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(54) AUTOMATIC CLEANING SYSTEM FOR SLUDGE CLEANING - BUILT INTO TWO-STROKE CROSS-HEAD ENGINES

IN ZWEITAKT-KREUZKOPFMOTOREN EINGEBAUTES AUTOMATISCHES REINIGUNGSSYSTEM ZUR SCHLAMMREINIGUNG

SYSTÈME DE NETTOYAGE AUTOMATIQUE POUR LE NETTOYAGE DE BOUES - INTÉGRÉ DANS DES MOTEURS À DEUX TEMPS À CROSSE

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(73) Proprietor: **Smart-Marine ApS**
9000 Aalborg (DK)

(72) Inventor: **PETERSEN, Hansa Maria**
6470 Sydals (DK)

(74) Representative: **Patrade A/S**
Ceresbyen 75
8000 Aarhus C (DK)

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Description

BACKGROUND

[0001] The invention concerns an engine with an automatic cleaning system with rotating flexible spiral auger fixed mounted within a hollow of the engine such that fluids and solids within the hollow are transported along the outer diameter of the auger.

[0002] More specific the invention relates to an automatic cleaning system with a rotating flexible spiral auger that can be used in or on two-stroke crosshead engines. and is particularly suitable for incorporation into the engine flushing air belts. (also referred to as" Scavenge air space" or "piston underside space").

[0003] It is known from two-stroke crosshead engines that "sludge" accumulates layer on layer in engine flushing air belts. This phenomenon occurs because of the composition of the medium. The media consists of lubricating oil from the lubrication of the cylinder, mixed with solid particles in the form of unburned particles (sludge). These solid or sluggish liquid constituents tend to precipitate/precipitate and accumulate on surfaces with little or no inclination, relatively quickly, layer on layer, building up a relatively large amount of solid sludge under the operation of the engine. This built-up material has almost consistency as hard trampled soil. The phenomenon occurs because the flowing part of the media (oil) flows away, without being able to keep the solid/sluggish liquid components in sufficient motion.

[0004] Examples are known where an unacceptable amount of solid sludge is built up, after only 3 weeks of operation since the last cleaning.

[0005] Presently the problem is mainly solved by manually cleaning the areas by small shovels, creators, spatulas and other known tools for cleaning/excavating. However, this leads to relatively high consumption of working hours. In addition, it is necessary to stop the engine for several hours to perform this manual work.

[0006] In known examples a consumption of over 1200 working hours on manual cleaning of purge air belts, purge air tank and associated drainage pipes annually. In addition, the work is a nuisance for those involved, as it often takes place in awkward positions and often involves the use of toxic and potentially harmful chemicals and / or diesel oil.

[0007] There is also growing concern about the long-term effects of the sludge-harmful constituents on those involved employees. It is often seen that the crew cannot avoid skin contact with the sludge during the cumbersome manual excavation / cleaning. It also often appears very high temperature inside these relatively narrow spaces. This mixed with the air content of different potentially harmful fumes / mist, make it desirable to completely avoid human manual excavation and cleaning.

[0008] For the above areas and associated pipes, cleanliness is important for engine operation. Too big an accumulation of sludge could lead to significant operational and safety concerns with engine operation.

[0009] Various rotating pipes and drain cleaners are known. These are characterized by a wire being pushed like a cleaning tape in through an opening in a tube, or pipe. They are usually handheld and requires access to an opening in the tube and are typically used when a tube is completely or partially clogged to punch a hole in a possible in the clogging plug. The devices are not intended for fixed/permanent mounting and continuous prevention operation.

[0010] A prior publication, GB 468813 A, discloses an automatic cleaning system with rotating flexible spiral auger fixed in the pipe system. Transport of solids takes place by a scraping effect against the bottom of the pipe while the system allows liquid flow through the hollow diameter of the helical auger, as well as along the space that emerges between the outer diameter of the helical auger and the inner diameter of the tube.

[0011] The publication describes an invention and technique intended for transporting ash and slag down through a pipe that is constantly filled / flooded by stagnant water, a technique mainly used in various combustion boilers, and is characterized by the transporting / forcing of the solid down below the surface and through stagnant water in a constantly pipe. The purpose of this technique is to effectively extinguish embers and fire in the ash / slag before being transported for storage.

[0012] Moreover, a rotating flexible spiral or helical auger is known from flex augers which e.g. used for transport of feed and granules in e.g. agriculture. In these applications, the auger is characterized by a relatively fast rotation and the primary function of the auger is transport (auger run) of dry feed or granules through a pipe or duct.

[0013] From WO 2018/233789 A1 an automatic cleaning system for an engine as described in the introductory paragraph. The cleaning system comprises a rotating flexible spiral auger fixed mounted within a hollow of the engine. When rotating the spiral auger fluids and solids within the hollow are transported along the outer diameter of the auger.

OBJECT OF THE INVENTION

[0014] The object of the invention is to automatically prevent unacceptable accumulation of solid / sluggish liquid sludge during continued operation of the engine, using adapted rotation of flexible centerless helical auger.

[0015] A further object is to obtain a trouble-free operation of two-stroke engines and a saving in man-hours for manual cleaning.

