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Skardal

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[54] **TOROIDAL VORTEX CLEANER**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **209/211,** 210/512

[51] **Int. Cl.** **B04c 3/00**

[58] **Field of Search** 209/211, 144; 210/512; 55/407

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Assistant Examiner—Ralph J. Hill
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[57] **ABSTRACT**

A vortex cleaner for removing impurities from fibre suspensions, in particular high-consistency pulp and paper-stock suspensions, comprises a toroidal vortex chamber, which is provided with an annular, slot-shaped inlet opening for the fibre suspension to be treated extending coaxially relative the axis of symmetry of the toroidal vortex chamber, and means for injecting the fibre suspension to be treated into the vortex chamber through said annular inlet opening substantially over the entire length thereof in such a manner that the injected fibre suspension has a direction of flow in each point along the annular inlet opening, which includes a substantial flow component which is tangential relative the cross-section of the vortex chamber at said point, whereby the injected fibre suspension forms a helical vortex flow in the vortex chamber about the circular center line of the toroidal vortex chamber. An internal, generally radial partition wall is provided in the toroidal vortex chamber and has a substantially centrally disposed opening with a substantially smaller diameter than the cross-sectional diameter of the vortex chamber. A discharge conduit for the accept fraction of the fibre suspension being treated is connected to said opening in said partition wall on the one side of the partition wall and a discharge opening for the reject fraction of the fibre suspension being treated is disposed in the wall of the toroidal vortex chamber close to said partition wall on the opposite side thereof.

