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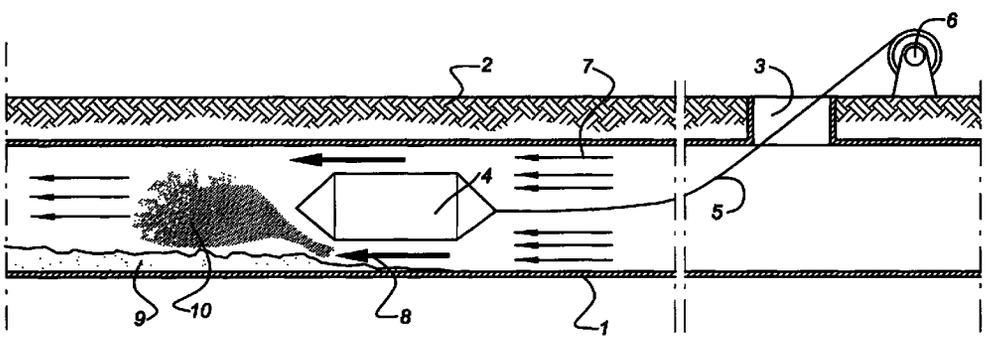
(54) Method and device for cleaning a liquid duct

(57) A method for cleaning a liquid pipeline (1) by means of sluicing comprises the step of causing the liquid to flow through the pipeline (1) at a higher velocity (8) than the nominal velocity (7) for a short time, in such a manner that sediment (9) and the like is swirled up (10) and entrained. The cross section of the pipeline (1) is constricted temporarily, at least in a section of the pipeline, in such a manner that a higher flow velocity (8) is generated at the location of the constriction, in order to assist with swirling up (10) and discharging the sediment.

Fig 1



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Description

[0001] The invention relates to a method for cleaning a liquid pipeline by means of sluicing, comprising the step of causing the liquid to flow through the pipeline at a higher velocity than the nominal velocity for a short time, in such a manner that sediment and the like is swirled up and entrained.

[0002] Sediment is usually deposited in liquid pipelines, such as water pipes, and this sediment has to be removed from time to time in order to counteract contamination of the liquid being conveyed. To carry out this cleaning, the liquid is forced through the pipeline in question at a higher velocity for a certain period of time. In water pipes, the velocity is increased, for example, to 1.5 m/s, while a normal transport velocity is 0.5 m/s.

[0003] To ensure that the pipeline has been thoroughly cleaned, the water is completely refreshed more than once, for example 3 to 4 times. Especially for pipelines with a relatively large diameter, this results in a considerable volumetric flow rate, which is not easy to generate and which also presents drainage problems. Moreover, the total volume of liquid consumed is extremely high.

[0004] The object of the invention is to provide an improved method which, on the one hand, makes it possible to obtain the desired cleaning action and, on the other hand, makes it possible to limit the volumetric flow rate and the total volume of liquid consumed. This object is achieved by the fact that the cross section of the pipeline is constricted temporarily, at least in a section of the pipeline, in such a manner that a higher flow velocity is generated at the location of the constriction, in order to assist with swirling up and discharging the sediment.

[0005] In the method according to the invention, the volumetric flow rate can remain limited, while nevertheless the desired high liquid velocity which is required in order to stir up the sediment is still obtained at the location of the flow constriction. When this method is carried out in practice, the constriction may be considerably shorter than the pipeline itself. Although in this case the liquid velocity falls again downstream of the flow constriction, the sediment which has been swirled up does not normally sink very quickly, so that it can be reliably discharged in full.

[0006] The flow of liquid exerts a driving action on the flow body. Therefore, without further measures, this body would be entrained with the flow at approximately the same velocity; in this case, however, there would be no cleaning action. Therefore, according to the invention, the flow constriction is moved through the pipeline at a velocity which is less than or oppositely directed to the flow velocity at the location of the constriction. In particular, the cross section of the pipeline may be reduced by more than half at the location of the constriction.

[0007] The flow body which is used in the method according to the invention may be designed in various ways. It is preferable to use a sluice ball, the external transverse dimensions of which are smaller than the transverse dimensions in the pipeline and the longitudinal dimension of which is shorter than the longitudinal dimension of the pipeline. This sluice ball has means by which it can be moved through the pipeline at a velocity which is lower than that of the flow of liquid. The sluice ball may also be moved in the opposite direction to the flow of liquid.