[0016] A further object is to obtain savings in relation to consumption of cleaning chemicals and diesel oil consumed in connection with manual cleaning of the indicated areas in the engine.

[0017] A still further object is to obtain a saving in the consumption of cylinder lubrication oil.

SUMMARY OF THE INVENTION

[0018] The problems are solved with the engine described by way of introduction and as defined in the preamble of claim 1 and which is peculiar in

- that the auger is positioned in an engine hollow being the scavenge air space or piston underside space or
- that the auger is positioned in an engine hollow being the scavenge air receiver or

that an auger is positioned in both the scavenge air space or piston underside space and in the scavenge air receiver.

[0019] Hereby the engine is introduced which comprises an automatic cleaning system with rotating flexible spiral auger fixed mounted within a hollow of the engine such that fluids within the hollow are transported along the outer diameter of the auger.

[0020] The present invention will result in trouble-free operation of these two-stroke engines and will mean a drastic saving in man-hours for manual cleaning. In addition, the invention could lead to one significant savings in relation to consumption of cleaning chemicals and diesel oil consumed in connection with manual cleaning of the indicated areas in the engine. Furthermore, the present invention will assist engine operators to save consumption of significant amount of cylinder lubrication oil.

[0021] The automatic cleaning system with a rotating flexible spiral auger is particularly suitable for incorporation into the engine flushing air belts. (also referred to as" Scavenge air space" or "piston underside space").

[0022] The invention is also suitable for installation in the engine flushing air tank "scavenge air receiver". In addition, the system is suitable for installation in the piping systems that divert from the above areas.

[0023] The invention can be used both as a retrofit on existing engines and installations, as well as for installation in or on new engines and installations. The invention can be used both for pressure-set and pressure-less (open) systems.

[0024] The auger may be centreless such that sludge and oil further flows in an auger center.

[0025] The auger may be sufficiently flexible to allow it to extend straight or slightly curvingly, thus adapting to the hollow.

[0026] The auger may be positioned such that it can scrape a sludge out of the engine towards an outlet opening.

[0027] When the auger is positioned in an engine hollow being the scavenge air space or piston underside space the bottom of the hollow may incline towards the bottom of the auger, thus that both sludge and oil will slide or flow down towards the bottom of the auger.

[0028] Moreover, when the auger is positioned in an engine hollow being the scavenge air receiver the auger may be held in position by a longitudinal guiding plate.

[0029] An auger may be positioned in the scavenge air space or piston underside space and/or in the scavenge air receiver.

[0030] A driving unit may be mounted at the end of the auger.

[0031] The auger may be positioned in the integrated pipes that drains from the engine.

[0032] The rotating flexible helical auger is further characterized by being flexible so that it can follow and function in any channels and/or tubes and any soft bends.

[0033] With the automatic cleaning system with rotating flexible spiral auger, the auger's primary function is to prevent the deposition of solids (sludge) within the hollow in which the auger is positioned. This is achieved at a relatively slow rate rotation that produces a scraping effect against the inner wall of a channel, tube or duct.

[0034] The primary media transport passes by flow through the hollow diameter of the spiral auger, as well as along the outer diameter of the auger.

[0035] The flow occurs by gravity due to the inclination of the inner wall or as due to pressure difference between the inlet and outlet of the auger. There are also systems where flow occurs as a result of a combination of gravity and pressure difference.

[0036] By "inner wall' is referred the surface of the profile cross section in which the auger is positioned, and which may be a channel, a duct of a tube. The auger can thus be placed in pipes and/or ducts that are closed and possibly combined with fully / partially open stretches. The auger can also be positioned in closed pipes and ducts.

[0037] This effect of the present invention is opposite to the effect obtained with a system disclosed in the above-mentioned GB 468813 A which has the purpose of transporting/forcing the solid down below a water surface and through stagnant water in a constantly pipe in order to effectively extinguish embers and fire in the ash/slag before being transported for storage.

[0038] The effect of the present invention is continuously to keep a tube or pipe inner wall clean of undesired sludge.

[0039] For e.g. large two-stroke engines this is extremely important since the clogging can cause sudden leaks of oil, fuel or cooling water, and of safety reasons it is important that such a leak be diverted immediately through clean and empty ducts and drainage tubes or pipes, that therefore needs continuously to be kept clean and empty - ready to drain abnormal leakage via.

[0040] The present invention further differs from the prior art technique by being built into e.g. a two-stroke engine, preferably of the crosshead type.

[0041] The rotational speed of the spiral auger may be adjusted so that a relatively clean inner wall/channel/pipe is maintained by preventing precipitation and construction of solid and/or sluggish liquid material. The speed of rotation of the auger may be adjusted to slow speed to avoid unnecessary friction between auger and inner wall. This avoids unnecessary wear as well as temperature

rise on the rotating auger.

[0042] The rotating movement of the spiral auger can be a constant or varying rotational speed. The invention can is also be performed with intermittent (start / stop) rotating motion.

[0043] The invention is further characterized by having a drive unit mounted at the end of the auger. The scraping / cleaning movement of the spiral auger can take place with the direction of movement away from the drive unit - as well as direction of movement towards the drive unit. The drive unit produces a rotary movement of the spiral auger. The rotary movement of the drive unit can be performed using electric motor / actuator, hydraulic motor / actuator, pneumatic motor / actuator, mechanical actuator or manually operated.