18 Claims, 10 Drawing Figures

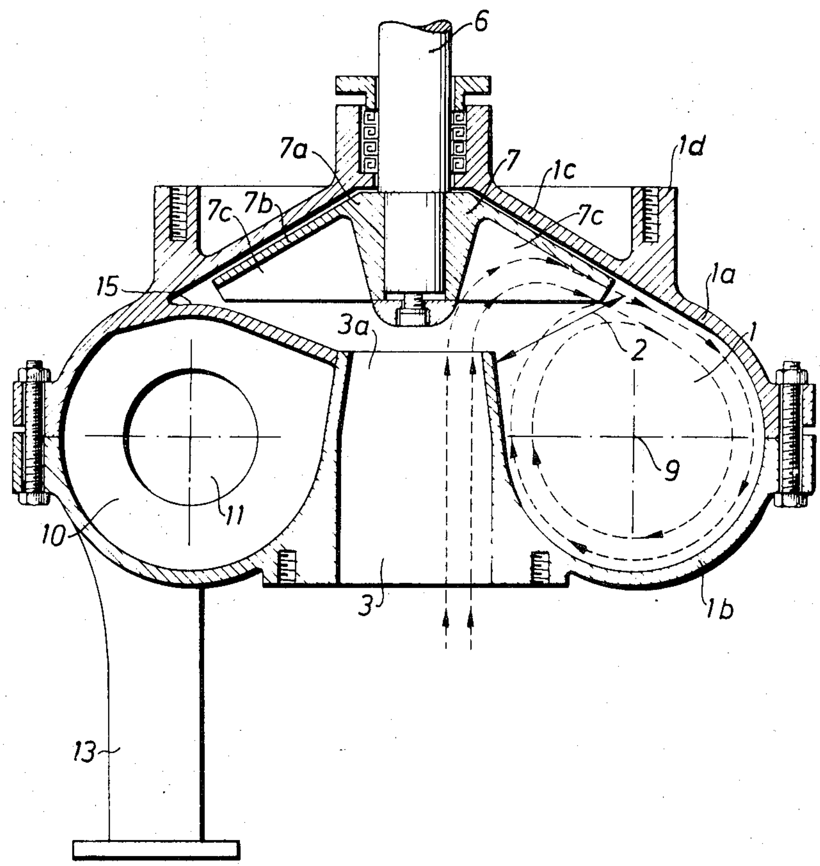


Fig.1

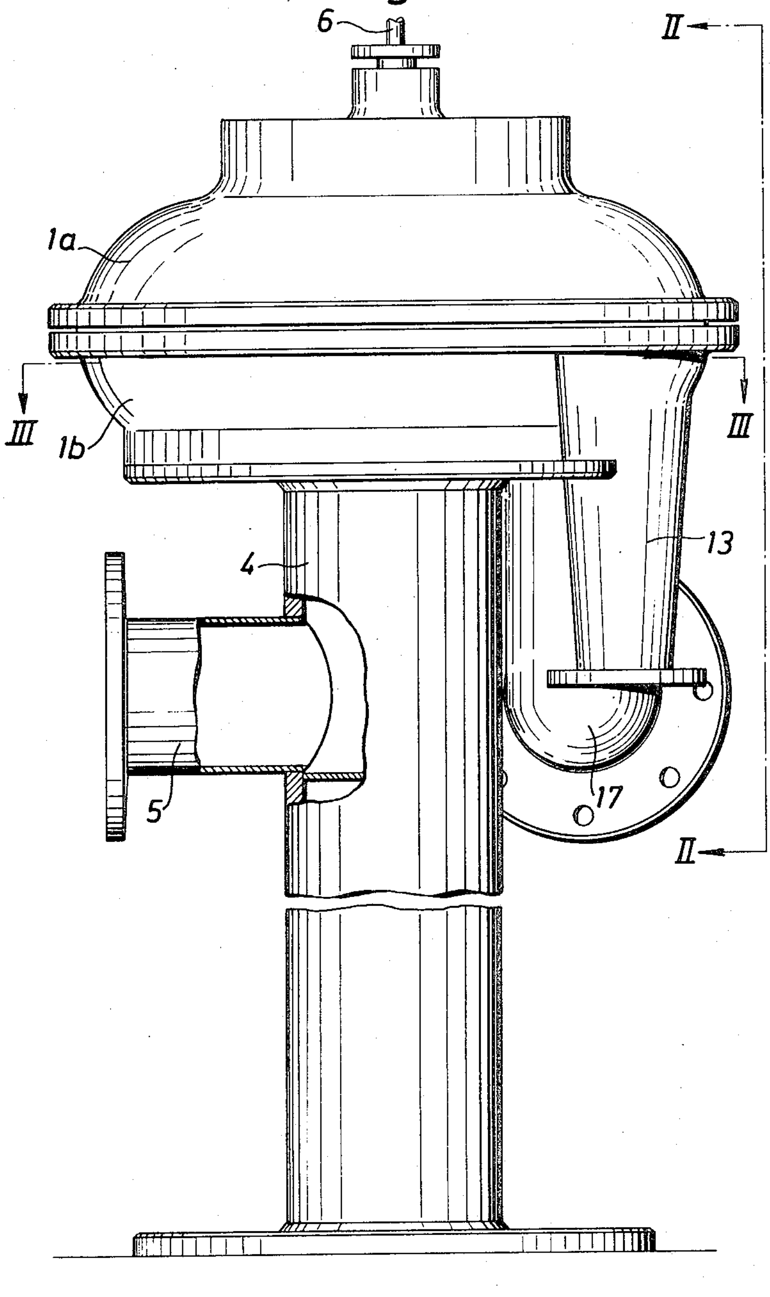


Fig. 2

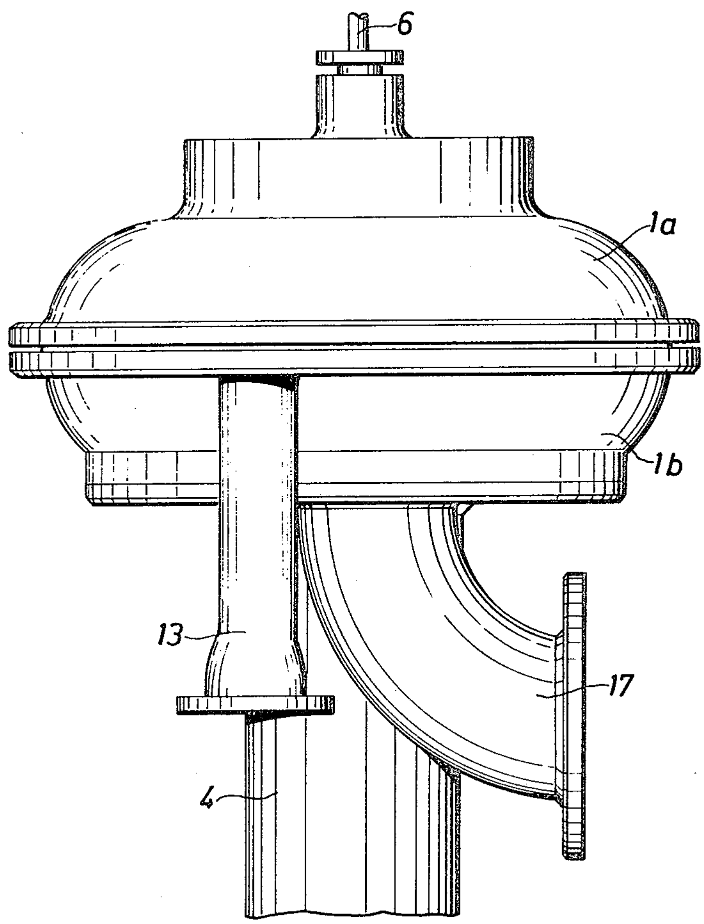


Fig. 3

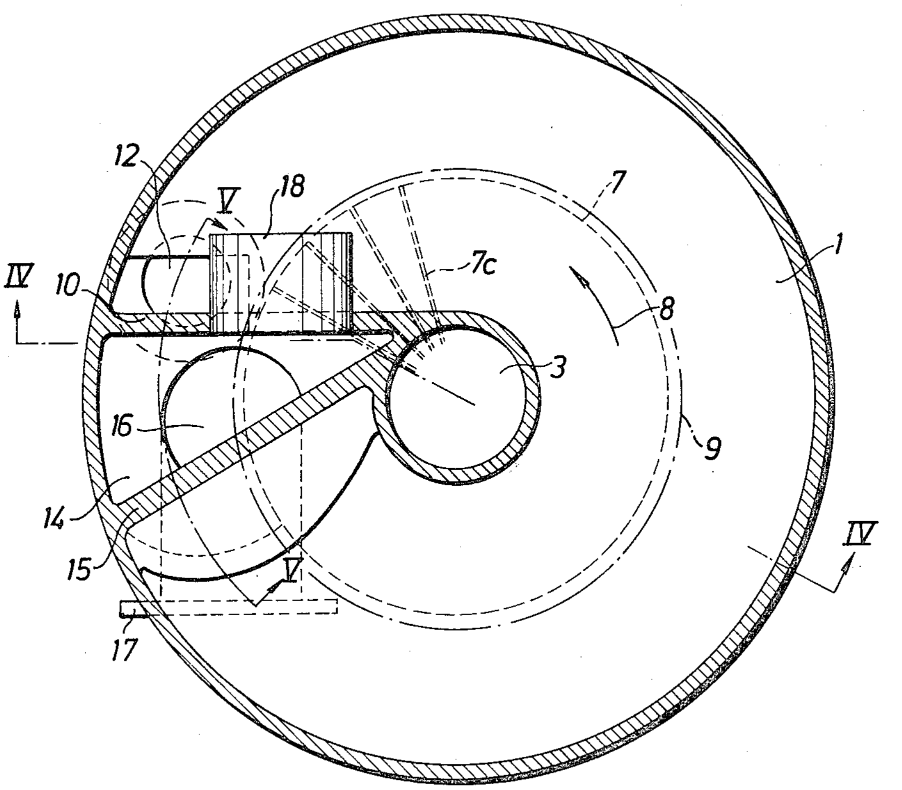


Fig.4

