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(54) **Barrier for preventing rats or other vermin from entering a sewage pipe system**

Schranke zur Vermeidung des Eindringens von Ratten und anderer Schädlinge in ein Abwasserrohrssystem

Barrière pour empêcher les rats ou autres animaux indésirables d'entrer dans un système de tuyau pour eaux usées

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Description

[0001] The present invention relates to a barrier for preventing rats or other vermin from entering a sewage pipe system, said barrier comprising at least one shutter pivotally suspended in the barrier about a first axis and having a centre of gravity lying under the axis, and said shutter being pivotal between a first angular position in which the at least one shutter is forming a first relatively larger angle with the direction of flow and at least substantially barring the aperture of the barrier, and a second angular position in which the at least one shutter is forming a second relatively smaller angle with the direction of flow keeping the aperture of the barrier at least partly open.

BACKGROUND OF THE INVENTION

[0002] Numerous solutions exist for preventing vermin such as rats from entering specific sections of a sewage pipe system. Among others, the following prior art patent publications exist:

WO 92/21830 describes means for barring animals, in particular rats, from entering a network of tubes, for instance a section of a sewerage system, said means comprising a hatch or a body, which in a transition well is hinged at level with and covering the outlet from the network of tubes into the transition well. To ensure that the animals cannot by repeated attempts manipulate the hatch and thereby gain access to the blocked network of tubes, the transition well is constructed in such a way that the outlet from the network of tubes is placed higher than a possible level of liquid in the transition well, the outlet projecting somewhat into the well, that the well is provided with a cover placed immediately above the outlet from the network of tubes, in which cover the hatch or the body is hinged, and in that the cover is provided with guiding protrusions or similar means for ensuring that the mounting of the cover only can take place in a predetermined angular position.

WO 03/069082 describes a barrier serving for preventing a rat from entering a sewage pipe in the direction against the flow. The barrier comprises a first pivotal shutter and a second pivotal shutter located upstream of the first shutter. Both shutters are forming an acute angle with the direction of flow when they are in a first angular position, in which at least the first shutter is barring the aperture of the sewage pipe. From the first angular position, the first shutter can be swung to a second angular position, in which it is clear of the aperture of the sewage pipe. The two shutters are detachably locked to each other when they both are in their first angular position. The second shutter is simultaneously detachably locked to a fixed stop on the barrier. The rat can therefore not open the first shutter and thereby force the barrier. When the flow in the sewage pipe gets so strong that the rat cannot struggle its way upstream, the liquid pressure will force the second shutter towards a second angular position in relation to the first shutter, whereby the locking engagement between the second shutter and the stop is released. Then, the liquid pressure is allowed to force the first shutter to its second angular position, in which the liquid freety can flow through the sewage pipe but at such a force that the rat is not able to pass the barrier.

FR 769,554 shows an apparatus for preventing rats from invading cellars. A figure shows the body of the apparatus with fitment in an inner end and outer end. The apparatus constitutes an integrate part of the sewage pipe system. The apparatus is absolutely dependent on the type, shape and dimensions of the circular inlet or outlet pipe.

GB 2 248 857 shows a vermin trap for fitting in a sewerage inspection chamber, and comprises a hinged flap valve which opens when there is a flow of sewerage into the inspection chamber and closes when there is no flow. Preferably the valve is mounted on the upstream end of a vermin cage which is formed over the inlet of said chamber. The flap constitutes part of a cage which constitutes part of an inspection chamber, and thus constitutes an integral part of the sewerage inspection chamber. The vermin trap is an integrate part of the sewage pipe system and is fixedly mounted in the inspection chamber.

US 4,174,913 shows an animal guard for use in a field pipe has a generally circular baffle member mounted for pivotable movement and a stop bar secured inwardly of the pipe. The animal guard prevents animal entry past the member while the member is free to pivot in the first direction toward the open pipe end to provide substantially free-flow of debris carrying effluents in the pipe toward the open end. A generally U-shaped member having inner and outer legs connected by a bight portion is proportioned to fit over an upper wall section of an open pipe end, with the inner and outer legs extending axially of the pipe and respectively engaging the inner and outer surfaces thereof. The animal guard is fixed to the field pipe by means of bolts and nuts extending through the pipe and the U-shaped member from the outside to the inside or vice versa.

Common to all the prior art solutions is the fact that the barrier is either an integrate part of the sewage pipe system and/or the barrier is absolutely dependent on at least one of the parameters of the sewage pipe system: the type, i.e. a circular inlet or outlet pipe or just a half-pipe in the bottom of a man-hole or an inspection-hole; or the

size, i.e. the exact diameter or the circular pipe or of the exact width and length of the half-pipe; or the orientation, i.e. whether the inlet pipe leads to the outlet pipe directly across the bottom of the inspection-hole, or leads to the outlet pipe along an oblique orientation across the bottom of the inspection-hole.

SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide a barrier for preventing vermin such as rats from entering a sewage pipe system, especially the section of the sewage pipe system leading to and from private households, but also for industrial sewage pipe systems such as at hospitals, and where the barrier is capable of being fitted easily and reliably to the sewage pipe system, without the need for professional skills and knowledge with in sewer systems.

[0004] This object is obtained by a barrier, said barrier comprising

- at least one shutter pivotally suspended in the barrier about a first axis and having a centre of gravity lying under the axis, and said shutter being pivotal between a first angular position in which the at least one shutter is forming a first relatively larger angle with the direction of flow and at least substantially barring the aperture of the barrier, and a second angular position in which the at least one shutter is forming a second relatively smaller angle with the direction of flow keeping the aperture of the barrier at least partly open, and where
- the section of the pipe is intended for entering at least one of an inlet or an outlet of the sewage pipe system and where said section of the pipe is being provided with a first contact surface for abutting a first circumferential extension of a sidewall of a sewage pipe, and a second contact surface for abutting a second circumferential extension of the sidewall of the sewage pipe, and
- where a distance is relatively smaller between said first contact surface and said second contact surface in a first configuration, in which first configuration no manually applied force is present between the first contact surface and the second contact surface, and
- where a distance is relatively larger between said first contact surface and said second contact surface in a second configuration, in which second configuration a repulsive force is present between the first contact surface and the second contact surface, and
- where said repulsive force is intended for forcing the first contact surface towards the first circumferential extension of a sidewall of a sewage pipe and for forcing the second contact surface towards the second circumferential extension of a sidewall of a sewage pipe.

[0005] A barrier as mentioned has the great advantage that the barrier may easily and quickly be installed by a non-professional person, without any specific skills within sewage systems. Also, a barrier as mentioned has the great advantage that the barrier may easily and quickly be installed by a person without any specific technical or physical skills. Thus, the barrier may be installed by almost any gown-up person living in a private household or working in an industrial site, and wanting to install a barrier for vermin such as rats in an already established sewage pipe system of the private household or the industrial site. The advantage of non-technical skills needed is due to the fact that the pipe section of the barrier has an initial configuration having a smaller cross-section in which initial configuration the only skill needed is to insert a pipe section of the barrier and having a relatively smaller cross-section into a pipe section of the sewage system and having a relatively larger cross-section. Such a skill, i.e. inserting a pipe having a relatively smaller cross-section into a pipe of relatively larger cross-section, is ordinary skills of any person.

[0006] The advantage of non-physical skills needed is due to the fact that the pipe section of the barrier exhibits the relatively smaller cross-section in a configuration being stable, i.e. a configuration needing no manually applied force to establish. Thus, when having to insert the pipe section of the barrier into the pipe section of the sewage system, only positional skills are needed.