[0008] The sluice ball may be connected to a pulling member, such as a cable, chain and the like; this pulling member may be paid out in such a manner that the sluice ball moves along with the flow of liquid but at a lower velocity. The sluice ball may also be connected to a towing member, which towing member is hauled in in order to move the sluice ball along with the flow of liquid.

[0009] The invention also relates to a device for use in the method described above. This device comprises a flow body, such as a sluice ball, the transverse dimensions of which are smaller than the cross-sectional dimensions of the pipeline, as well as means for moving the flow body through the pipeline at a predetermined velocity.

[0010] Of course, a flow body of this nature has to be introduced into the pipeline in a suitable way. Also, it must be possible to guide the flow body past any pipeline narrowing, bends, connections and the like. Therefore, the flow body may be at least partially inflatable, optionally in combination with solid sections.

[0011] Preferably, the flow body comprises a plurality of parts which are positioned one behind the other in the longitudinal direction. At least two of these parts may enclose a gap between them. Such gaps induce additional turbulence in the flow of liquid, further assisting with swirling up the sediment.

[0012] Incidentally, it should be noted that the flow body itself is also struck by the flow of liquid and may therefore exhibit an oscillating movement. This imparts additional turbulence to the sediment. In this connection, it is important to select the relative density of the flow body to be less than or equal to 1. This prevents the flow body from being dragged along the bottom of the pipeline in a more or less stable condition, since this would make the turbulence effect extremely limited.

[0013] In this connection, the flow body may have at least one cavity which is in communication with the outside, in such a manner that each cavity can be filled with the liquid in the pipeline. The advantage of this design is that the flow body itself has a relatively low weight, making it easier to handle outside the pipeline. According to a further variant, the flow body may comprise a plurality of parts which are positioned one behind the other in the longitudinal direction.

[0014] Preferably, the flow body is completely hollow and is also completely filled with the liquid in the pipeline.

[0015] One of the parts may have a larger transverse

dimension than the other parts. The advantage of this design is that the local flow velocity is increased still further, assisting with the cleaning action.

[0016] Nevertheless, the flow resistance of the device remains acceptable, in view of the fact that the remaining parts have a smaller transverse dimension.

[0017] The flow body may be connected to a flexible pulling member, such as a cable or chain, which pulling member is connected to winding gear for paying out the pulling member and the flow body which is connected thereto, in a flow of liquid inside the pipeline.

[0018] The parts of the flow body are preferably threaded on to the pulling member. As a result, they can be displaced slightly with respect to one another, thus making it easier to move through bends in the pipeline. The flow body may in this case "shift" in that the parts are displaced slightly with respect to one another, between stops.

[0019] Finally, the invention also relates to a pipe system, comprising a liquid pipeline in which a liquid flow can be generated, a launching piece which is incorporated in the pipeline, a device for constricting the cross section of the pipeline, which device comprises a flow body, such as a sluice ball, the transverse dimensions of which are smaller than the cross-sectional dimensions of the pipeline, as well as means for moving the flow body through the pipeline at a predetermined velocity, it being possible to introduce the flow body into the pipeline via the launching piece.

[0020] Furthermore, the flow body may be connected to a flexible pulling member such as a cable or chain, which pulling member is connected to winding gear for paying out the pulling member, and therefore the flow body, in a flow of liquid inside the pipeline, it being possible to arrange the winding gear near to the pipeline, for example on the surface of an area of land in which the pipeline is situated. The winding gear is connected to the flow body situated inside the pipeline via the pulling member which runs through the launching piece.

[0021] The invention will now be described in more detail with reference to the figures, in which:

Figure 1 shows a pipe system according to the invention, in longitudinal section.

Figure 2 shows a variant of the sluice ball to be used in the said pipe system.

[0022] The pipe system illustrated in Figure 1 comprises a liquid pipeline 1 which is buried in the ground beneath a surface 2. The pipe system is accessible via manholes 3, which are arranged at regular intervals.

[0023] With a view to cleaning this pipe system, a so-called sluice ball 4 is introduced into the pipeline via a manhole 3. By means of a cable or chain 5, this sluice ball 4 is connected to the winding gear 6 which is arranged on the surface 2 in the vicinity of the manhole 3.