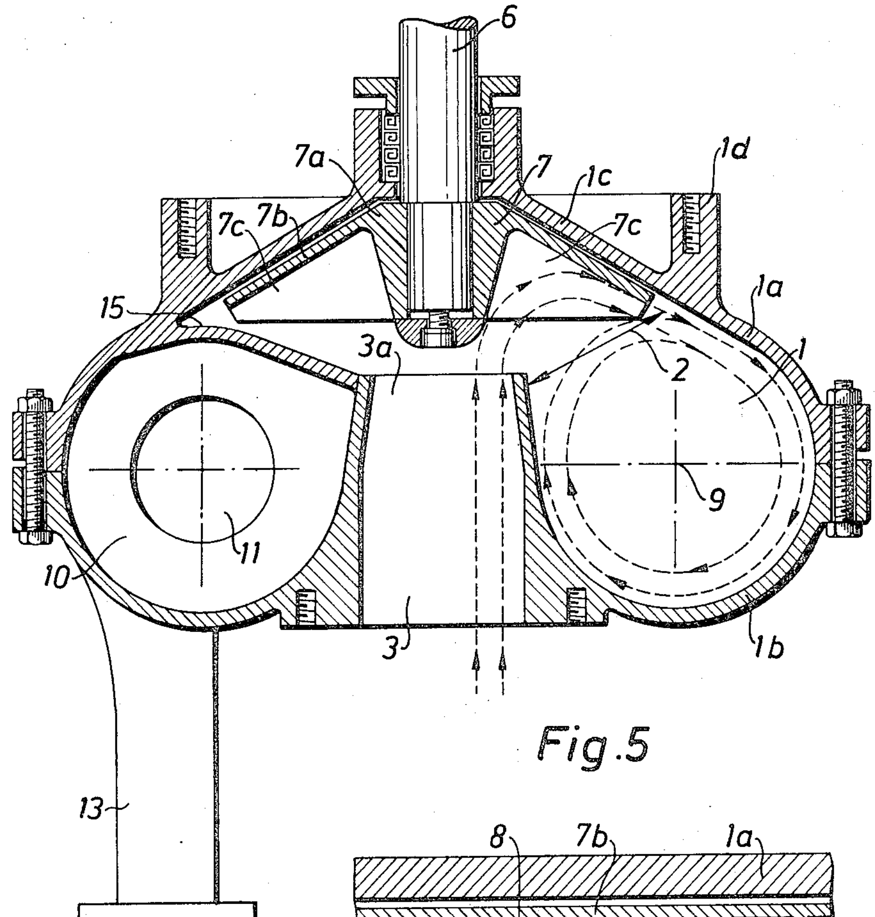
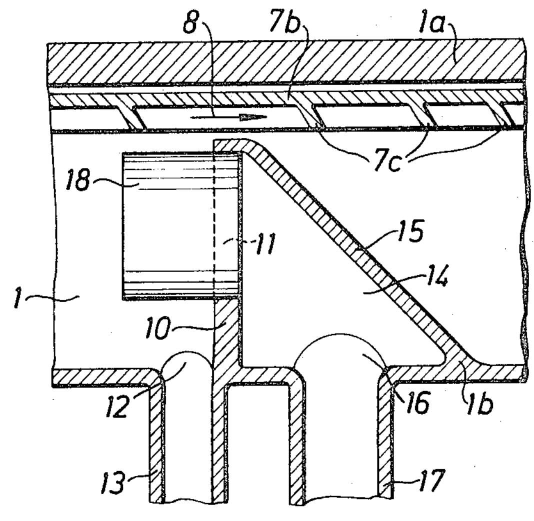

6
7a
7
1c
1d
7c
7b
7c
1a
15
3a
2
1
9
11
10
3
1b
13

Fig.5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7b
1a
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1b
13
17