[0007] There is no need for manually applying repulsive or attractive force during insertion of the pipe section of the barrier into the pipe section of the sewage system for thereby positioning the pipe section of the barrier in the pipe section of the sewage system.

[0008] Also, there is no need for manually applying repulsive or attractive force during insertion of the pipe section of the barrier into the pipe section of the sewage system for thereby maintaining a relatively smaller the cross-section of the pipe section of the barrier.

[0009] In a possible embodiment of the invention, said first contact surface is a contact surface provided at one lateral side of the barrier, and where said second contact surface is a contact surface provided at another lateral side of the barrier, and where a repulsive force applied between the first contact surface and the second contact surface is intended for providing abutment of the first contact surface and the second contact surface with diagonally opposite laterally orientated sections, respectively, of sidewalls of the sewage pipe system.

[0010] Manually or automatically applying a repulsive force between the first contact surface and the second contact surface results in the contact surfaces, from exhibiting a relative smaller mutual distance, now exhibit a relative larger mutual distance. The relatively larger mutual distance results in the contact surfaces coming into abutment with laterally orientated sidewalls of the pipe section of the sewage system, thereby fastening the barrier to the pipe section of the sewage system. The automatic appliance of a repulsive force may simply be one or more spring members provided as part of the barrier

and the spring force of which is capable of being released, after the barrier has been installed.

[0011] The embodiment where the contact surfaces are positioned laterally and where the contact surfaces is in abutment with lateral sidewalls of the pipe section of the sewage system has the advantage that a bottom of the pipe section of the sewage system may be maintained free of any possibly obstructing parts of the barrier, when the barrier is installed in the pipe section of the sewage system.

[0012] Thereby, any flow of sewage water through the pipe section of the sewage system may take place totally un-obstructed by any parts of the barrier, except by the intended obstruction of the at least one shutter. However, the at least one shutter is only obstructing the flow of sewage water, and of any vermin such as rats trying to enter the pipe section, in an upstream direction, not in a downstream direction.

[0013] In a possible other embodiment of the invention, said first contact surface is a contact surface provided at a substantially vertical downwards side of the barrier, and where said second contact surface is a contact surface provided at a substantially vertical upwards side of the barrier, and where a repulsive force applied between the first contact surface and the second contact surface is intended for providing abutment of the first contact surface and the second contact surface with diagonally opposite substantially vertically downwards and upwards orientated sections, respectively, of sidewalls of the sewage pipe system.

[0014] Manually or automatically applying a repulsive force between the first contact surface and the second contact surface results in the contact surfaces, from exhibiting a relative smaller mutual distance, now exhibit a relative larger mutual distance. The relatively larger mutual distance results in the contact surfaces coming into abutment with upwards and downwards orientated sidewalls of the pipe section of the sewage system, thereby fastening the barrier to the pipe section of the sewage system. The automatic appliance of a repulsive force may simply be one or more spring members provided as part of the barrier and the spring force of which is capable of being released, after the barrier has been installed.

[0015] The embodiment where the contact surfaces are positioned downwards and upwards and where the contact surfaces is in abutment with downwards orientated and upwards orientated sidewalls of the pipe section of the sewage system may results in a bottom of the pipe section of the sewage system possibly being obstructed by parts of the barrier, when the barrier is installed in the pipe section of the sewage system.

[0016] However, preferably at least the downwards orientated contact surface will be designed for flush abutment with the bottom of the pipe section of the sewage system.

[0017] Thus, any flow of sewage water through the pipe section of the sewage system may take place practically un-obstructed by any parts of the barrier, except by the intended obstruction of the at least one shutter. However, the at least one shutter is only obstructing the flow of sewage water, and of any vermin such as rats trying to enter the pipe section, in an upstream direction, not in a downstream direction.

[0018] According to a possible embodiment of the barrier, the first contact surface constitutes an integrate part of the pipe section of the barrier, and where the second contact surface constitutes an individual part of the pipe section, and said individual second contact surface being displaceable in relation to the first contact surface in a lateral direction in relation to a longitudinal extension of the pipe section.

[0019] The first contact surface being an integrate part of the pipe section of the barrier and the second contact surface being an individual part of the barrier has the advantage that it is only the second contact surface that need being forced towards the sidewall of the pipe section of the sewage system. The increase of the mutual distance between the first contact surface and the second contact surface is obtained by repulsive forcing only the second contact surface towards the sidewall. However, due to the fact that the mutual distance is increased, the first contact surface will be forced towards the sidewall as well, but not directly, but indirectly, by means of repulsive force.

[0020] Thus, the mechanical complexity of the barrier is limited because only the second contact surface has to be displaceable in relation to the pipe section of the barrier. Also, the repulsive force needed for forcing the second contact surface towards the sidewall of the sewage system may be lesser compared to repulsive forcing both the first contact surface and the second contact surface at the same time towards the sidewall of the pipe section of the sewage system.

[0021] According to a possible other embodiment of the barrier, the first contact surface constitutes an integrate part of the pipe section of the barrier, and where the second contact surface constitutes an integrate part of the pipe section, and said first contact surface and said second contact surface being displaceable in relation to each other in a lateral direction in relation to a longitudinal extension of the pipe section.

[0022] Both the first contact surface being an integrate part of the pipe section of the barrier and the second contact surface being an integrate part of the barrier has the advantage that it is possible to freely select which sections of the circumference of the pipe section of the barrier, which are to constitute the first contact surface and the second contact surface. The increase of the mutual distance between the first contact surface and the second contact surface is obtained by repulsive forcing, and thereby altering, the shape of the circumference of the pipe section of the barrier. The altering of the circumference must result in that the mutual distance between the first contact surface and the second contact surface is increased such that both the first contact surface and the second contact surface will be directly forced towards

the sidewall of the pipe section of the sewage system.

[0023] The mechanical complexity of the barrier is even more limited because not any of the first contact surface and the second contact surface has to be displaceable in relation to the pipe section of the barrier. However, the repulsive force needed for forcing the first contact surface and the second contact surface towards the sidewall of the sewage system may be higher due to the need for actually altering the shape of the circumference of the pipe section of the barrier. However, the repulsive force needed depends on the choice of material, on the dimensions and on the construction of the pipe section of the barrier.

[0024] According to even a possible other embodiment of the barrier, the first contact surface constitutes an individual part of the pipe section of the barrier, and where the second contact surface constitutes an individual part of the pipe section, and said first contact surface and said second contact surface being displaceable in relation to each other in a lateral direction in relation to a longitudinal extension of the pipe section.

[0025] Both the first contact surface being an individual part of the pipe section of the barrier and the second contact surface being an individual part of the barrier has the advantage that no altering is needed of the shape of the circumference of the pipe section of the barrier for repulsive forcing the first contact surface and the second contact surface towards the sidewall of the pipe section of the sewage system. The increase of the mutual distance between the first contact surface and the second contact surface is obtained by repulsive forcing both the first contact surface and the second contact surface towards the sidewall. When the mutual distance is increased, both the first contact surface and the second contact surface will be forced directly towards the sidewall by means of repulsive force.

[0026] However, the mechanical complexity of the barrier may be increased because both the first contact surface and the second contact surface have to be displaceable in relation to the pipe section of the barrier. Possibly, the repulsive force needed for forcing the first contact surface and the second contact surface towards the sidewall of the sewage system may be lesser compared to repulsive forcing an integrate first contact surface and an integrate second contact surface at the same time towards the sidewall of the pipe section of the sewage system.