[0024] With a view to cleaning the pipeline, a flow of liquid which is at a defined velocity 7 is generated in the said pipeline.

[0025] At the location of the sluice ball 4, this flow encounters a cross section with a smaller surface area. As a result, a higher flow velocity 8 is generated in this area. This higher flow velocity 8 is such that the sediment 9 which has collected in the pipeline is swirled up, and consequently forms a suspension 10 downstream of the sluice ball 4.

[0026] Downstream of the sluice ball 4, the flow velocity falls again and is approximately equal to the flow velocity 7. However, the sediment which has formed suspension 10 will not sink again, and as a result it can be discharged reliably.

[0027] As shown in Figure 2, it is also possible to use a sluice ball 16 comprising parts 11, 12, 13, 14. The parts 11, 12, 13, 14 enclose gaps 18 between them. The sluice ball 16 is also connected to a cable or chain 5, as illustrated in Figure 1.

[0028] The advantage of this multipart sluice ball 16 is that it is easier to place in the pipeline via a manhole 3. Also, additional turbulence is generated at the location of the gaps 18, thus assisting with swirling up the sediment.

[0029] One (or more) of the parts 13 may have a larger transverse dimension than the other parts 11, 12, 14. At the location of such a larger part 13, the flow velocity in the pipeline (not shown) is greater, as a result of the greater constriction in that area. A highly local increase in flow of this nature improves the cleaning action.

[0030] Furthermore, one (or all) of the parts 14 may have cavities 15. This reduces the weight of such a part 15, making it easier to handle. Since the cavities 15 are in communication with the outside, they fill up with liquid, in such a manner that the relative density of the said part 14, with its cavities filled, is still approximately equal to 1.

[0031] In addition to the cable or chain 5 which is being paid out, the sluice ball 16 may be connected to a cable or chain 17 which is being hauled in.

[0032] According to a first possibility, the parts 11-14 may be displaceably threaded on to the cable or chain 5. However, their total displacement is limited by the stops 19 on the cable or chain 5. This limited displaceability provides the parts 11-14 with a certain degree of play with respect to one another, making it easier to pass through bends in a pipeline.

[0033] According to a further possibility, the parts 11-14 are attached immovably to the cable or chain 5.

[0034] Finally, it is possible to arrange some parts in a fixed position on the cable or chain 5 and the other parts displaceably. This option is illustrated in Figure 2, in which the outer parts 11 are fixed to the cable or chain 5, as are the stops 19. The parts 12-14 can slide on the cable or chain 5, in each case between two stops 19.

Claims

1. Method for cleaning a liquid pipeline (1) by means of sluicing, comprising the step of causing the liquid to flow through the pipeline (1) at a higher velocity (8) than the nominal velocity (7) for a short time, in such a manner that sediment (9) and the like is swirled up (10) and entrained, characterized in that the cross section of the pipeline is constricted temporarily, at least in a section of the pipeline (1), in such a manner that a higher flow velocity (8) is generated at the location of the constriction, in order to assist with swirling up (10) and discharging the sediment.

2. Method according to Claim 1, in which a constriction is generated over a length which is less than the length of the pipeline (1) to be cleaned.

3. Method according to Claim 1 or 2, in which the constriction is moved through the pipeline (1) at a velocity which is less than, or oppositely directed to, the flow velocity (8) at the location of the constriction.

4. Method according to one of the preceding claims, in which the cross section of the pipeline (1) is reduced by more than half at the location of the constriction.

5. Method according to one of the preceding claims, in which a sluice ball (4, 16), the external transverse dimensions of which are smaller than the cross-sectional dimensions in the pipeline (1) and the longitudinal dimension of which is shorter than the longitudinal dimension of the pipeline (1) to be cleaned, is introduced into the pipeline (1), which sluice ball (4) has means for moving it through the pipeline (1) at a lower velocity than that of the liquid flow.

6. Method according to Claim 5, in which the sluice ball (4, 16) is connected to a pulling member (5), such as a cable, chain and the like, and the pulling member (5) is paid out in order to move the sluice ball (4, 16) along with the flow of liquid.

7. Method according to Claim 5 or 6, in which the sluice ball (4, 16) is connected to a towing member (17), which towing member is hauled in in order to move the sluice ball (4, 16) along with the flow of liquid.