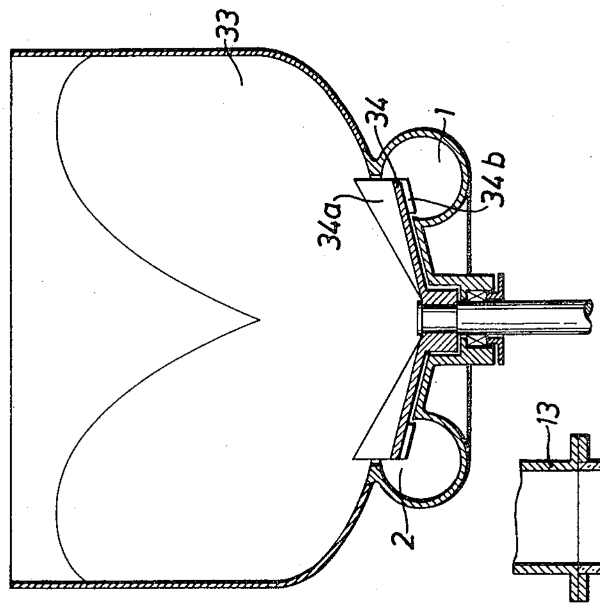


Fig.8

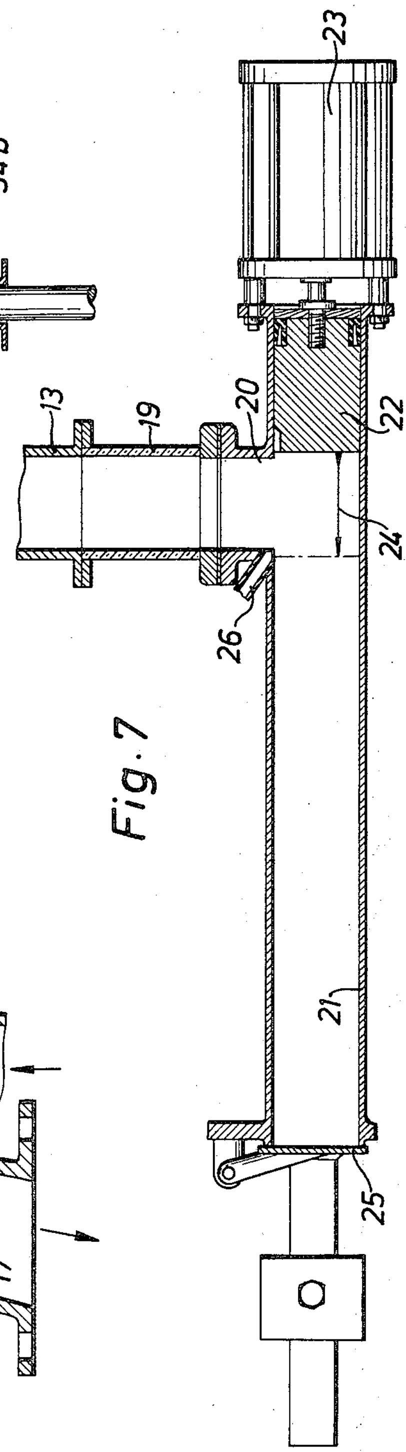


Fig.7

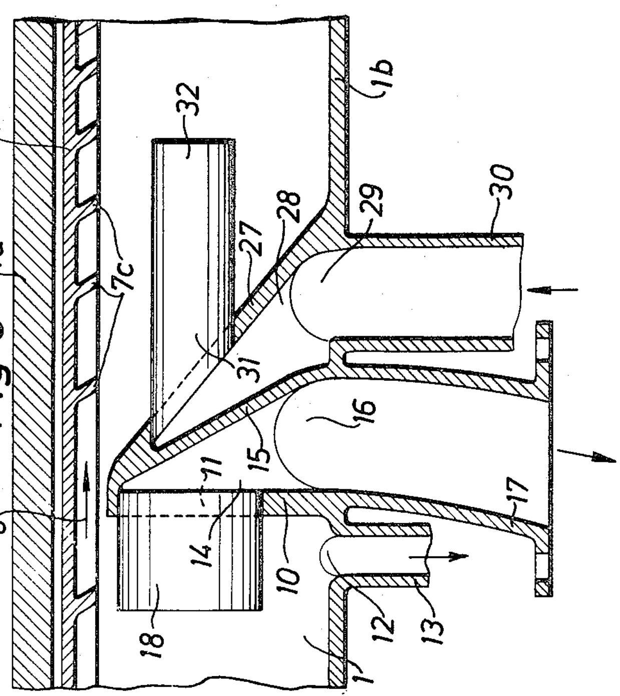


Fig.6

Fig.9

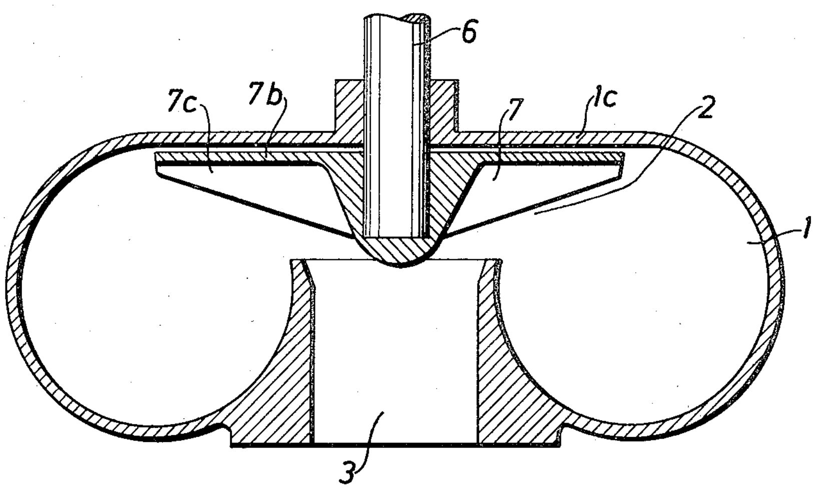
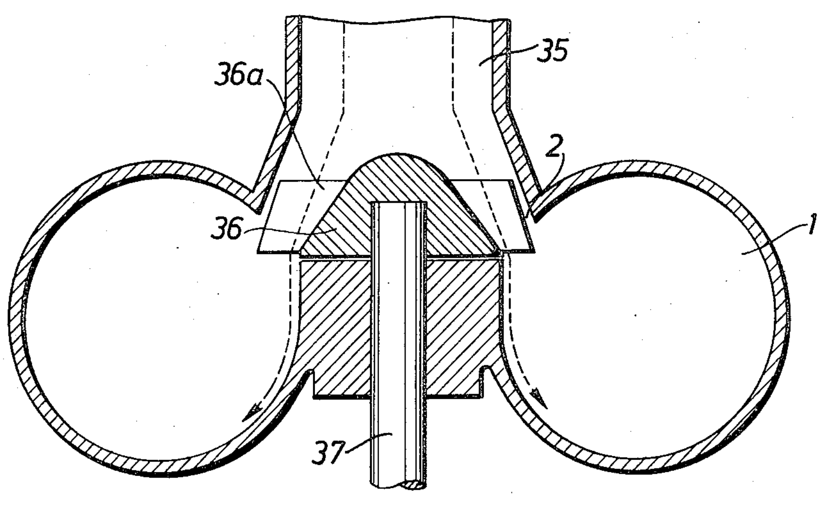


Fig.10



TOROIDAL VORTEX CLEANER

BACKGROUND OF THE INVENTION

The present invention relates to a vortex type separator or cleaner for the removal of impurities from fibre suspensions, in particular pulp and paper-stock with a comparatively high consistency of about 3 percent or higher. Such so called high-consistency pulp or paper-stock is obtained, for example, when disintegrating waste paper in water for re-use. Such high-consistency stock contains therefore a considerable amount of coarse impurities such as paper clips, paper staples, nails, bundling strip iron, string pieces, stones, gravel and sand as well as clods of undefibered paper kept together by staples. These impurities must be removed from the stock or they will cause damage and wear on the downstream equipment for the treatment of the stock, such as refiners etc.

For removing impurities from high-consistency stock one has up to now used vortex cleaners of substantially the same type as for low-density pulp. These vortex cleaners consist in principle of a vertical, downwards conically tapering vortex chamber, to which the fibre suspension to be cleaned, the so called inject, is supplied at the upper end of the chamber in such a way that the suspension forms a downwards moving helical vortex flow in the chamber, whereby the centrifugal force moves the heavier impurities in the suspension towards the wall of the vortex chamber. Under the influence of the gravity force and the downwards moving helical vortex flow the impurities sink along the wall towards the lower end of the vortex chamber, where the fraction containing the impurities, the so called reject, is discharged from the vortex chamber. The cleaned portion of the fibre suspension, the so called accept, is concentrated, due to its lower specific gravity, to the axial central part of the vortex chamber, often as an inner upwards moving helical vortex flow, and is discharged through a pipe, a so called vortex finder, projecting coaxially into the vortex chamber at the upper or lower end thereof.

The result aimed at with the cleaning process is of course that the discharged reject shall contain only impurities and water but no useful fibres, whereas the accept shall be completely free from impurities and contain only useful fibres. When using vortex cleaners of the prior art type described above for the cleaning of high-consistency stock, that is pulp suspensions with a relatively high consistency of 3 percent and higher, it has been found difficult, however, to obtain this desired result. Often one will get an accept which still contains a considerable amount of impurities. This is particularly the case when one tries to obtain a reject not containing any considerable amount of useful fibres. The reasons for these difficulties when using prior art vortex cleaners seem primarily to be that the time of residence for the fibre suspension in the vortex chamber will be rather short and that the tangential or peripheral flow velocity in the vortex flow and thus the centrifugal force decreases considerably in the lower part of the vortex chamber. Therefore, in a high-consistency fibre suspension, the impurities will not be efficiently separated towards the wall of the vortex chamber, but a large amount of the impurities will instead be discharged together with the accept.