[0027] A possible barrier having the first contact surface and the second contact surface orientated laterally, either one of or both of the first contact surface and the second contact surface, when being an individual part of the pipe section, is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being diverted laterally, when the contact surface is being provided at a lateral side of the barrier.

[0028] A vertically orientated force is easy to establish from a top of a man-hole or inspection-hole of a sewage pipe system and down into the manhole or inspection hole. None muscular strength as such is needed by the person applying the vertically orientated force, possibly only the weight of the person him- or her-self is needed for applying the vertically orientated force. By diverting the vertically orientated force laterally, preferably by a lever arm of the barrier, the vertically orientated force is diverted laterally towards the first contact surface and/or the second contact surface, substantially without any loss of force occurring.

[0029] Another possible barrier having the first contact surface and the second contact surface orientated vertically, either one of or both of the first contact surface and the second contact surface, when being an individual part of the pipe section, is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being directly applied to the contact surface, when the contact surface is provided at a substantially vertical downwards side of the barrier.

[0030] A vertically orientated force is easy to establish from a top of a man-hole or inspection-hole of a sewage pipe system and down into the manhole or inspection hole. None muscular strength as such is needed by the person applying the vertically orientated force, possibly only the weight of the person him- or her-self is needed for applying the vertically orientated force. By directing the vertically orientated force directly downwards, possibly without any lever arm of the barrier, the vertically orientated force is directed directly towards the contact surface without any loss of force occurring.

[0031] Even another possible barrier having the first contact surface and the second contact surface orientated vertically, either one of or both of the first contact surface and the second contact surface, when being an individual part of the pipe section, is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being diverted oppositely, when the contact surface is provided at a substantially vertical upwards side of the barrier.

[0032] A vertically orientated force is easy to establish from a top of a man-hole or inspection-hole of a sewage pipe system and down into the manhole or inspection hole. None muscular strength as such is needed by the person applying the vertically orientated force, possibly only the weight of the person him- or her-self is needed for applying the vertically orientated force. By diverting the vertically orientated force oppositely and upwards, possibly by means of a lever arm of the barrier, the vertically orientated force is diverted oppositely towards the contact surface, substantially without any loss of force occurring.

[0033] According to an embodiment of any aspect of the invention, exerting a lateral force to either one of or both of the first contact surface and the second contact

surface is obtained by a manually downwards applied force, and where diverting of the manually applied force is obtained by a linkage mechanism with a first lever arm being operated by the manually applied force, and a second lever arm operating either one of or both of the first contact surface and the second contact surface in a lateral direction.

[0034] According to another embodiment of any aspect of the invention, exerting a substantially vertical force to the contact surface, when the contact surface is intended for abutting a vertical part of the sewage pipe system, is obtained by a manually downwards applied force, and where diverting of the manually applied force is obtained by a linkage mechanism with a first lever arm being operated by the manually applied force, and second lever arm operating the contact surface in an upwards direction.

[0035] Applying a downwards force is easily done by any person, possibly by just using the weight of the person for exerting the lateral force or the downwards/upwards force to the first contact surface and/or the second contact surface. There is as such no need for an especially strong person for installing the barrier according to the invention into a sewage pipe system. Many private users as well as professional users will be capable of installing the barrier.

[0036] According to one embodiment of the invention, a pipe section of the barrier has one end intended for facing a pipe section of the sewage system, when the barrier is installed in the sewage system, and where an opposite end of the pipe section having an inclination leading from a top surface of the pipe section to a bottom surface of the pipe section 34, said inclination resulting in a top generatrix along the top surface is extending farther rearwards in relation to a sewage flow direction, when the barrier is installed in the sewage system, than an extension of a bottom generatrix along the bottom surface. This embodiment is in the case, where the blunt end of the pipe section of the barrier is directed downstream of the sewage flow.

[0037] According to an alternative embodiment of the invention, a pipe section of the barrier has one end intended for facing a pipe section of the sewage system, when the barrier is installed in the sewage system, and where an opposite end of the pipe section having an inclination leading from a top surface of the pipe section to a bottom surface of the pipe section 34, said inclination resulting in a top generatrix along the top surface is extending farther forwards in relation to a sewage flow direction, when the barrier is installed in the sewage system, than an extension of a bottom generatrix along the bottom surface. This embodiment is in the case, where the blunt end of the pipe section of the barrier is directed upstream of the sewage flow.

[0038] The formation of the inclination between the top surface and the bottom surface of the pipe section results in the major advantage, that any sewer which may enter form a side pipe section of the sewage pipe system, where the barrier is installed, easily and with no limitation can enter the sewage pipe system and flow freely past the barrier, the barrier thus constituting no or at least just a minor hindrance towards the flow of sewer from an side pipe section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] The invention will hereafter be described with reference to the drawings, where

Fig. 1 is a perspective view of one embodiment of a barrier according to the invention in a configuration before and during installation of the barrier in a sewage pipe system,

Fig. 2 is a perspective view of the one embodiment of a barrier according to the invention in a configuration after installation and when the barrier is in use in a sewage pipe system,

Fig. 3 is a first plane view of the one embodiment of a barrier according to the invention in a configuration before and during installation of the barrier in a sewage pipe system,

Fig. 4 is another plane view of the one embodiment of a barrier according to the invention in a configuration before and during installation of the barrier in a sewage pipe system,

Fig. 5 is a perspective view of the one embodiment of the barrier when installed and when in use in the sewage pipe system.

Fig. 6 is a perspective view of another embodiment of a barrier according to the invention in a configuration before and during insertion of the barrier in a sewage pipe system,

Fig. 7 is a perspective view of the other embodiment of a barrier according to the invention in a configuration after insertion and when the barrier is in use in a sewage pipe system,

Fig. 8 is a cross-section of the other embodiment of the invention, with both shutters of the barrier in a fully closed position, barring the aperture of the barrier,

Fig. 9 is a cross-section of the other embodiment of the invention, with both shutters of the barrier in a fully open position, keeping the aperture of the barrier fully open,

Fig. 10 is a cross-section of the other embodiment of the invention, with both shutters of the barrier in a partly open position, keeping the aperture of the barrier partly open,

Fig. 11 is a cross-section of the other embodiment of the invention, with the second shutter being pivoted in relation to the first shutter and locking both shutters of the barrier

Fig. 12 is a view of the other embodiment of the barrier during installation of the barrier down into an inspection-hole a sewage pipe system,

Fig. 13 is a plane view of the other embodiment of

the barrier during installation and when installed of a pipe section of the barrier into a pipe section of a sewage pipe system,

Fig. 14 is a plane sideways view of the other embodiment of the barrier when the pipe section of the barrier has been installed into the pipe section of a sewage pipe system and is being secured to the pipe section of the sewage system,

Fig. 15 is a perspective top view of the other embodiment of the barrier when the pipe section of the barrier has been installed into the pipe section of a sewage pipe system and is being secured to the pipe section of the sewage system, and

Fig 16 is a perspective view of an alternative pipe section of the other embodiment of the barrier. The locking mechanism disclosed in Fig. 8-11 does not fall within the scope of the appended claims 1-13.

DETAILED DESCRIPTION OF THE INVENTION

[0040] Fig. 1-4 are perspective and plane views of a barrier intended for being positioned in the bottom of a man-hole or inspection-hole of a sewage pipe system. The barrier is provided with one shutter being pivotally suspended in the barrier.