8. Device for constricting the cross section of a liquid pipeline (1) for carrying out the method according to one of the preceding claims, comprising a flow body, such as a sluice ball (4, 16), the transverse dimensions of which are smaller than the cross-sectional dimensions of the pipeline (1), as well as means (5, 6) for moving the flow body (4) through the pipeline (1) at a predetermined velocity.

9. Device according to Claim 8, in which the flow body (4, 16) is at least partially inflatable.

10. Device according to Claim 8 or 9, in which the flow body (4, 16) is at least partially solid.

11. Device according to one of the preceding claims 8-10, in which the relative density of the flow body (4, 16) is less than or equal to 1.

12. Device according to one of Claims 8-11, in which the flow body (14) has at least one cavity (15) which is in communication with the outside, in such a manner that each cavity (15) can be filled with the liquid in the pipeline.

13. Device according to one of Claims 8-12, in which the flow body is completely hollow.

14. Device according to one of the preceding claims 8-13, in which the flow body (16) comprises a plurality of parts (11, 12, 13, 14) which are positioned one behind the other in the longitudinal direction.

15. Device according to Claim 14, in which at least two parts (12) surround a gap (18) between them.

16. Device according to Claim 14 or 15, in which at least one of the parts (13) has a larger transverse dimension than the other parts (11, 12, 14).

17. Device according to one of the preceding claims 8-16, in which the flow body (4, 16) is connected to a flexible pulling member (5) such as a cable or chain, which pulling member (5) is connected to winding gear (6) for paying out the pulling member (5), and therefore the flow body (4, 16), in a flow of liquid inside the pipeline (1).

18. Device according to Claim 17, in which at least one of the parts (12) has been threaded on to the pulling member (5).

19. Device according to Claim 18, in which at least two of the parts (12) have been threaded on to the pulling member (5) and can be displaced to a limited extent along the said pulling member.

20. Device according to Claim 20, in which at least two of the parts (12) can be displaced along the pulling member (5) between stops (19).

21. Device according to Claims 8-20, in which the length of at least one of the parts is approximately

equal to its transverse dimension.

22. Pipe system, comprising a liquid pipeline (1) in which a liquid flow can be generated, a launching piece (3) which is incorporated in the pipeline (1), a device (4, 5, 6, 16) for constricting the cross section of the pipeline (1), which device comprises a flow body (4, 16), such as a sluice ball, the transverse dimensions of which are smaller than the cross-sectional dimensions of pipeline (1), as well as means (5, 6) for moving the flow body (4, 16) through the pipeline (1) at a predetermined velocity, it being possible to introduce the flow body (4, 16) into the pipeline (1) via the launching piece (3).

23. Pipe system according to Claim 22, in which the flow body (4, 16) is connected to a flexible pulling member (5) such as a cable or chain, which pulling member (5) is connected to winding gear (6) for paying out the pulling member (5), and therefore the flow body (4, 16), in a flow of liquid inside the pipeline (1), it being possible to arrange the winding gear (6) near to the pipeline (1), for example on the surface (2) of an area of land in which the pipeline (1) is situated, and the winding gear (6) being connected to the flow body (4, 16) situated inside the pipeline (1) via the pulling member (5) which runs through the launching piece (3).