In this prior art type of vortex cleaners the necessary vortex flow is generally produced in that the inject is fed in a peripheral or tangential direction into the upper end of the vortex chamber. The necessary energy for the maintenance of the vortex flow in the vortex chamber is consequently supplied to the vortex flow exclusively at the upper end of the vortex chamber. For high-consistency fibre suspensions, however, this results in a rapid decrease of the tangential flow velocity in the vortex flow due to friction losses in the fibre suspension itself and between the fibre suspension and the wall of the vortex chamber. Therefore, for high-consistency fibre suspensions the high tangential flow velocity in the vortex flow at the upper end of the vortex chamber is not maintained further down in the vortex chamber. Particularly in the lower part of the vortex chamber, where the impurities are discharged, the vortex flow may be completely interrupted, whereby no separation at all will exist any more. In order to increase the peripheral flow velocity and thus the centrifugal forces in the vortex flow in a vortex cleaner for high-consistency stock one has in some cases provided a motor-driven impeller at the upper inlet end of the vortex chamber, by means of which the necessary tangential flow velocity for the vortex flow is imparted to the inject being supplied to the vortex chamber. Inspite of this, however, the vortex flow is still unsatisfactory, as also in this case the energy supply to the vortex flow is still concentrated to a restricted portion of the vortex chamber and more specifically to the upper end thereof, wherefore for high-consistency fibre suspensions the peripheral flow velocity in the vortex flow decreases rapidly in the lower parts of the vortex chamber. Furthermore, impurities in the inject in the form of string pieces, bundling wires and similar objects get easily entangled in the impeller with shut-downs as a result.

SUMMARY OF THE INVENTION

The object of the present invention is therfore to provide an improved vortex cleaner, in particular for the cleaning of fibre suspensions with a high-consistency of about 3 percent and higher.

For this object the invention concerns a vortex cleaner for removing impurities from a fibre suspension, in particular a fibre suspension having a comparatively high consistency, which comprises a vortex chamber having substantially the shape of a toroid, the wall of said toroidal chamber being provided with an annular, slot-shaped inlet opening for the fibre suspension to be treated extending coaxially relative the axis of symmetry of the toroidal chamber, means for feeding the fibre suspension to be treated into the toroidal chamber through said annular inlet opening along substantially the entire length thereof with a direction of flow in each point along the inlet opening having a substantial flow component which is tangential relative the cross-section of the toroidal chamber at said point along the inlet opening, and a first transverse partition wall within said toroidal chamber, said partition wall being provided with a substantially centrally located opening having a smaller diameter than the cross-sectional diameter of the toroidal chamber, said opening in the partition wall communicating on one side of the partition wall with a discharge conduit for the accept fraction of the fibre suspension being treated and the wall of the toroidal chamber being provided with a discharge opening for the reject fraction of the fibre suspension being treated, said discharge opening being located close to the opposite side of said first partition wall.

As in the vortex cleaner according to the invention the vortex chamber has the shape of a toroid, a vortex chamber of a considerable length is obtained, in which consequently the average time of residence for the fibre suspension will be long, and over the entire length of which necessary energy can be supplied continuously for maintaining a forceful vortex flow of the fibre suspension in the vortex chamber even if the suspension has a high consistency. This results in a very efficient separation of any impurities, even if the fibre suspension has a high consistency, whereby the accept discharged from the vortex cleaner will be substantially completely free from impurities and contain only useful fibres.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described more in detail with reference to the accompanying drawings, in which

FIG. 1 shows by way of example a side view of a first embodiment of a vortex cleaner according to the invention;

FIG. 2 is a side view of the vortex cleaner shown in FIG. 1 as seen from the line II—II in FIG. 1;

FIG. 3 shows a section through the vortex cleaner along the line III—III in FIG. 1;

FIG. 4 shows an axial section through the vortex cleaner along the line IV—IV in FIG. 3;

FIG. 5 shows a partial section through the vortex cleaner along the line V—V in FIG. 3;

FIG. 6 shows a section similar to the section shown in FIG. 5 through a vortex cleaner with a somewhat modified design as compared with the vortex cleaner illustrated in FIGS. 1 to 5.

FIG. 7 shows schematically and in section a preferred device for discharging the reject fraction, that is the separated impurities, from the vortex cleaner;

FIG. 8 shows schematically an axial section through a second embodiment of a vortex cleaner according to the invention;

FIG. 9 shows schematically and in axial section another embodiment of a vortex cleaner according to the invention; and

FIG. 10 shows schematically and in axial section still another embodiment of a vortex cleaner according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The vortex cleaner according to the invention, which is shown by way of example in FIGS. 1 to 5, comprises a substantially toroidal vortex chamber 1, which in the illustrated example is formed by two joined chamber halves 1a and 1b. As most readily seen from FIG. 4, the toroidal wall of this vortex chamber 1 is not completely closed but provided with an annular inlet slot or opening 2, which extends along the entire circumference of the toroidal vortex chamber and through which the fibre suspension to be cleaned, the so called inject, is fed into the vortex chamber 1. The inject is supplied through an inlet pipe 3, which extends coaxially through the inner central opening of the toroidal chamber 1 so that the rim 3*a* of its open end forms the radially inner edge of the annular inlet slot 2 to the toroidal chamber 1. As illustrated in FIGS. 1 and 2, the vortex cleaner is mounted with the inlet pipe 3 on top of a tubular column 4, which forms a support structure for the vortex cleaner and the upper part of which forms a direct extension of the inlet pipe 3 and to which the inject is supplied through a pipe connection 5.