BRIEF DESCIPTION OF THE FIGURES

[0044]

Fig. 1 Figure 1 shows an embodiment seen in the cross-section of an engine 1 where augers 2 (or snails or spiral screws) are mounted both in the engine flushing air belts 3 (referred to as" Scavenge air space" or "piston underside space"), and in the engine flushing air tank 4. The augers 2 are covered by longitudinal guiding plates 5.

Fig. 2 Illustration seen from the side of the engine 1 with an auger 2 positioned in the engine flushing air tank 4 and a section of the auger extending into a pipe or channel 9 with an opening 6.

Fig. 3 Illustration seen from the side of the engine with an auger 2 positioned in the engine flushing air belts 3 and a section of the auger extending into a pipe or channel 9 with an opening 6.

Fig 4 Illustration of an embodiment where the augers 2 are mounted in the engine flushing air belts 3, as well as in the integrated pipes 10 that drains from the engine 1.

Fig 5 Illustration of an auger 2 positioned within an auger tube 13.

Fig 6 Illustration of an auger 2 and parts of a driving unit 8.

Fig. 7 Illustration of an auger 2 positioned relative to a surface 24 with declining sides towards the auger 2.

Fig. 8 Illustration of an auger 2 positioned relative to a surface 24 with one vertical side.

Fig. 9 Illustration of an auger 2 positioned relative to a surface 24 where the auger 2 is positioned in a recess 25 of the surface 24 according to one embodiment.

Fig.10 Illustration of an auger 2 positioned relative to a surface 24 where the auger 2 is positioned in a recess 25 of the surface 24 according to another embodiment relative to fig. 9.

Fig. 11 Illustration of an auger 2 positioned relative to a circular surface 24 and with a longitudinal guiding plate 5.

DETAILED DESCRIPTION OF THE INVENTION

[0045] The detailed description and specific examples, while indicating embodiments of the invention, are given by way of illustration only.

[0046] Figure 1 shows an embodiment seen in the cross-section of an engine 1 where augers 2 (or snails or spiral screws) are mounted both in the engine flushing air belts 3 (referred to as" Scavenge air space" or "piston underside space"), and in the engine flushing air tank 4 (also referred to as "scavenge air receiver"). In the illustrated embodiment, the augers 2 are held in position by longitudinal guiding plates 5. The auger 2 can extend straight or slightly curvingly. The bottom of the engine flushing air belts 3 are made with an appropriate inclination towards the bottom of the auger 2, thus that both sludge and oil will slide/flow down towards the bottom of the auger 2. The auger 2 thus can scrape the sluggish liquid sludge out of the engine 1, towards the outlet opening 6 of the auger 2 (see fig 3). The oil will be able to flow along the outer diameter of the auger 2, as well as in the hollow of the auger 2 center 7 (see fig. 4).

[0047] Fig 2 and Fig 3 illustrates embodiments seen from the side of the engine 1. The spiral augers 2 in the embodiment extends along all the engine 1 cylinders. The cleaning system can be divided into sections if desirable. The figures show driving units 8 mounted at the end of the augers 2 and the outlet opening 6 positioned in relation to a form of pipe or channel 9 that the auger 2 extend into towards its outlet 6. The outlet 6 may be connected via pressure tight pipes to a tank, for collection of oil and sludge.

[0048] In the form shown, the longitudinal direction of the screws is mainly parallel to that of the engine 1 longitudinal direction.

[0049] Figure 4 illustrates an embodiment where the augers 2 are mounted in the engine flushing air belts 3, as well as in the integrated pipes 10 that drains from the engine 1. In this embodiment a valve 11 (e.g. a ball valve) is positioned at the inlet to the integrated tube 10. The integrated tube 10 is common for all the cylinders of engines 1, and it may be an advantage to be able to seal off the outlet from the individual cylinders using a valve 11. In the illustration the crossmounted augers 2 scrapes

sludge and oil from the engine flushing air belts 3, towards the driving unit 8. The mixture of sludge and oil will then flow/slide into the integrated tube 10. The auger 2a scrapes the sluggish liquid sludge away from the engine 1 in the engine 1 longitudinal direction. The oil could flow along the outer diameter of the auger (2), as well as in the hollow center 7.

[0050] In the illustrated embodiment the longitudinal direction of the auger 2 is mainly perpendicular to the engine's 1 longitudinal direction, while the auger 2a built into the integrated tubes 10, mainly in the longitudinal direction of the engine 1.

[0051] The automatic cleaning system can thus be built in at any practical angle, in relation to the longitudinal direction of the engine 1, as well as any practical angle to the horizontal plane of the engine 1. However, it is an advantage to be inclined towards the outlet 6 of the auger 2, 2a.

[0052] The outlet 6 of the auger 2, 2a from the engine 1 may be designed as a circular pipe, a machined or cast channel, or any other pressure tight duct or passage, allowing the free rotation and movement of the auger 2.