Fig 1

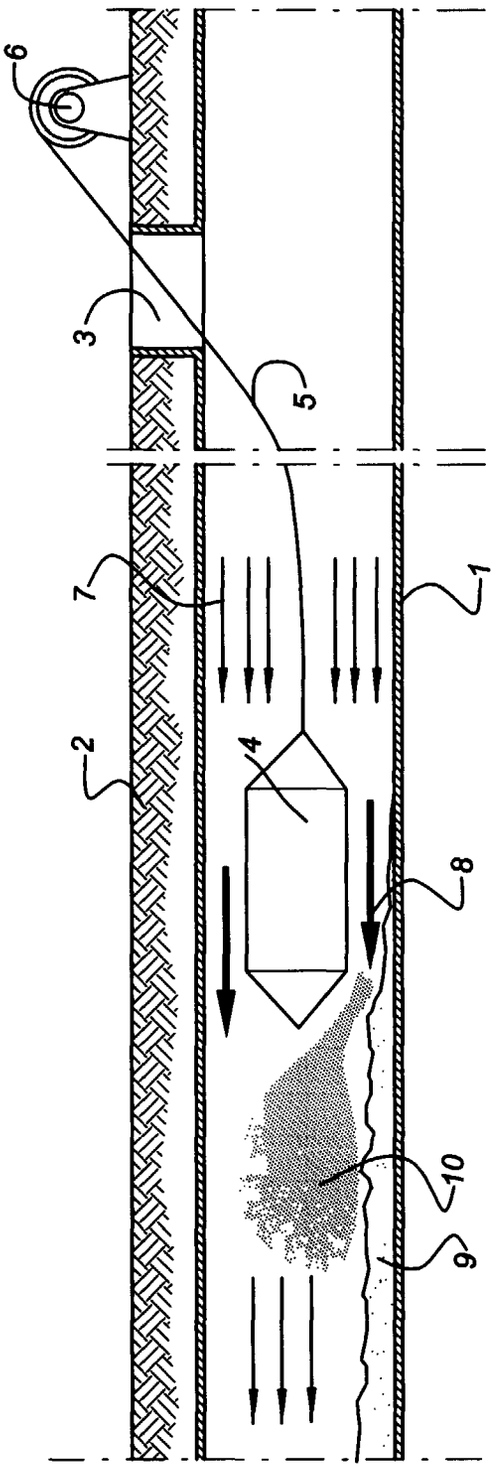
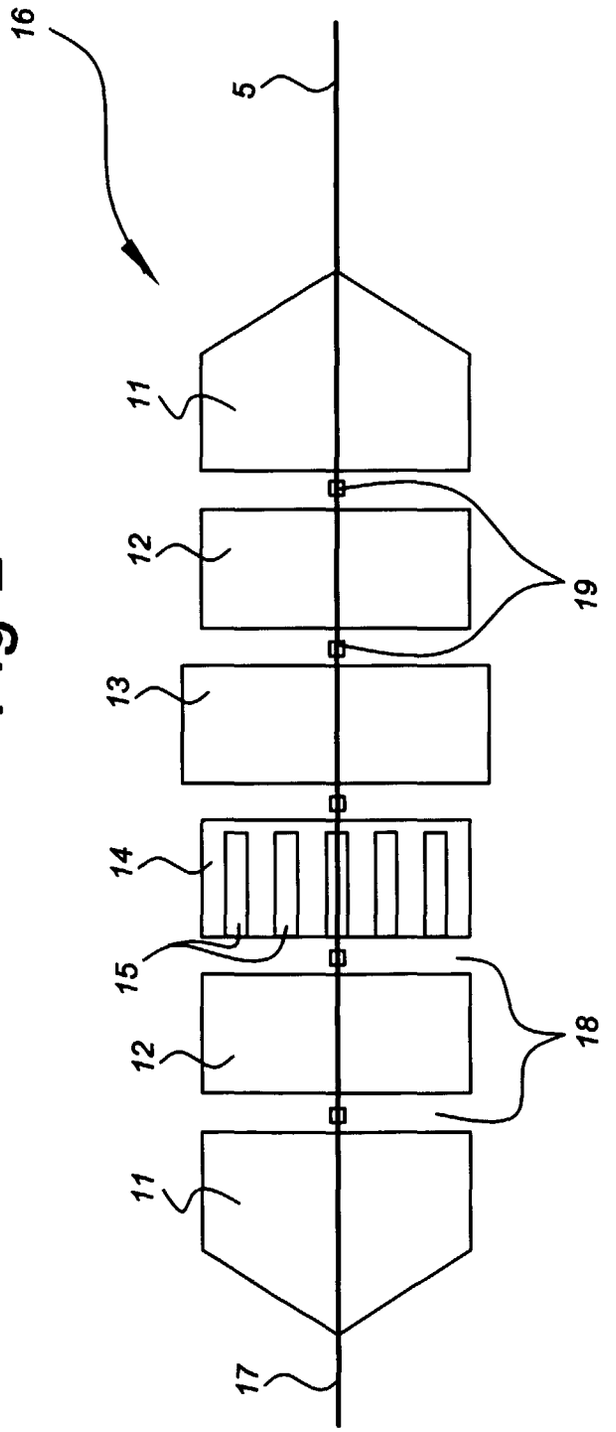


Fig 2



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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 0943

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 June 1999	Van der Zee, W

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 0943

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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Place of search	Date of completion of the search	Examiner
THE HAGUE	29 June 1999	Van der Zee, W

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