[0041] The suspension of the one shutter 1 is arranged about an axis 2 (see fig. 4) such that the shutter is having a centre of gravity lying under the axis 2. The shutter 1 is pivotal between a first angular position in which the at least one shutter is forming a first relatively larger angle v (see fig. 3) with the direction of flow of waste material and at least substantially barring the aperture of the barrier in a fully closed position of the shutter 1, and a second angular position in which the at least one shutter 1 is forming a second relatively smaller angle w (see fig. 3) with the direction of flow of waste material and at least partly keeping open the aperture of the barrier in an at least partly open position, possibly a fully open position, of the shutter 1.

[0042] The direction of flow of waste material through the aperture of the barrier is shown by an arrow.

[0043] The shutter 1 is provided with a come-like lower part 3 allowing water to pass at least downstream in the direction of the arrow, while the shutter 1 is still in a fully closed position.

[0044] The barrier is further provided with a first contact surface 4 and a second contact surface 5. The contact surfaces 4,5 are provided at lateral sidewalls 6,7 of a mantle 8 of the barrier. The contacts surfaces are suspended from pivoting axes 9,10 constituting part of the mantle 8 of the barrier. The contact surfaces 4,5 are intended for being forced laterally towards sidewalls of a bottom half-pipe of the sewage pipe system (see fig. 5). In the embodiment shown, the contact surfaces 4,5 have the shape of plane plates being pivotally suspended from the barrier. The contact surfaces may have other shapes such as concave, convex or even having the shape of a rod.

[0045] In the configuration shown in fig. 1 and in fig. 4, the contact surfaces 4,5 extend within the exterior dimensions of the mantle 8 of the barrier. Thus, the contact surfaces 4,5 do not extend outside the boundaries of the sidewalls 6,7 of the mantle 8 of the barrier. In the configuration shown in fig. 1 and in fig. 4, the barrier is not capable of a secure installation in the sewage pipe system. The configuration where the contact surfaces do not extend outside the exterior dimensions of the mantle of the barrier is the configuration during which the barrier is being installed, but is not the configuration of the barrier when having been installed.

[0046] In the configurations shown in fig. 2, the contact surfaces 4,5 extend outside the exterior dimensions of a mantle 8 of the barrier. Thus, the contact surfaces 4,5 extend outside the boundaries of the sidewalls 6,7 of the mantle 8 of the barrier. In the configuration shown in fig. 2, the barrier is capable of a secure installation in the sewage pipe system. The configuration where the contact surfaces extend outside the exterior dimensions of the mantle of the barrier is the configuration of the barrier when having been installed and the configuration of the barrier during use.

[0047] Pivoting of the contact surfaces 4,5 from the configuration, where the contact surfaces extend within the exterior dimensions of a mantle of the barrier (see fig. 1 and fig. 4) to the configuration where the contact surfaces extend outside the exterior dimensions of the barrier (see fig. 2) is obtained by applying a repulsive force between the contact surfaces 4,5, teherby increasing the mutual distance between the contacts surfaces 4,5. The repulsive force is applied by means of lever arms 11,12 being connected by a linkage mechanism to a vertically displaceable bushing 13.

[0048] The vertically displaceable bushing 13 is positioned in a raised position in the configuration where the contact surfaces extend within the exterior dimensions of the barrier (see fig. 1 and fig. 4), and the vertically displaceable bushing is positioned in a lowered position in the configuration where the contact surfaces extend outside the exterior dimensions of the barrier (see fig. 2). Thus, pivoting of the contact surfaces 4,5 from the configuration where the contact surfaces extend within the exterior dimensions of the barrier (see fig. 1 and fig. 4) to the configuration where the contact surfaces extend outside the exterior dimensions of the barrier (see fig. 2) may take place by simply lowering the bushing 13.

[0049] The bushing 13 is attached to a vertically extending post 14. The post 14 is intended for extending all the way from the mantle 8 of the barrier to the top of the inspection-hole in the bottom of which the barrier is to be installed (see fig. 5). The post 14 is furthermore slideable along a guide pin 15 extending from the mantle 8 of the barrier. Thus, sliding the post 14 along the guide pin 15 will result in also the bushing 13 sliding along the guide pin 15.

[0050] Therefore, if the post 14 is pushed downwards from the top of the inspection-hole, the post 14 will slide

downwards along the guide pin 15 and also the bushing 13 will slide downward, i.e. will be lowered in relation to a raised position. And when the post 14 is pushed downwards, the lever arms 11,12 will provide a repulsive force to the contact surfaces 4,5, respectively, and the contact surfaces 4,5 will displace towards the sidewalls of the sewage pipe system and thus secure the barrier to the half-pipe in the bottom of the inspection hole of the sewage pipe system (see fig. 5).

[0051] The barrier is furthermore provided with bars 16,17 extending upwards from the mantle 8 of the barrier. The bars 16,17 are provided with holes 18 arranged with certain intervals I along the bars 16,17. At one of the holes 18 of each of the bars 16,17, a transversely extending rod 19,20 is extending, each of the transversely extending rods 19,20 being positioned a certain distance above a top side of the mantle 8 of the barrier. The transverse rods 19,20 are intended for supporting the barrier at the bottom of the inspection-hole, at bottom surfaces of the hole (see fig. 5), said bottom surfaces being provided at each side of the half-pipe in the bottom of the hole.

[0052] The transverse rods 19,20 are provided with pawls 21,22 slideable along the bars 16,17 and being provided with bolts or pins 23,24 extending through the holes 18 in the bars 16,17 and thereby fastening the transverse rods 19,20 to the bars 16,17 in the desired position. The transverse rods 19,20 may be positioned in any of the holes 18 along the posts, but the holes 18 being selected depend on the type and of the make of man-hole or inspection-hole. Different companies within the sewage pipe manufacturing industry manufacture man-hole or inspection-hole pipes and bottoms having different dimensions. Thus, one barrier dimensioned according to a man-hole or inspection-hole of one manufacturer may not fit into a man-hole or inspection-hole of another manufacturer.

[0053] The obvious way to remedy such disadvantage is to provide barriers having different dimensions in order to fit man-holes or inspection-holes of different manufacturers.

[0054] However, by providing bars 16,17 as the ones shown in fig. 1-5 and by establishing the possibility of supporting the barrier at the bottom of the inspection-hole in such a manner that the shutter is suspended into the half-pipe of the sewage pipe at the right depth (see fig. 5), it is possible to produce only one type of barrier suiting more or all the inspection-hole dimensions of the different manufacturers of sewage pipe systems.

[0055] It is possible to position the holes 18 along the bars 16,17 in a position exactly corresponding to selected different manufacturers of sewage pipe systems. Thus, when knowing the manufacturer of and/or by knowing the make of the sewage pipe system in which the barrier is to be used, it is possible, before installing the barrier in the sewage pipe system, to position the transverse rods 19,20 in the holes 18 along the bars 16,17 in positions exactly corresponding to the make of sewage pipe system and exactly corresponding to the manufacturer of the sewage pipe system, thus being sure that the barrier will fit the sewage pipe system when being installed.

[0056] Markings, as shown, of the different makes and/or the different manufacturers of sewage pipe systems may be provided at some or at each of the holes 18 along the bars 16,17 of the barrier, thus making it easy to select the correct position of the transverse rods 19,20.

[0057] Fig. 6-9 are perspective and plane views of another embodiment of a barrier intended for being positioned in the bottom of a man-hole or inspection-hole of a sewage pipe system. The barrier is provided with two shutters, a first shutter 30 being pivotally suspended from a pipe section 34 via a support element 33 of the barrier, and a second shutter 31 being pivotally suspended from the first shutter 30.