[0053] Figures 5 and 6 show an embodiment of the drive unit 8 intended for pressurized systems (cleaning from the engine flushing air belts 3 and flushing air tank 4). The illustrated auger 2 is blunt (as may be the case for all the disclosed embodiments) and the embodiment relates to a traditional axel sealing 12 seals against the pressure present in the auger tube 13 (the flushing air pressure). The axle 14 (or shaft) transmits the slow rotating motion of a gear motor 16 to spiral the auger 2. The housing 15 acts both as the fundament and as the end flange of the auger tube 13. The bearing housing 17 absorbs the axial and radial forces of the shaft via e.g. a ball bearing.

[0054] The gear motor 16 produces the rotation of the axle 14 and auger 2. The rotating power of the gear motor 16 is transmitted through a spring split mounted through the holes 18a, 18b to ensure the auger 2 and gear motor 16 from being overloaded. The sliding bearing 19 functions partly to absorb the radial forces of the axle 14 and to compress the traditional axle sealing 12. The compressing effect is achieved by tightening the bolts 20 so that the sliding bearing 19 is pulled in the direction of the housing 15 achieving a close effect between the rotating axle 14 and the stationary housing 15. The spiral auger 2 may be fastened to the axle 14 by means of a screw 21 (e.g. a pinole screw) in a recess in the axle 14. The guard 22 is mounted on the housing 15 to protect against access to the rotating axle 14. The inductive sensor 23 monitors the desired axle rotation.

[0055] Fig. 7 shows an embodiment auger 2 positioned relative to a surface 24. The auger 2 is positioned at the bottom of a bend surface 24 having declining sides towards the auger 2. The arrows indicate direction of movement of sludge and oils towards the bottom of the auger 2.

[0056] Fig. 8 shows the auger 2 and surface 24 in another embodiment differing from the embodiment of fig. 7 in that one side of the surface 24 is vertical. The arrows indicate direction of movement of sludge and oils towards the bottom of the auger 2.

[0057] Fig. 9 shows the auger 2 and surface 24 in a third embodiment differing from the embodiment of fig. 7 in that the auger 2 is positioned in a recess 25 of the surface 24 having a depth so that the auger 2 reach above the recess 25. The arrows indicate direction of movement of sludge and oils towards the bottom of the auger 2.

[0058] Fig. 10 shows the auger 2 and surface 24 in a fourth embodiment differing from the embodiment of fig. 9 by the recess 25 having a depth at least as large as the diameter, or height, of the auger 2, this thus being essentially fully confined within the recess 25. The arrows indicate direction of movement of sludge and oils towards the bottom of the auger 2.

[0059] Fig. 11 shows the auger 2 and surface 24 in a fourth embodiment where the surface 24 is circular, or at least curving. The arrows indicate direction of movement of sludge and oils towards the bottom of the auger 2.

[0060] The auger 2 as illustrated in fig. 11, but which could be implemented in any of the embodiments, are held in position by longitudinal guide plates 5. These guide plates are positioned and designed to ensure that sludge and oil can slide / flow down to the bottom of the auger 2. And at the same time keep the auger in the desired position relative to surface 24 and/or recess 25.

References

[0061]

1 - Engine
2, 2a - Auger or snail
3 - Engine flushing air belts (" Scavenge air space" or "piston underside space")
4 - Engine flushing air tank (also referred to as "scavenge air receiver")
5 - Longitudinal guiding plates
6 - Outlet opening of the auger
7 - Auger center
8 - Driving units
9 - pipe or channel
10 - Integrated tube
11 - Valve
12 - Axel sealing
13 - Auger tube
14 - Axle or shaft
15 - Housing
16 - Gear motor
17 - Bearing housing
18a, 18b - Holes
19 - sliding bearing
20 - Bolts
21 - Screw
22 - Guard
23 - Inductive sensor
24 - Surface

25 - Recess

Claims

1. Engine (1) with an automatic cleaning system with rotating flexible spiral auger (2) fixed mounted within a hollow (3, 4) of the engine (1) such that fluids and solids within the hollow are transported along the outer diameter of the auger (2), **characterized in**

   - **that** the auger (2) is positioned in an engine hollow (3) being the scavenge air space or piston underside space or
   - **that** the auger (2) is positioned in an engine hollow being the scavenge air receiver or

   that an auger (2) is positioned in both the scavenge air space or piston underside space and in the scavenge air receiver.

2. Engine (1) according to claim 1, wherein the auger (2) is centreless such that sludge and oil further flows in an auger center (7).

3. Engine (1) according to claim 1 or 2, wherein the auger (2) is sufficiently flexible allowing it to extend straight or slightly curvingly.

4. Engine (1) according to claim 1, 2 or 3, wherein the auger (2) is positioned such that it can scrape a sludge out of the engine (1) towards an outlet opening (6).

5. Engine (1) according to any one of the previous claims, wherein the bottom of the hollow (3) inclines towards the bottom of the auger (2), thus that both sludge and oil will slide or flow down towards the bottom of the auger (2).

6. Engine (1) according to any one of the previous claims, wherein the auger (2) is held in position by a longitudinal guiding plate (5).

7. Engine (1) according to any one of the previous claims, wherein a driving unit (8) mounted at the end of the auger (2).