As can be seen in FIG. 4, the upper chamber half 1a is provided with a conical cover 1c, which is integral with the upper half 1a and which joins the upper chamber half 1a along the radially outer edge of the annular inlet slot 2. A shaft 6 is journalled in the conical cover 1c coaxially relative the toroidal chamber 1. The upper end of this shaft 6 is coupled to a drive motor, which is not illustrated in the drawing but which can be mounted on a flange 1*d* on the upper chamber half 1*a*. The lower end of the shaft 6, which projects inside the cover 1*c*, carries a centrifugal impeller 7 including a hub 7*a*, a conical impeller disc 7*b* disposed close to the cover 1c and radial impeller blades 7*c*. In FIG. 3 the circumferential rim of the impeller 7 and some of its blades 7*c* are indicated with dotted lines. It is assumed that the impeller rotates in the direction indicated by an arrow 8 in FIG. 3. Under the action of the rotating impeller 7 the inject supplied through the inlet pipe 3 will be fed into the toroidal vortex chamber 1 through its annular inlet slot 2 in such a manner that within the toroidal vortex chamber the inject forms a helical vortex flow about the circular center line 9 in the toroidal chamber 1. This is achieved in that the centrifugal impeller 7 injects the inject suspension close to the wall of the vortex chamber 1 with a velocity vector, which has a first vector component which is tangential relative the substantially circular cross-section of the toroidal chamber 1 at the point of injection as well as a second vector component which is parallel to the circular center line 9 in the toroidal chamber 1. It is appreciated that the inject from the inlet pipe 3 is fed into the toroidal chamber 1 along the entire length of the annular inlet slot 2. It is also appreciated that the rotating centrifugal impeller 7 will not only inject the inject suspension into the toroidal vortex chamber 1 as described above but also contribute towards maintaining the described vortex flow of the inject suspension already present in the vortex chamber 1. The necessary energy for the maintenance of this vortex flow of the inject suspension is consequently supplied continuously along the entire circumferential length of the vortex chamber 1.

It is appreciated, that in a vortex cleaner according to the invention it is possible to obtain a vortex chamber with a substantial length, in which consequently the average time of residence for the inject suspension becomes comparatively long, and over the entire length of which a forceful helically extending vortex flow of the inject suspension can be maintained. In this vortex flow all heavier impurities will, under the effect of the centrifugal force, be concentrated towards the outer portion of the vortex flow, that is close to the wall of the vortex chamber 1, whereas a portion of the inject suspension containing substantially only useful fibres is obtained in the more central portion of the vortex flow.

As most readily seen in FIGS. 3 to 5, the toroidal vortex chamber 1 is shut-off by an internal transverse partition wall 10, which is provided with an opening 11 having a substantially smaller diameter than the cross-sectional diameter of the vortex chamber 1. It is appreciated that the central portion of the vortex flow of the inject suspension in the vortex chamber **1**, which central portion contains substantially only useful fibres, will pass through the opening **11** in the partition wall **10**, whereas on the contrary the impurities, that is the so called reject, which is concentrated close to the wall of the vortex chamber **1** will be stopped by the partition wall **10** and not permitted through the opening **11** in the partition wall. The impurities, that is the reject, which are stopped by the partition wall **1** are discharged from the vortex chamber **1** through a discharge opening **12** in the wall of the lower half **1b** of the vortex chamber immediately in front of the partition wall **10**, as seen in the direction of rotation **8** of the impeller **7**. A pipe conduit **13**, serving as a reject outlet, is connected to the discharge opening **12**.

The accept fraction passing through the opening **11** in the partition wall **10** enters a space **14** (FIGS. **3** and **5**), which is separated from the remaining portion of the toroidal vortex chamber **1** and is located between the partition wall **10** and a second partition wall **15**, which is inclined and joins the partition wall **10** at its upper edge close to the annular inlet slot **2** of the vortex chamber **1**. From this space **14** the accept fraction is discharged through an opening **16** in the wall of the lower half **1b** of the vortex chamber. A pipe conduit **17**, serving as an accept outlet, is connected to this discharge opening **16**.

It should be noticed that alternatively the pipe conduit **17** could be extended into the vortex chamber **1** and be connected directly to the opening **11** in the partition wall **10**. However, the inclined partition wall **15** causes less disturbances in the flow and thereby a smaller total pressure drop in the vortex cleaner.

As shown in FIGS. **3** and **5**, the opening **11** in the partition wall **10** is preferably provided with a short pipe **18**, which projects from the partition wall **10** opposite to the direction of rotation **8** of the impeller **7** and which functions as a so called vortex finder. This vortex finder **18** makes it still more certain that no impurities can pass through the opening **11** in the partition wall **10** together with the accept fraction.

As can be seen in FIG. **3**, the partition wall **10** with the opening **11** is preferably positioned at an angle relative to the radial direction from the axis of symmetry of the toroidal chamber **1** and thus relative the radial blades **7c** of the impeller **7** so that the blades **7c** form an angle with the partition wall **10** when the blades pass the partition wall and so that the blade tips are the last portions of the blades passing the partition wall. This arrangement of the partition wall **10** gives the advantage that rejected impurities, which are for any reason not immediately discharged through the reject outlet **12**, will be kept in rotation about the vortex finder **18** in front of the partition wall **10** by the blades *7c* of the rotating impeller **7** so that they are given several opportunities to be discharged through the reject outlet **12**. Otherwise, a substantial portion of such rejected impurities would be thrown by the impeller **7** past the partition wall **10** over its upper edge close to the impeller **7**, whereby these rejected impurities would be forced to make a second run through the toroidal vortex chamber.

As can be seen in FIG. **5**, the blades *7c* of the impeller **7** are preferably somewhat inclined relative to the disc *7b* of the impeller. This gives the advantage that the inject suspension supplied from the inlet pipe **3** and in particular heavier impurities in the inject are forced by the blades *7c* towards the conical impeller disc *7b*, whereby the injection of the inject suspension into the toroidal vortex chamber **1** will take place as close as possible to the wall of the vortex chamber.

As explained in the foregoing, it is desired that the reject fraction being discharged from the vortex cleaner should contain substantially only impurities but no useful fibres. It is also desired that only small amounts of water should be discharged through the reject outlet. Both these objects are satisfied in a very efficient manner by a reject discharge device designed as schematically illustrated in FIG. **7**.

