward direction. At the ends of the surfaces the liquid can then drip down into the lower region of the compartment. The net flow of gas through the second region 4 is in a generally upward direction.

Upon exiting the second region 4, the gas flow (which may still contain some liquid component carried therewith), enters into a third region 5. The third region 5 has an inlet 10 through which flow from the second region is able to enter the third region. The third region 5 includes or is preferably substantially occupied by a filtration medium such as for example a fine filtration element or strainer type filter which is primarily made of from wire mesh, cloth or steel wool or similar for example SUS304 S.S. wire. The filter will allow for liquid to impinge onto the surfaces thereof and then allow such liquid to be removed from the gas flow. The liquid will eventually drip downwards and into the sump region. This third region has an outlet 11 via which the gas flow is able to leave the third region 5 and the compartment of the filter housing. The outlet 11 is placed at a height above the inlet 10. Any liquid that is captured on the surfaces of the filter 5 is able to drain downwardly via the second region (for example) and within the compartment towards the bottom of the compartment. The bottom of the compartment is provided with a drain outlet 12 via which the liquid separated from the gas flow is able to drain and be removed from the filter. The outlet 12 will be via a conduit which may for example include an S-trap to prevent any gas escaping via the outlet 12.

CLAIMS

1. A filter for separation of liquid carried by a gas comprising;
 - a housing through which a gas flow can be established wherein
 - (a) along a first region within said housing the flow path of said gas passes through a cyclone separator region of said housing where the nature of the flow path is cyclonic and at least some of the liquid is separated from the flow path of said gas and
 - (b) along a second region within the housing the flow path of said gas passes through a labyrinth region which includes at least two plates of the housing wherein some liquid can be removed from said gas flow by adherence to a surface of said plates and
 - (c) along a third region of said housing the flow path of said gas passes through a fine filtration element wherein some liquid can be removed from said gas flow,

said second region being downstream in the flow path to said first region and upstream of said third region and wherein the flow path through said first region is in a generally downward direction the flow path through said second and third region is generally upward, said housing including a first opening through which flow is introduced into said housing, a second opening through which said flow leaves said housing and a third opening through which liquid separated from said flow is able to leave said housing.
2. A filter as claimed in claim 1 wherein said housing is a fabricated housing.
3. A filter as claimed in claims 1 or 2 wherein said first region includes swirl inducing inlet opening.
4. A filter as claimed in claim 3 wherein said swirl inducing inlet opening is provided by a conduit defining a flow path immediately upstream of the inlet opening which is in a direction not perpendicular to the wall of said first region to which said opening is most proximate to.

5. A filter as claimed in claims 3 or 4 wherein there are two swirl inducing inlet openings the axis of rotation of said swirl induced by said two inlet openings being common.
6. A filter as claimed in any one of claims 1 to 5 wherein said at least two plates are positioned such their planes are substantially parallel.
7. A filter as claimed in any one of claims 1 to 6 wherein said baffled section is defined by at least 3 plates.
8. A filter as claimed in any one of claims 1 to 7 wherein said housing is divided into two compartments, a first by which said first region is defined and includes vertically extending wall surfaces by which the cyclonic flow is entrained and against which said liquid is impinged and thereby separated from said flow.
9. A filter as claimed in claim 8 wherein a second of said two compartments includes said second and third regions, said first region separated from said second region by a divider which extends substantially vertically and from wall to wall of said housing save for an opening defined by said divider through which said flow from said first region can pass to said second region.
10. A filter as claimed in any one of claims 1 to 9 wherein said third opening allows said liquid to drain from said housing.
11. A filter for the separation of liquid from gas in a multiphase flow of fluid comprising;
a housing which includes two compartments, a first with a first opening through which said multiphase flow is introduced into said housing and an outlet opening, and

a second compartment with a first opening through which the multiphase flow from said first compartment is introduced into said second compartment and an outlet through which said the gas of said multiphase flow leaves said housing,

wherein said housing includes a drainage outlet at a lower region thereof through which said liquid is able to pass, and

wherein a means to induce a cyclonic flow of fluid in said first compartment is provided to separate liquid from said fluid flow and

wherein a plurality of inclined to the horizontal baffles are provided provide a labyrinth flowpath for the multiphase flow through said second compartment to separate liquid from said flow

and wherein a fine filtration element is provided within said housing through which said flow is able to pass,

said flow is generally in a downward direction through said first compartment and in a generally upward direction through said second compartment.