8. Engine (1) according to any of the previous claims, wherein the auger (2) is positioned in the integrated pipes (10) that drains from the engine (1).

9. Engine (1) according to any of the previous claims, wherein the engine is a two-stroke crosshead engine.

10. An automatic cleaning system with rotating flexible spiral auger (2) and for use in an engine according to claim 1, wherein the auger (2) is fixed mounted within a hollow (3, 4) of the engine (1) such that fluids and solids within the hollow are transported along the outer diameter of the auger (2) and **characterized in**

    - **that** the auger (2) is positioned in an engine hollow (3) being the scavenge air space or piston underside space or
    - **that** the auger (2) is positioned in an engine hollow being the scavenge air receiver or

    that an auger (2) is positioned in both the scavenge air space or piston underside space and in the scavenge air receiver.

Patentansprüche

1. Motor (1) mit einem automatischen Reinigungssystem mit rotierender flexibler Spiralschnecke (2), die derart fest in einem Hohlraum (3, 4) des Motors (1) montiert ist, dass Fluide und Feststoffe innerhalb des Hohlraums entlang des Außendurchmessers der Schnecke (2) transportiert werden, **dadurch gekennzeichnet,**

   dass die Schnecke (2) in einem Motorhohlraum (3) positioniert ist, der der Spülluftraum oder der Kolbenunterseitenraum ist, oder
   dass die Schnecke (2) in einem Motorhohlraum positioniert ist, der der Spülluftbehälter ist, oder
   dass eine Schnecke (2) sowohl in dem Spülluftraum oder Kolbenunterseitenraum als auch in dem Spülluftbehälter positioniert ist.

2. Motor (1) nach Anspruch 1, wobei die Schnecke (2) derart zentrumslos ist, dass Schlamm und Öl weiter in ein Schneckenzentrum (7) fließen.

3. Motor (1) nach Anspruch 1 oder 2, wobei die Schnecke (2) ausreichend flexibel ist, um zu ermöglichen, dass sie sich gerade oder leicht gekrümmt erstreckt.

4. Motor (1) nach Anspruch 1, 2 oder 3, wobei die Schnecke (2) derart positioniert ist, dass sie Schlamm aus dem Motor (1) in Richtung einer Auslassöffnung (6) schaben kann.

5. Motor (1) nach einem der vorhergehenden Ansprüche, wobei der Boden des Hohlraums (3) in Richtung des Bodens der Schnecke (2) hin geneigt ist, so dass sowohl Schlamm als auch Öl in Richtung des Bodens der Schnecke (2) hinuntergleiten oder -fließen werden.

6. Motor (1) nach einem der vorhergehenden Ansprüche, wobei die Schnecke (2) von einer länglichen Führungsplatte (5) in Position gehalten wird.

7. Motor (1) nach einem der vorhergehenden Ansprüche, wobei eine Antriebseinheit (8) an dem Ende der Schnecke (2) montiert ist.

8. Motor (1) nach einem der vorhergehenden Ansprüche, wobei die Schnecke (2) in den integrierten Rohren (10) positioniert ist, die aus dem Motor (1) abfließen.

9. Motor (1) nach einem der vorhergehenden Ansprüche, wobei der Motor ein Zweitakt-Kreuzkopfmotor ist.

10. Automatisches Reinigungssystem mit rotierender flexibler Spiralschnecke (2) und zur Verwendung in einem Motor nach Anspruch 1, wobei die Schnecke (2) derart fest in einem Hohlraum (3, 4) des Motors (1) montiert ist, dass Fluide und Feststoffe innerhalb des Hohlraums entlang des Außendurchmessers der Schnecke (2) transportiert werden, und **dadurch gekennzeichnet,**

dass die Schnecke (2) in einem Motorhohlraum (3) positioniert ist, der der Spülluftraum oder der Kolbenunterseitenraum ist, oder
dass die Schnecke (2) in einem Motorhohlraum positioniert ist, der der Spülluftbehälter ist, oder
dass eine Schnecke (2) sowohl in dem Spülluftraum oder Kolbenunterseitenraum als auch in dem Spülluftbehälter positioniert ist.

Revendications

1. Moteur (1) équipé d'un système de nettoyage automatique à vis sans fin spiralée flexible rotative (2) montée à demeure dans un creux (3, 4) du moteur (1) de telle sorte que les fluides et les solides à l'intérieur du creux sont transportés le long du diamètre extérieur de la vis sans fin (2), **caractérisé en ce que**

- la vis sans fin (2) est positionnée dans un creux de moteur (3) qui est l'espace d'air de balayage ou l'espace inférieur de piston ou
- la vis sans fin (2) est positionnée dans un creux de moteur qui est le récipient d'air de balayage ou

une vis sans fin (2) est positionnée à la fois dans l'espace d'air de balayage ou l'espace inférieur de piston et dans le récipient d'air de balayage.

2. Moteur (1) selon la revendication 1, dans lequel la vis sans fin (2) ne présente pas de centre de sorte que les boues et l'huile s'écoulent en outre dans un centre de vis sans fin (7).

3. Moteur (1) selon la revendication 1 ou 2, dans lequel la vis sans fin (2) est suffisamment flexible pour lui permettre de s'étendre de manière droite ou légèrement courbée.