[0058] The suspension of the first shutter 30 is arranged about an axis 32 such that the first shutter is having a centre of gravity lying under the axis 32. The first shutter 30 is pivotal between a first angular position in which the at least one shutter 30 is forming a first relatively larger angle v (see fig. 8) with the direction of flow of waste material and at least substantially barring the aperture of the barrier, and a second angular position in which the at least one shutter is forming a second relatively smaller angle w (see fig. 9) with the direction of flow of waste material and at least partly keeping open the aperture of the barrier.

[0059] The direction of flow of waste material through the aperture of the barrier is shown by an arrow.

[0060] The first shutter 30 is pivotally attached to a support element 33 being secured to a pipe section 34 of the barrier. The pipe section 34 of the barrier constitutes the mantle of the barrier.

[0061] The suspension of the second shutter 31 from the first shutter 30 is also arranged about an axis 35 such that the second shutter 31 is having a centre of gravity lying under the axis 35. The second shutter 31 will, during normal use, pivot together with first shutter 30 because the second shutter 31 is suspended from the first shutter 30. However, the second shutter 31 may additionally or alternatively pivot independently of any pivoting of the first shutter 31 about the axis 35 from which the second shutter 31 is suspended, said axis 35 being supported in bearings (not shown) of the first shutter 31.

[0062] Thus, apart from the pivoting of the second shutter 31 together with the first shutter 30, when the first shutter 30 is pivoting, the second shutter 31 may furthermore pivot independently between a first position in relation to the first shutter, in which first position a lower part 36 of the second shutter 31 is resting on a lower part 37 the first shutter 30 (see fig. 10), and a second position in relation to the first shutter 30, in which second position the lower part 36 of the second shutter 31 is raised from the lower part 37 of the first shutter 30 (see fig. 11).

[0063] The second shutter 31 is having a cross-sectional area (see fig. 6 and fig. 7) blocking substantially the entire inside of the pipe section 34 of the barrier, when

the first shutter 30 and the second shutter 31 are in the fully closed configuration. Side edges 38 of the second shutter 31 is directed rearwards in the upstream direction allowing the second shutter 31 to pivot together with the first shutter 30 without the second shutter 31 getting stuck inside the pipe section, even if the second shutter 31 is pivoted to a fully open configuration as shown in fig. 9.

[0064] The individual pivoting of the second shutter 31 takes place independently of any pivoting of the first shutter 30. The second shutter 31 may pivot in relation to the second shutter 30 in any situation where the first shutter 30 is also pivoting and also in situations where the first shutter 30 is not pivoting. Referring to fig. 10 and fig. 11, the technical effect of the second shutter will be explained. It is important to notice that the technical effect is present both in a situation where the first shutter 30 is also pivoting and also in a situation where the first shutter 30 is not pivoting.

[0065] The barrier is furthermore provided with a first contact surface 40 and a second contact surface 41. The contact surfaces 40,41 are provided at downwards oriented and upwards orientated sidewalls, respectively, of the pipe section 34 of the barrier. The contact surfaces 40,41 are intended for being forced downwards and upwards towards sidewalls of a full-circumference pipe of the sewage pipe system (see fig. 12 and fig. 13). In the embodiment shown, the downwards orientated contact surface 41 is an integrate part of the pipe section 34 of the barrier and has the shape of the circumference of a circular pipe.

[0066] In the embodiment shown, the upper contact surface 40 is an individual part and is pivotally suspended around an axis 39 of the support element 33 and the upper contact surface 41 has the shape of a plate provided with a small bead 42 (see fig. 6, fig. 7 and fig. 12, fig. 13). The small bead 42 is intended for providing a means for avoiding rotation around a horizontal axis when the barrier is installed in the full-circumference pipe of the sewage pipe system (see fig. 12 and fig. 13). The contact surfaces 40,41 may have other shapes such as concave, convex or even having the shape of a rod.

[0067] In the configuration shown in fig. 6, fig. 8 and fig. 9, the upper contact surface 41 extends within the exterior dimensions of the pipe section 34 of the barrier. Thus, the upper contact surface 41 does not extend outside the upper wall boundary of the pipe section 34 of the barrier and in this configuration the barrier is not capable of providing a secure installation of the barrier in the sewage pipe system. The configuration where the contact surface does not extend outside the exterior dimensions of the pipe section 34 of the barrier is the configuration during which the barrier is intended for being installed in the sewage pipe system.

[0068] In the configuration shown in fig. 7, the upper contact surface 41 extends outside the exterior dimensions of a pipe section 34 of the barrier. Thus, the upper contact surface 41 extends outside the upper wall boundary of the pipe section 34 of the barrier and in this configuration the barrier is capable of providing a secure installation of the barrier in the sewage pipe system. The configuration where the contact surface extends outside the exterior dimensions of the pipe section 34 of the barrier is the configuration, where the barrier has been installed in the sewage pipe system and is the configuration, where the barrier during use as a barrier.

[0069] Pivoting of the upper contact surface 41 from the configuration, where the upper contact surface extends within the exterior dimensions of the pipe section 34 of the barrier, to the configuration, where the upper contact surface 41 extends outside the exterior dimensions of the pipe section 34 of the barrier, is obtained by applying a repulsive force between the individual first upper contact surface 41 and the integrated second lower contact surface 40. The repulsive force is applied by means of a vertically displaceable bushing 43 being connected to a lever arm 44 by means of a linkage mechanism 45.

[0070] The vertically displaceable bushing 43 is positioned in a raised position in the configuration where the individual upper contact surface 41 extends within the exterior dimensions of the pipe section 34 of the barrier, and the vertically displaceable bushing 43 is positioned in a lowered position in the configuration where the upper contact surface 41 extends outside the exterior dimensions of the pipe section 34 of the barrier. Thus, pivoting of the upper contact surface 34, around the axis 39, from the configuration where the upper contact surface 41 extends within the exterior dimensions of the pipe section 34 of the barrier to the configuration where the upper contact surface 41 extends outside the exterior dimensions of the pipe section 34 of the barrier may take place by lowering the bushing 43.

[0071] The bushing 43 is attached to a vertically extending post 46. The post 46 is intended for extending all the way from the pipe section 34 of the barrier to the top of the inspection-hole in the bottom of which the barrier is to be installed. The post 46 is furthermore slideable along a guide pin 47 extending from the pipe section 34 of the barrier. Thus, sliding the post 46 along the guide pin 47 will result in also the bushing 43 sliding along the guide pin 47.

[0072] Therefore, if the post 46 is pushed downwards from the top of the inspection-hole, the post 46 will slide downwards and also the bushing 43 will slide downward, i.e. will be lowered in relation to a raised position. And when the post 46 is pushed downwards, the lever arm 44 will provide a repulsive force to the upper contact surface 41, and the contact surfaces 40,41 will displace toward the sidewalls of the sewage pipe system (see fig. 12 and fig. 13) and will secure the barrier to the full-circumference pipe in the bottom of the inspection hole of the sewage pipe system.

[0073] The lever arm 44 is provided with a stop 44A intended for ensuring a sufficient but still not a too extensive insertion of the pipe section into a pipe section of the sewage pipe system. Too extensive insertion is dis-

advantageous if a bending of the sewage pipe system is present nearby or perhaps in immediate vicinity the position of insertion if the barrier. Referring to fig. 12 and fig. 13, a further description of stop 44A is provided.