FIG. **7** shows the lower portion of the discharge conduit **13**, which is connected to the outlet opening **12** for the reject. This discharge conduit is connected through a transparent pipe section **19**, a so called sight-glass, and a T-joint **20** to a substantially horizontal pipe **21**. This horizontal pipe **21** contains a piston **22**, which can be moved by means of a pneumatic cylinder **23** or any other suitable device back and forth past the T-joint **20** has a stroke **24** with a length only slightly exceeding the diameter of the vertical branch of the T-joint **20**. The opposite end of the pipe **21** is shut by a weighted flap **25**, which primarily seals against the water pressure in the reject discharge conduit **13** so that only negligible amounts of water will leak through the pipe **21**. Instead of a weighted flap it is of course possible also to use a spring-biased flap or some other suitable shutting device. When starting the operation of the vortex cleaner the outer end of the pipe **21** at the flap **25** could, when necessary and desired, be filled with loosely stuffed waste-paper, cotton waste or some similar material, which assists in preventing water leaking from the pipe **21** at the flap **25**, until the pipe **21** becomes filled with reject. It is appreciated that rejected impurities discharged from the vortex chamber **1** through the reject outlet **12** will under the influence of their own weight fall through the reject discharge pipe **13** down into the pipe **21** immediately below the T-joint **20**. At repeated intervals the piston **22** is moved by means of the cylinder **23** from its unoperative position illustrated in FIG. **7** to the left in the drawing past the T-joint **20**, whereby the rejected impurities collected underneath the T-joint **20** are pushed to the left in the tube **21** towards the flap **25**. The movement of the piston **22** is comparatively slow so as not to produce any pressure shock, which could result in a water leakage at the flap **25** or produce disturbancies in the flow at the reject outlet **12** from the vortex chamber. When the entire pipe **21** between the T-joint **20** and the flap **25** has become completely filled with rejected impurities, each additional stroke of the piston **22** will open the flap **25** and discharge some rejected impurities from the pipe **21**. In order to prevent that useful fibres are discharged together with the rejected impurities through the reject discharge pipe **13**, it is preferable, as known per se in the art, to supply a suitable amount of back-washing or sealing-water to the reject discharge conduit **13**. In the device illustrated in FIG. **7** this is done through a pipe **26** discharging into the T-joint **20**. The amount of sealing-water supplied through the pipe **26** is adjusted to such a value that no fibres are discharged from the vortex cleaner through the reject discharge pipe **13**. This can be controlled visually in the sight-glass **19**. The location of the supply pipe **26** for the sealing-water illustrated in FIG. **7** has the advantage that the sealing-water flow keeps the edge of the T-joint **20** furthest away from the piston **22** clean from impurities so that the piston **22** can be safely moved past the T-joint **20.**

In some cases it may be desired to clean a paper stock suspension in two stages. In such cases one discharges from a first vortex cleaner designed according to the present invention a reject fraction which contains not only impurities but also a certain amount of useful fibres and which is fed, possibly after being diluted with additional water, to a second vortex cleaner, which may be of the conventional prior art type. From this second vortex cleaner an accept fraction is discharged, which contains some impurities and which is therefore returned or re-circulated to the first vortex cleaner. Consequently, the accept fraction from the second cleaning stage shall be supplied as an inject suspension to the first vortex cleaner, which is designed in accordance with the present invention. Naturally, this can be done by mixing the accept fraction from the second cleaning stage with the initial fibre suspension, before this is supplied to the vortex cleaner according to the present invention, that is to the first cleaning stage. However, the vortex cleaner according to the present invention can also be provided with a separate inlet for the accept fraction derived from the second cleaning stage. FIG. **6** in the accompanying drawing shows such a modification of the vortex cleaner according to the invention which has been described in the foregoing and which is illustrated in FIGS. **1** to **5.** FIG. **6** shows a partial section through the modified vortex cleaner corresponding to the section illustrated in FIG. **5.** Identical parts in the modified vortex cleaner illustrated in FIG. **6** and the vortex cleaner illustrated in FIGS. **1** to **5** are provided with the same reference numerals.

The modified vortex cleaner illustrated in FIG. **6** differs from the vortex cleaner illustrated in FIGS. **1** to **5** in that the toroidal vortex chamber **1** is provided with an additional partition wall **27,** which is located on the opposite side of the inclined partition wall **15** relative to the partition wall **10** provided with the accept opening **11** and which joins the partition walls **15** and **10** at its upper edge so that a space **28** is formed between the partition walls **27** and **15.** In this space **28** the lower half **1***b* of the vortex chamber is provided with an opening **29,** which is connected to an inlet conduit **30** for the accept fraction derived from the second cleaning stage. The partition wall **27** is provided with an opening **31,** which is located centrally in the vortex chamber **1** and has a substantially smaller diameter than the cross-sectional diameter of the vortex chamber **1** and which is provided with a pipe **32** projecting axially into the vortex chamber **1.** The accept fraction derived from the second cleaning stage is consequently fed through the pipe conduit **30,** the opening **29,** the space **28,** the opening **31** in the partition wall **27** and the pipe **32** into the toroidal vortex chamber **1** into the center of the vortex flow which is formed in the vortex chamber **1** by the inject suspension which is injected by the impeller **7** from the inlet pipe **3** through the inlet slot **2** (FIG. **4**).

It is appreciated that various other embodiments of a vortex cleaner according to the invention are possible in addition to the embodiments described in the foregoing. Some alternative embodiments are illustrated schematically in FIGS. **8** to **10,** which show axial sections through the vortex cleaners but in which all inlet and outlet pipes for the inject, the accept fraction and the reject fraction respectively have been omitted for the sake of simplicity.

Corresponding parts are provided with the same reference numerals as in FIGS. **1** to **5.**

The vortex cleaner according to the invention and illustrated in FIG. **8** is mounted directly in the bottom of a pulper **33,** from which the suspension is fed into the toroidal vortex chamber **1** by means of the rotating impeller **34.** This impeller is provided with radial blades **34***a* on its upper side, which serve on one hand as agitators in the pulper **33** and also feed the suspension into the vortex chamber **1.** However, the impeller **34** is also provided with blades **34***b* on its lower side. These blades are consequently located within the vortex chamber **1** and have as an object to maintain the helical vortex flow within the vortex chamber **1.**

The embodiment of the invention schematically illustrated in FIG. **9** is similar in essential parts to the embodiment of the invention which is illustrated in FIGS. **1** to **5** and which has been described in detail in the foregoing and differs from this vortex cleaner substantially only therein that the cover **1***c* of the toroidal vortex chamber **1** is flat instead of conical and that consequently the impeller **7** has a plane impeller disc **7***b* for the blades **7***c*.