4. Moteur (1) selon la revendication 1, 2 ou 3, dans lequel la vis sans fin (2) est positionnée de sorte qu'elle peut racler les boues hors du moteur (1) vers une ouverture de sortie (6).

5. Moteur (1) selon l'une quelconque des revendications précédentes, dans lequel le fond du creux (3) est incliné vers le fond de la vis sans fin (2), de sorte qu'à la fois les boues et l'huile tombent ou s'écoulent vers le bas en direction du fond de la vis sans fin (2).

6. Moteur (1) selon l'une quelconque des revendications précédentes, dans lequel la vis sans fin (2) est maintenue en position par une plaque de guidage longitudinale (5).

7. Moteur (1) selon l'une quelconque des revendications précédentes, dans lequel une unité d'entraînement (8) est montée à l'extrémité de la vis sans fin (2).

8. Moteur (1) selon l'une quelconque des revendications précédentes, dans lequel la vis sans fin (2) est positionnée dans les tuyaux intégrés (10) qui sortent du moteur (1).

9. Moteur (1) selon l'une quelconque des revendications précédentes, dans lequel le moteur est un moteur à deux temps à crosse.

10. Système de nettoyage automatique à vis sans fin spiralée flexible rotative (2) et destiné à être utilisé dans un moteur selon la revendication 1, dans lequel la vis sans fin (2) est montée à demeure dans un creux (3, 4) du moteur (1) de telle sorte que les fluides et les solides à l'intérieur du creux sont transportés le long du diamètre extérieur de la vis sans fin (2) et **caractérisé en ce que**

- la vis sans fin (2) est positionnée dans un creux de moteur (3) qui est l'espace d'air de balayage ou l'espace inférieur de piston ou
- la vis sans fin (2) est positionnée dans un creux de moteur qui est le récipient d'air de balayage ou

une vis sans fin (2) est positionnée à la fois dans l'espace d'air de balayage ou l'espace inférieur de piston et dans le récipient d'air de balayage.