[0074] Alternatively, or possibly additionally, to a stop 44A the pipe section may be frusto-conically shaped (not shown) with the smallest diameter directed towards the pipe section of the sewage system. Depending on the conicity of the pipe section the barrier may thus be capable of being inserted into different pipe sections of the sewage system having different inner diameters. Accordingly, one barrier may be used in connection with different inner diameter pipe sections of the sewage system. The way of securing the barrier to the sewage pipe system mat still be the same as the one described.

[0075] Fig. 10 and fig. 11 are cross-sections of the barrier in two different configurations of the second shutter 31. In both figures, the configuration of the first shutter 30 is the same. The technical effect of the second shutter will be explained with reference to fig. 10 and fig. 11.

[0076] It is important to notice that the technical effect of the second shutter 31 is present both in a situation where the first shutter 30 is also pivoting and also in a situation where the first shutter 30 is not pivoting, the latter being the situation shown in fig. 10 and fig. 11.

[0077] In fig. 10 the first shutter 30 is partly open leaving a small space beneath the first shutter 30 for allowing waste water and other sewage material to pass. However, the first shutter 30 could also be fully closed as shown in fig. 8 or fully open as shown in fig. 9, depending on the amount of sewage material and the size of the sewage material passing the first shutter 30.

[0078] A lower part 36 of the second shutter 31 is resting at a lower part 37 of the first shutter 30. In the configuration shown in fig. 10, the first shutter 30 and the second shutter 31 act as one shutter only, the second shutter 31 pivoting along with any pivoting of the first shutter 30 whenever the first shutter 30 is pivoting. The second shutter 31 is not pivoted in relation to the first shutter 31, and apart from the mass of the second shutter 31, the second shutter 31 is not in any way limiting or blocking the pivoting of the first shutter 30.

[0079] In fig. 11 the first shutter 30 is also partly open leaving a small space beneath the first shutter 30 for allowing waste water and other sewage material to pass. However, the first shutter 30 could also be fully closed as shown in fig. 8 or fully open as shown in fig. 9, depending on the amount of sewage material and the size of the sewage material passing the first shutter 30.

[0080] Contrary to the configuration shown in fig. 10, the lower part 36 of the second shutter 31 is raised from the lower part 37 of the first shutter 30, i.e. the lower part 36 of the second shutter 31 is not resting on the lower part 37 of the first shutter 30.

[0081] In the configuration shown in fig. 11, the first shutter 30 and the second shutter 31 act both combined and independently, the second shutter 31 pivoting along with any pivoting of the first shutter 30 whenever the first shutter is pivoting, but the second shutter 31 also being pivoted in relation to first shutter 30. Pivoting of the second shutter 31 in relation to the first shutter 30 takes place when a force is applied upstream at the lower part 36 of the second shutter 31.

[0082] Pivoting of the second shutter 31 in relation to the first shutter 30 will not take place just because of any sewage material passing along the pipe section 34 of the barrier in the direction of the arrow. Pivoting of the second shutter 31 in relation to the first shutter 30 may however take place because of a rat or other vermin trying to open the shutters 30,31 upstream from the shutters 30,31. The rat or other vermin trying to pass the shutters 30,31 will grasp or in any other way try to open the shutters 30, 31 by manipulating the second shutter 31, which is the shutter being positioned upstream.

[0083] Because of the second shutter 31 being pivoted in relation to the first shutter 30, when a force is applied upstream at the lower part 36 of the second shutter 31, a brace 48 being an integrate part of the second shutter 31 is brought into engagement with a ratchet mechanism 49 being an integrate part of the support element 33.

[0084] Therefore, when the second shutter 31 is pivoted as shown in fig. 11, the brace 48 together with the ratchet mechanism 49 will lock not only the pivoting of the second shutter 31 in relation to the support element 33, but will also lock the pivoting of the first shutter 30 in relation to the support element 33. Thus, locking the second shutter 31 towards pivoting, incurred by a rat or other vermin upstream of the shutters and trying to pass the shutters 30,31 and enter the sewage pipe system, is also locking the first shutter 30 towards pivoting. The rat or other vermin is thus prevented from entering the sewage pipe system from upstream of the system.

[0085] The limitation towards pivoting of the first shutter 30 and the second shutter 31 is provided in a technical reliable and an absolutely mutual relationship between the first shutter 30 and the second shutter 31. Thus, the limitation toward pivoting is not dependent on any parts of the barrier, which do not constitute part of the shutters 30,31 or the support element 33 from which the first shutter 30 is suspended. Any malfunction of other parts of the barrier will thus not impede the locking function of the first shutter 30 and the second shutter 31.

[0086] Fig. 12-14 are plane views, and fig. 15 is a perspective view, of an installation of the other embodiment of the barrier. The barrier is firstly lowered into the inspection-hole and down to the bottom of the hole as shown with the arrow in Fig. 12. When having reached the bottom of the hole, the pipe section 34 of the barrier is displaced laterally towards the pipe section of the sewage pipe system, as shown by the arrow in Fig. 13, into which the barrier is to be installed.

[0087] In the embodiment shown, where the pipe section 34 of the barrier is directed upstream, the pipe section and thus the barrier are intended for being installed into a pipe section 50 constituting an outlet to the bottom of the inspection-hole of the sewage pipe system. If the pipe

section 34 of the barrier were directed oppositely, i.e. if the pipe section 34 of the barrier was directed downstream, the pipe section 34 and thus the barrier would be intended for being installed into a pipe constituting an outlet from the bottom of the inspection-hole of the sewage pipe system.

[0088] During insertion of the pipe section 34 of the barrier, the upper contact surface 41 is in the configuration where the upper contact surface 41 is situated within the exterior dimensions of the pipe section 34 of the barrier. Thus, the upper contact surface 41 is not in the way during insertion of the pipe section 34 of the barrier into the outlet pipe section 50 of the sewage system.

[0089] When the pipe section 34 of the barrier has been inserted into the outlet pipe section 50 of the sewage system, the upper contact surface 41 is activated by applying a repulsive force to the upper contact surface 41. The repulsive force is applied as described, i.e. by pushing the post 46 downwards, thereby pushing downwards the bushing 43, and via the lever arm 44 forcing the upper contact surface 41 upwards towards an inner circumference of the pipe section 50 of the sewage system. When the upper contact surface 41 is forced upwards, at the same time the lower contact surface 40 being the integrate part of the pipe section 34 of the barrier is forced downwards, because a mutual distance between the upper contact surface 41 and the lower contact surface 40 is increased when the upper contact surface 41 is forced upwards.

[0090] As mentioned, in the embodiment shown (see also fig. 6 and fig. 7) the upper contact surface 41 is provided with a bead 42, said bead 42 partly of fully penetrating the inner circumference of the pipe section 50 of the sewage system. The partly or fully penetration by the bead 42 has the effect, that after installation of the barrier it is not possible for the barrier to rotate in relation to the pipe section 50 of the sewage system around a horizontal axis. Thus, the orientation of the shutters 30,31, i.e. orientated downwards, suspended from the axes or pivoting, will remain the same during and after installation of the barrier.

[0091] As mentioned, the lever arm 44 is provided with a stop 44A intended for intended for ensuring a sufficient, but still not a too extensive insertion of the pipe section into a pipe section of the sewage pipe system. When the pipe section 34 of barrier is inserted into the pipe section 50 of the sewage pipe system during the lateral displacement of the barrier, after having been lowered to the bottom of the inspection-hole, the stop 44A will limit the depth of insertion of the pipe section 34 into the pipe section 50.