In the embodiment of the invention schematically illustrated in FIG. **10** the inject suspension is supplied through a descending pipe conduit **34** and is fed into the toroidal chamber **1** through its annular inlet slot **2** by means of a rotating propeller **36,** which has its shaft **37** journalled in the center of the toroidal chamber. The blades **36***a* of the propeller **36** project somewhat into the vortex chamber **1** so that they can assist in maintaining the helical vortex flow in the vortex chamber. As compared with the embodiments of the invention described in the foregoing the embodiment illustrated in FIG. **10** has the disadvantage that string pieces, bundling wires and similar impurities present in the inject suspension may get entangled in the propeller **36** and give cause to shut-downs.

What I claim is:

1. A vortex cleaner for removing impurities from a fibre suspension, in particular a fibre suspension having a relatively high consistency, comprising a vortex chamber having substantially the shape of a toroid, the wall of said vortex chamber being provided with an annular, slot-shaped inlet opening for the fibre suspension to be treated extending coaxially relative to the axis of symmetry of the vortex chamber, means for feeding the fibre suspension to be treated into the vortex chamber through said annular inlet opening substantially along the entire length thereof and with a direction of flow at each point along the inlet opening, which includes a substantial flow component which is tangential with respect to the cross-section of the vortex chamber at said point along the inlet opening, a first internal partition wall in said vortex chamber, said first partition wall having an opening substantially centrally disposed therein and with a smaller diameter than the cross-sectional diameter of the vortex chamber, a discharge conduit for the accept fraction of the fibre suspension being treated being connected to said opening on one side of said first partition wall, and the wall of the vortex chamber being provided with an opening serving as a discharge opening for the reject fraction of the fibre suspension being treated disposed close to said first partition wall on the opposite side thereof.

2. A vortex cleaner as claimed in claim 1, wherein a second internal partition wall is provided in said vortex chamber on said one side of said first partition wall and spaced therefrom so that a first space is restricted between said first and second partition walls, said first space being sealed relative to said annular inlet opening and communicating with the remaining portion of the vortex chamber only through said opening in said first partition wall, the wall of the vortex chamber being provided with a discharge opening for the accept fraction from said first space.

3. A vortex cleaner as claimed in claim 2, wherein said second partition wall is inclined relative to said first partition wall.

4. A vortex cleaner as claimed in claim 2, wherein a third internal partition wall is provided in said vortex chamber on the opposite side of said second partition wall relative to said first partition wall and spaced from said second partition wall so that a second space is restricted between said second and third partition walls, said second space being sealed relative to said annular inlet opening, the wall of the vortex chamber being provided with an inlet opening to said second space for a secondary supply of fibre suspension to be treated, and said third partition wall is provided with an opening substantially centrally disposed therein and having a smaller diameter than the cross-sectional diameter of the vortex chamber.

5. A vortex cleaner as claimed in claim 4, wherein said third partition wall is provided with a short pipe surrounding said opening in the wall and projecting from the wall on the side thereof opposite to said second partition wall.

6. A vortex cleaner as claimed in claim 1, wherein said first partition wall is provided with a short pipe surrounding said opening in the wall and projecting from the wall on said opposite side of the wall.

7. A vortex cleaner as claimed in claim 1, wherein said means for feeding the fibre suspension to be treated into the vortex chamber through said annular inlet opening includes an impeller mounted coaxially relative to the axis of symmetry of the vortex chamber for rotation in a direction towards said opposite side of said first partition wall as seen in the circumferential direction of the vortex chamber.

8. A vortex cleaner as claimed in claim 7, wherein said impeller is a centrifugal impeller having its circumferential rim disposed at said annular inlet opening to the vortex chamber.

9. A vortex cleaner as claimed in claim 8, wherein said means for supplying the fibre suspension to be treated to said vortex chamber includes an inlet pipe extending coaxially relative the axis of symmetry of the vortex chamber through the center of the vortex chamber and having an open end with a rim forming the radially inner edge of said annular inlet opening to the vortex chamber, the centrifugal impeller being disposed opposite the open end of said inlet pipe with its circumferential rim close to the radially outer edge of said annular inlet opening to the vortex chamber.

10. A vortex cleaner as claimed in claim 9, wherein said centrifugal impeller comprises a conical impeller disc and radial impeller blades attached substantially over their entire radial length to said conical impeller disc on the side thereof facing the open end of said inlet pipe, the conicity of said impeller disc being such that the impeller disc is substantially tangential relative the wall of the vortex chamber.

11. A vortex cleaner as claimed in claim 10, wherein the radial outer edge of said annular inlet opening to said vortex chamber is joined circumferentially with a conical cover, said impeller being journalled in said cover with its conical impeller disc close underneath the cover.

12. A vortex cleaner as claimed in claim 9, wherein said centrifugal impeller comprises an impeller disc and radial impeller blades attached substantially over their entire radial length to said impeller disc on the side thereof facing the open end of said inlet pipe, said impeller blades being inclined relative to said impeller disc so that the longitudinal edges of the blades attached to the disc lag the opposite longitudinal edges of the blades, as seen in the direction of rotation of the impeller.

13. A vortex cleaner as claimed in claim 9, wherein said first partition wall in said vortex chamber is disposed at an angle relative to the radial direction to the axis of symmetry of the vortex chamber so that the blades of said impeller, when passing said first partition wall upon rotation of the impeller, form an angle to said first partition wall and the radially outer tips of the blades are the last portions of the blades passing said first partition wall.

14. A vortex cleaner as claimed in claim 1, wherein said vortex chamber is mounted with its axis of symmetry vertical and said reject discharge opening is disposed in the lower portion of the wall of the vortex chamber.

15. A vortex cleaner as claimed in claim 1, comprising a substantially vertical pipe having one end connected to said reject discharge opening and its opposite end connected through a T-joint to a second, substantially horizontal pipe, a piston being disposed in said horizontal pipe on one side of said T-joint and being reciprocatingly movable past said T-joint.

16. A vortex cleaner as claimed in claim 15, wherein the end of said horizontal pipe on the opposite side of said T-joint is provided with closure means which can be opened against a biasing force.

17. A vortex cleaner as claimed in claim 15, comprising means for feeding water into said vertical pipe, preferably adjacent said T-joint.

18. A vortex cleaner as claimed in claim 15, wherein said vertical pipe is provided with a transparent section.

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