Centrifugal spiral for separation of gas or liquid molecules.

The subject of the invention. A centrifugal spiral for the separation of gas or liquid molecules is a device that allows you to obtain a cheap and effective separation of heavier particles from a gas or liquid. The device according to the invention can be used for the separation of carbon dioxide from air or from industrial exhaust gases. The device according to the invention can be used for desalination of sea water, as well as for purification of drinking water from any impurities such as heavy metals or heavy water D2O. A centrifugal spiral for separating gas or liquid molecules can be used in a wide range of industrial processes where there is a need to separate gas or liquid molecules that differ in molar mass.

State of the art. At the present time, there are various types of centrifuges and filters in the world for separating particles from gas or liquid. Both of these technologies are relatively expensive and inefficient compared to the centrifugal spiral according to the invention.

The essence of the invention. A centrifugal spiral for separation of gas or liquid molecules is made of a cylindrical body with a separate spiral channel on its inner side, through which the gas or liquid subjected to the separation process flows. Inside the body there is a cylindrical sleeve, the outer surface of which forms the inner surface of the spiral channel. The outer surface of the sleeve and the inner surfaces of the spiral channel separated in the cylindrical body are ground and polished so as to obtain the best smoothness, which will eliminate the possibility of micro turbulence that could interfere with the correct separation process. The coils of the spiral channel throughout its location are characterized by the same angle of inclination to eliminate the possibility of turbulence that would interfere with the correct separation process.

The inlet of the helical duct is connected to the intake manifold, while the outlet of the helical duct is connected to the exhaust manifold, which has two outlet ducts, the first of which is closer to the axis of the device discharges lighter gas or lighter liquid, while the duct located farther from the axis of the device discharges heavier gas particles or liquids which during the separation process, under the influence of centrifugal force, accumulate in the areas of the spiral channel furthest away from the axis of the device. The wall separating both channels of the exhaust manifold has a sharp edge so as not to cause turbulence and to obtain the most effective separation process.

The shape of the cross-sectional area of the intake manifold duct is the same as the cross-sectional area of the spiral duct, and the cross-sectional shape of the exhaust manifold ducts on the spiral duct side is inscribed in the cross-sectional shape of the spiral duct, including the wall separating the two exhaust ducts. The outlet manifold may have more outlet channels separated by walls, where the device according to the invention could, for example, select polluted water into: water with particles lighter than water, pure water and water with particles heavier than water.

During the operation of the device according to the invention, on the example of separation of

gas molecules, the gas stream pumped by the fan, through the inlet manifold, enters the spiral channel with the appropriate speed, where, under the influence of centrifugal force, heavier particles tend to accumulate in the parts of the channel that are furthest from the axis of the device. spiral. At the outlet of the spiral duct, the separation process reaches its highest value and the gas falling into the outlet manifold channels is separated.

During the operation of the device according to the invention, on the example of separation of liquid molecules, the liquid stream pumped by the pump, through the inlet manifold, enters the spiral channel with the appropriate speed, where, under the influence of centrifugal force, heavier particles tend to accumulate in the parts of the channel that are furthest from the axis of the device. spiral. At the outlet of the spiral channel, the separation process reaches its highest value and the liquid falling into the outlet manifold channels is separated.

In order to obtain the appropriate efficiency of the device according to the invention, it is necessary to use the appropriate gas or liquid flow rate, the appropriate number of turns of the spiral channel and the appropriate diameter of the device. It should be noted here that the higher the flow rate of the medium, the more energy must be involved in the operation of the device, but thus we obtain a greater efficiency of the device according to the invention. Preliminary calculations showed that the energy cost of separating 1 tonne of carbon dioxide from atmospheric air oscillates around $320.-. However, in the case of separation of industrial flue gases, the energy cost of carbon dioxide separation is much lower and amounts to several or several dollars per 1 ton of CO2.