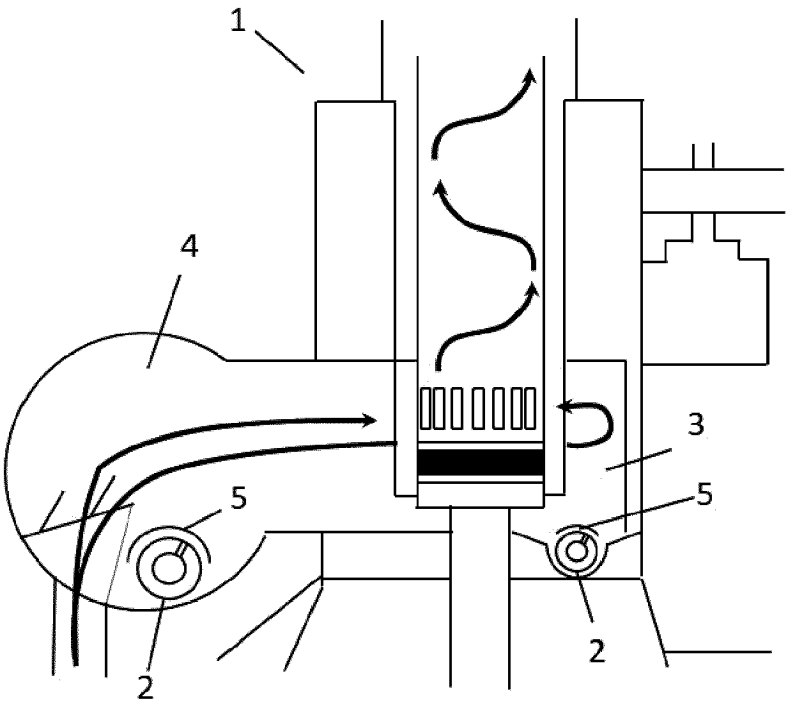


Fig. 1

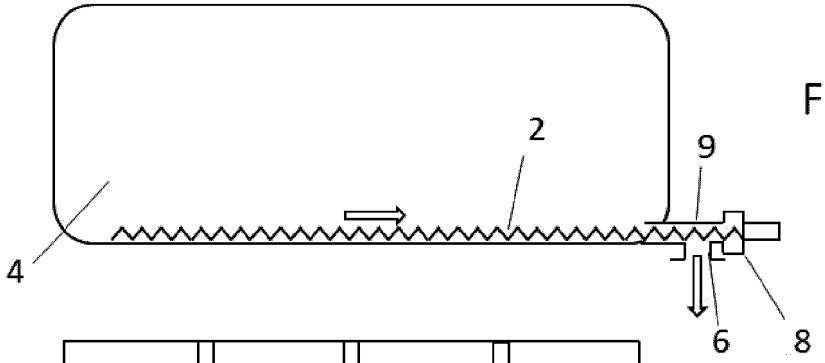


Fig. 2

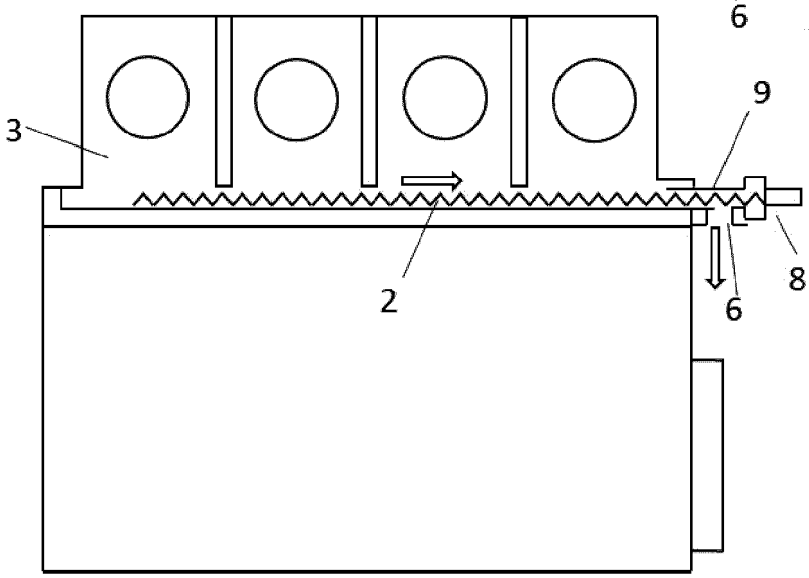


Fig. 3

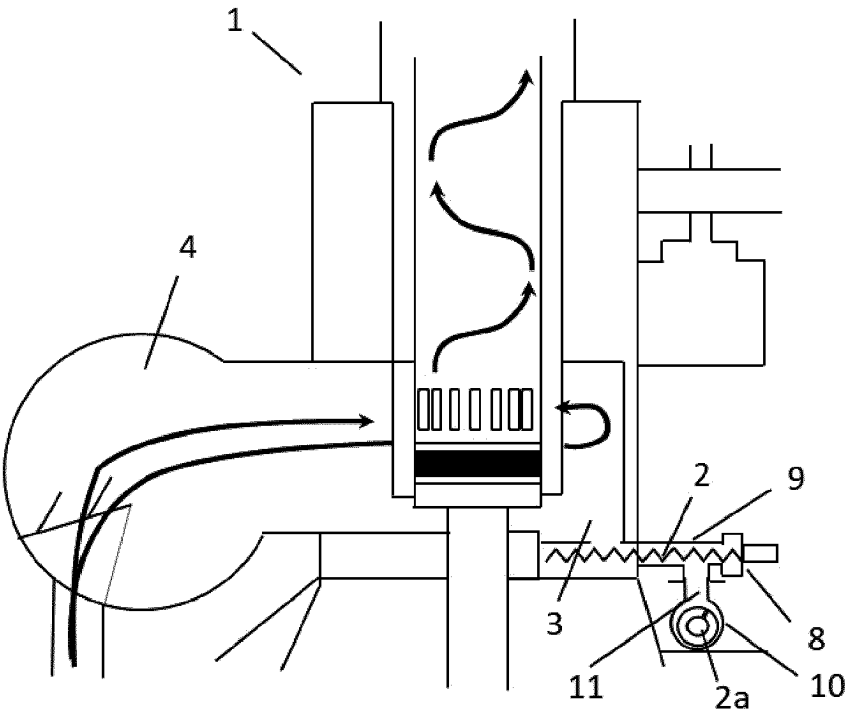


Fig. 4

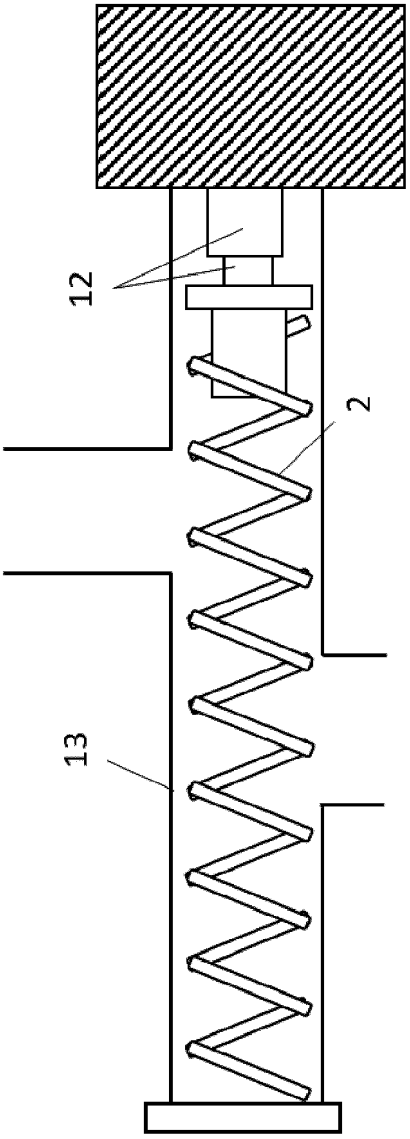


Fig. 5

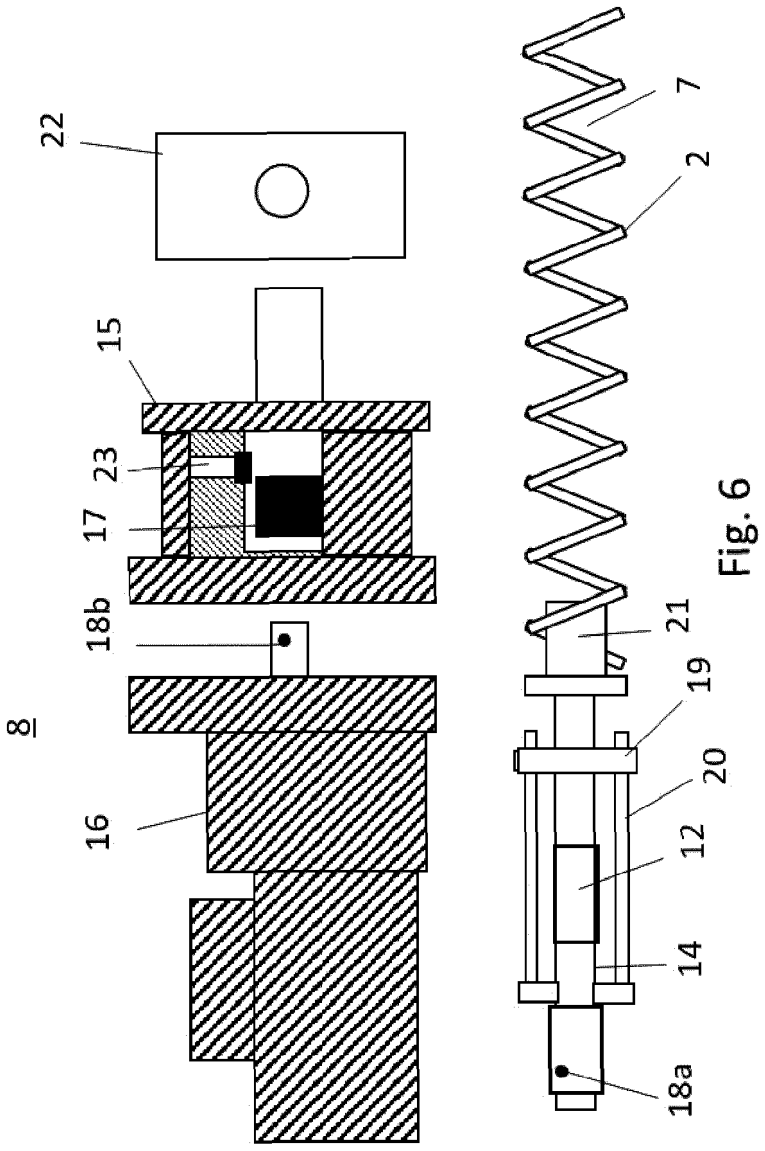


Fig. 6

Fig. 7