[0092] The stop 44A is provided so that the insertion of the pipe section 34 into the pipe section 50 is sufficient for the upper contact surface to obtain a sufficient abutment with the inner surface of the pipe section 50. The stop 44A is not mandatory to the function and the advantages of the barrier, but the stop 44A is advantageous to any non-professional person installing the barrier.

[0093] The pipe section 34 of the barrier has a blunt end 50 facing the pipe section 50 of the sewage system. The opposite end 52 of the pipe section 34 of the barrier is shaped having an inclination α leading from a top surface 53 of the pipe section, where the guide pin 47 is attached, forwards to a bottom surface 54 of the pipe section 34 and constituting the first contact surface. A top generatrix leading from the blunt end 51 along the top surface 53 of the pipe section 34 of the barrier is thus longer than a bottom generatrix leading from the blunt end 51 along the bottom surface 54 of the pipe section 34 of the barrier.

[0094] The inclination α of the pipe section 34 results in the barrier limiting the flow of sewage as little as possible, when the sewage passes the barrier. As example, if the sewage enters from a side branch pipe section 55 of the sewage system (see also fig. 15) the sewage may pass completely freely from the side branch pipe section 55 to the outlet pipe section 50 of the sewage system. Decreasing the limitation towards flow of sewage would not be the case if the pipe section 34 of the barrier had the same extension along a top generatrix as well as along a bottom generatrix.

[0095] In the embodiment shown, the inclination α is shown extending linearly from the top surface 53 of the pipe section 34, where the guide pin 47 is attached, forwards to the bottom surface 54 of the pipe section 34, said bottom constituting the first contact surface. In alternative embodiments, the inclination α may be concave, i.e. extending along an upwardly orientated curve, thereby further decreasing any possible limitation towards the flow of sewage.

[0096] Fig. 16 shows an alternative embodiment of the other barrier. In fig. 6-15, the pipe section 34 of the barrier extends along a full circumference, in the embodiment in fig. 6-15 along a full circumference of a circle.

[0097] The alternative embodiment shown in fig. 16 has the advantage that when the barrier is installed in the bottom of the inspection-hole of the sewage pipe system, the lower part of the pipe section of the sewage system is not in any way blocked by the pipe section of the barrier. Thus, the advantage present in the first embodiment shown in fig. 1-5 is also present in the alternative other embodiment of the barrier shown in fig. 16.

[0098] The extension of the pipe section of the barrier, i.e. whether the pipe section extends along perhaps the upper half the full circumference as shown, along perhaps the upper three quarters of a full circumference, or along more or less of a full circumference, depends on the actual application of use, i.e. the type and size of the pipe section of the sewage system, and also depends on the necessity of obtaining a satisfactory securing of the pipe section of the barrier along the inner circumference of the pipe section of the sewage system.

[0099] In the embodiments shown in fig. 6-16, the pipe section 34 of the barrier extends along at least part of a circular circumference. Other circumferences such as oval, triangular, square of other polygonal of non-polygonal shapes could also be envisaged. However, in any

of the possible configurations of the pipe section of the sewage system and the barrier, it may be advantageous to let the pipe section 34 only extend along part of a circumference, either circular, non-circular or polygonal.

[0100] The invention is described with reference to different embodiments. The description of the embodiments is however not to be construed as a limitation of the invention. Other embodiments as the ones described may be envisaged within the scope of the protection conferred by the appended claims.

Claims

1. A barrier for preventing rats or other vermin from entering a sewage pipe system, said barrier comprising

- at least one shutter (1, 30,31) pivotally suspended in the barrier about a first axis (2,32) and having a centre of gravity lying under the axis, and said shutter (1, 30,31) being pivotal between a first angular position (v) in which the at least one shutter is forming a first relatively larger angle with the direction of flow and at least substantially barring the aperture of the barrier, and a second angular position (w) in which the at least one shutter is forming a second relatively smaller angle with the direction of flow keeping the aperture of the barrier at least partly open, wherein said barrier is intended for being installed in the sewage pipe system, **characterized in that**
- said barrier is being provided with a first contact surface (4,40) for abutting a first circumferential extension of a sidewall of a sewage pipe, and a second contact surface (5,41) for abutting a second circumferential extension of the sidewall of the sewage pipe, and
- where a distance is relatively smaller between said first contact surface (4,40) and said second contact surface (5,41) in a first configuration, in which first configuration no manually applied force is present between the first contact surface (4,40) and the second contact surface (5,41), and
- where a distance is relatively larger between said first contact surface (4,40) and said second contact surface (5,41) in a second configuration, in which second configuration a repulsive force is present between the first contact surface (4,40) and the second contact surface (5,41), and
- where a manually or automatically applied repulsive force is intended for forcing the first contact surface towards the first circumferential extension of a sidewall of a sewage pipe and for forcing the second contact surface towards the second circumferential extension of a sidewall of a sewage pipe.

2. A barrier according to claim 1, where said first contact surface (4) is a contact surface provided at one lateral side (6) of the barrier, and where said second contact surface (5) is a contact surface provided at another lateral side (7) of the barrier, and where a repulsive force applied between the first contact surface (4) and the second contact surface (5) is intended for providing abutment of the first contact surface and the second contact surface with diagonally opposite laterally orientated sections, respectively, of sidewalls of the sewage pipe system.

3. A barrier according to claim 1, where said first contact surface (40) is a contact surface provided at a substantially vertical downwards side of the barrier, and where said second contact surface (41) is a contact surface provided at a substantially vertical upwards side of the barrier, and where a repulsive force applied between the first contact surface (40) and the second contact surface (41) is intended for providing abutment of the first contact surface and the second contact surface with diagonally opposite substantially vertically downwards and upwards orientated sections, respectively, of sidewalls of the sewage pipe system.

4. A barrier according to any of the preceding claims, where the first contact surface (40) constitutes an integrate part of the pipe section of the barrier, and where the second contact surface (41) constitutes an individual part of the pipe section, and said individual second contact surface being displaceable in relation to the first contact surface in a lateral direction in relation to a longitudinal extension of the pipe section.

5. A barrier according to any of the preceding claims, where the first contact surface (40) constitutes an integrate part of the pipe section of the barrier, and where the second contact surface (41) constitutes an integrate part of the pipe section, and said first contact surface and said second contact surface being displaceable in relation to each other in a lateral direction in relation to a longitudinal extension of the pipe section.

6. A barrier according to any of the preceding claims, where the first contact surface (4,40) constitutes an individual part of the pipe section of the barrier, and where the second contact surface (5,41) constitutes an individual part of the pipe section (34), and said first contact surface and said second contact surface being displaceable in relation to each other in a lateral direction in relation to a longitudinal extension of the pipe section (34).

7. A barrier according to any of the preceding claims, where either one of or both of the first contact surface (4,40) and the second contact surface (5,41), when being an individual part of the pipe section (34), is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being diverted laterally, when the contact surface is being provided at a lateral side of the barrier.

8. A barrier according to any of the preceding claims, where either one of or both of the first contact surface (4,40) and the second contact surface (5,41), when being an individual part of the pipe section (34), is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being directly applied to the contact surface, when the contact surface is provided at a substantially vertical downwards side of the barrier.

9. A barrier according to any of the preceding claims, where either one of or both of the first contact surface (4,40) and the second contact surface (5,41), when being an individual part of the pipe section (34), is displaceable by means of manually applied force exerted on the first contact surface, and where the manually applied force is intended for being applied vertically downwards and being diverted oppositely, when the contact surface is provided at a substantially vertical upwards side of the barrier.