Apart from the pump or fan, which are external devices necessary for the operation of the device according to the invention, the centrifugal spiral according to the invention itself has no moving parts that could wear out, thanks to which the device according to the invention can be characterized by great reliability and a long service life.

The centrifugal helix according to the invention should be firmly attached to the ground, and should be leveled to avoid a gyroscopic effect which could generate turbulence in the flowing gas or flowing liquid.

Example of implementation. A centrifugal spiral for separation of gas or liquid molecules is presented in an embodiment where a spiral channel 2 has been separated from the inside of the cylindrical body 1, through which the gas or liquid undergoing the separation process flows. Inside the body 1 there is a cylindrical sleeve 3, the outer surface of which forms the inner surface of the spiral channel 2. The outer surface of the sleeve and the internal surfaces of the spiral channel 2 separated in the cylindrical body 1 are ground and polished so as to obtain the best smoothness, which will eliminate the possibility of micro turbulences that could disturb the correct separation process. The coils of the spiral channel 2 have the same angle of inclination throughout their location to eliminate the possibility of turbulence that would interfere with the correct separation process.

The inlet of the spiral duct 2 is connected to the intake manifold 4, while the outlet of the spiral duct 2 is connected to the exhaust manifold 5, which has two outlet ducts 6 and 7, of which the first 6 being closer to the axis of the device discharges the lighter gas or liquid, while the duct 7 located further from the axis of the device, it removes heavier particles of gas or liquid, which during the separation process, under the influence of centrifugal force, accumulate in the areas of the spiral duct 2 furthest from the axis of the device. The wall 8 separating both channels of the exhaust manifold 5 has a sharp edge so as not to cause turbulence, and to obtain the most efficient separation process.

The shape of the cross-sectional area of the duct 4` of the intake manifold 4 is the same as the shape of the cross-sectional area of the spiral duct 2, while the shape of the cross-sectional area of the ducts 6 and 7 of the exhaust manifold 5 on the side of the spiral duct 2 is inscribed in the shape of the cross-sectional area of the spiral duct 2, taking into account a wall 8 separating both outlet channels 6 and 7. The outlet manifold 5 may have more outlet channels separated by walls, where

the device according to the invention could, for example, select polluted water into: water with particles lighter than water, pure water and water with particles heavier than water.

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Explanation of the figures of the drawings. Figure 1 - Shows the device in a three-dimensional drawing with a partial section showing its interior. Figure 2 - Shows the device in a three-dimensional drawing with a partial section, without the inner sleeve, showing the spiral channel. Figure 3 - Shows the device in a spatial drawing in an external view. Figure 4 - Shows the device in a partial cross-sectional three-dimensional drawing showing the intake port of the intake manifold and the outlet ports of the exhaust manifold. Figure 5 - Shows an exemplary cross-sectional shape of a spiral duct. Figure 6 - Shows an exemplary cross-sectional shape of the intake manifold duct. Figure 7 - Shows an exemplary cross-sectional shape of the discharge manifold on the spiral duct side.

Advantages of the device. A centrifugal spiral for the separation of gas or liquid molecules is a device that allows you to obtain a cheap and effective separation of heavier particles from a gas or liquid. The device according to the invention can be used to separate carbon dioxide from the air or from industrial exhaust gases, which is a very desirable feature at the moment. The device according to the invention can be used to desalinate sea water, as well as to purify drinking water from any impurities such as heavy metals or heavy water D2O, which is also a very desirable feature at the moment. A centrifugal spiral for separating gas or liquid molecules can be used in a wide range of industrial processes where there is a need to separate gas or liquid molecules that differ in molar mass. An example is the recovery of gold from seawater, where two devices with a capacity of 12 liters of water per second can separate approximately 1,000,000 liters of water per day. This amount of sea water contains about 11 grams of gold, which can be separated by the centrifugal spiral according to the invention. It should also be added that the centrifugal spiral for separation of gas or liquid molecules can be constructed in versions intended for sewage treatment plants.