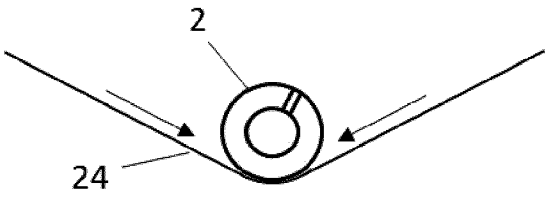


Fig. 8

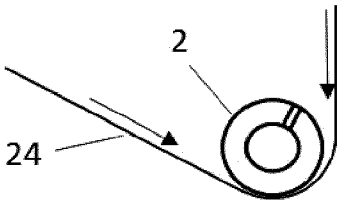


Fig. 9

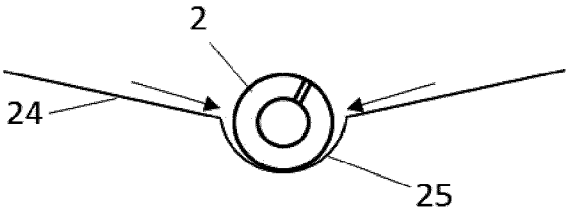


Fig. 10

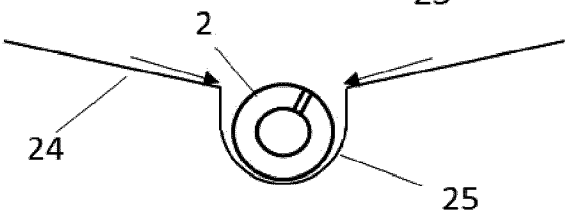
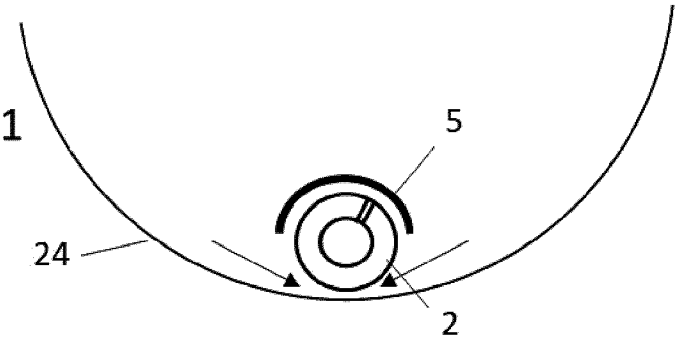


Fig. 11



REFERENCES CITED IN THE DESCRIPTION

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