10. A barrier according to any of the preceding claims, where exerting a lateral force to either one of or both of the first contact surface (4) and the second contact surface (5) is obtained by a manually downwards applied force, and where diverting of the manually applied force is obtained by a linkage mechanism with a first lever arm (11) being operated by the manually applied force, and a second lever arm (12) operating either one of or both of the first contact surface (4) and the second contact surface (5) in a lateral direction.

11. A barrier according to any of the preceding claims, where exerting a substantially vertical force to the contact surface (41), when the contact surface is intended for abutting a vertical part of the sewage pipe system, is obtained by a manually downwards applied force, and where diverting of the manually applied force is obtained by a linkage mechanism (45) with a first lever arm (44) being operated by the manually applied force, and second lever arm operating the contact surface (41) in an upwards direction.

12. A barrier according to any of the preceding claims, where a pipe section of the barrier has one end intended for facing a pipe section of the sewage system, when the barrier is installed in the sewage system, and where an opposite end of the pipe section having an inclination (α) leading from a top surface (53) of the pipe section to a bottom surface (54) of the pipe section (34), said inclination (α) resulting in a top generatrix along the top surface is extending farther rearwards in relation to a sewage flow direction, when the barrier is installed in the sewage system, than an extension of a bottom generatrix along the bottom surface (54).

13. A barrier according to any of claims 1-12, where a pipe section of the barrier has one end intended for facing a pipe section of the sewage system, when the barrier is installed in the sewage system, and where an opposite end of the pipe section having an inclination (α) leading from a top surface (53) of the pipe section to a bottom surface (54) of the pipe section (34), said inclination (α) resulting in a top generatrix along the top surface is extending farther forwards in relation to a sewage flow direction, when the barrier is installed in the sewage system, than an extension of a bottom generatrix along the bottom surface (54).

Patentansprüche

1. Barriere zum Verhindern des Eindringens von Ratten und anderen Schädlingen in ein Kanalisationssystem, wobei die Barriere umfasst

- mindestens eine Klappe (1, 30, 31), die drehbar um eine erste Achse (2,32) in der Barriere aufgehängt ist und einen Schwerpunkt aufweist, der sich unterhalb der Achse befindet, und wobei die Klappe (1, 30, 31) zwischen einer ersten Winkelposition (v), in der die mindestens eine Klappe einen ersten verhältnismäßig größeren Winkel zur Strömungsrichtung bildet und die Öffnung der Barriere mindestens teilweise blokkiert, und einer zweiten Winkelposition (w), in der die mindestens eine Klappe einen zweiten verhältnismäßig kleineren Winkel zur Strömungsrichtung bildet und die Öffnung der Barriere mindestens teilweise offen hält, drehbar ist, wobei die Barriere zur Montage in dem Kanalisationssystem vorgesehen ist, **dadurch gekennzeichnet, dass**
- die Barriere mit einer ersten Kontaktfläche (4, 40) zum Anliegen an einer ersten Umfangsverlängerung einer Seitenwand eines Kanalisationsrohrs und einer zweiten Kontaktfläche (5, 41) zum Anliegen an einer zweiten Umfangsverlängerung der Seitenwand des Kanalisationsrohrs versehen ist und

- wobei ein Abstand zwischen der ersten Kontaktfläche (4, 40) und der zweiten Kontaktfläche (5, 41) in einer ersten Konfiguration verhältnismäßig kleiner ist, wobei in der ersten Konfiguration keine von Hand angelegte Kraft zwischen der ersten Kontaktfläche (4, 40) und der zweiten Kontaktfläche (5, 41) vorhanden ist, und
- wobei ein Abstand zwischen der ersten Kontaktfläche (4, 40) und der zweiten Kontaktfläche (5, 41) in einer zweiten Konfiguration verhältnismäßig größer ist, wobei in der zweiten Konfiguration eine abstoßende Kraft zwischen der ersten Kontaktfläche (4, 40) und der zweiten Kontaktfläche (5, 41) vorhanden ist, und
- wobei eine von Hand oder automatisch angelegte abstoßende Kraft vorgesehen ist, um die erste Kontaktfläche zur ersten Umfangsverlängerung einer Seitenwand eines Kanalisationsrohrs zu zwingen und um die zweite Kontaktfläche zur zweiten Umfangsverlängerung einer Seitenwand eines Kanalisationsrohrs zu zwingen.

2. Barriere nach Anspruch 1, wobei die erste Kontaktfläche (4) eine Kontaktfläche ist, die an einer lateralen Seite (6) der Barriere vorgesehen ist, und wobei die zweite Kontaktfläche (5) eine Kontaktfläche ist, die an einer anderen lateralen Seite (7) der Barriere vorgesehen ist, und wobei eine abstoßende Kraft, die zwischen der ersten Kontaktfläche (4) und der zweiten Kontaktfläche (5) angelegt wird, zur Bereitstellung des Anliegens der ersten Kontaktfläche und der zweiten Kontaktfläche an diagonal gegenüberliegenden lateral ausgerichteten Abschnitten der Seitenwände des Kanalisationssystems vorgesehen ist.

3. Barriere nach Anspruch 1, wobei die erste Kontaktfläche (40) eine Kontaktfläche ist, die an einer im Wesentlichen senkrecht nach unten gerichteten Seite der Barriere vorgesehen ist, und wobei die zweite Kontaktfläche (41) eine Kontaktfläche ist, die an einer im Wesentlichen senkrecht nach oben gerichteten Seite der Barriere vorgesehen ist, und wobei eine abstoßende Kraft, die zwischen der ersten Kontaktfläche (40) und der zweiten Kontaktfläche (41) angelegt wird, zur Bereitstellung des Anliegens der ersten Kontaktfläche und der zweiten Kontaktfläche an diagonal gegenüberliegenden im Wesentlichen senkrecht nach unten bzw. noch oben gerichteten ausgerichteten Abschnitten der Seitenwände des Kanalisationssystems vorgesehen ist.

4. Barriere nach einem der vorhergehenden Ansprüche, wobei die erste Kontaktfläche (40) einen festen Bestandteil des Rohrabschnitts der Barriere darstellt und wobei die zweite Kontaktflache (41) einen separaten Bestandteil des Rohrabschnitts darstellt und wobei die separate zweite Kontaktfläche in einer lateralen Richtung in Bezug auf eine längliche Verlängerung des Rohrabschnitts zur ersten Kontaktfläche verschiebbar ist.

5. Barriere nach einem der vorhergehenden Ansprüche, wobei die erste Kontaktfläche (40) einen festen Bestandteil des Rohrabschnitts der Barriere darstellt und wobei die zweite Kontaktflache (41) einen festen Bestandteil des Rohrabschnitts darstellt und wobei die erste Kontaktfläche und die zweite Kontaktfläche in einer lateralen Richtung in Bezug auf eine längliche Verlängerung des Rohrabschnitts zueinander verschiebbar sind.

6. Barriere nach einem der vorhergehenden Ansprüche, wobei die erste Kontaktfläche (4, 40) einen getrennten Bestandteil des Rohrabschnitts der Barriere darstellt und wobei die zweite Kontaktflache (5, 41) einen separaten Bestandteil des Rohrabschnitts (34) darstellt und wobei die erste Kontaktfläche und die zweite Kontaktfläche in einer lateralen Richtung in Bezug auf eine längliche Verlängerung des Rohrabschnitts (34) zueinander verschiebbar sind.

7. Barriere nach einem der vorhergehenden Ansprüche, wobei entweder die erste Kontaktfläche (4, 40) oder die zweite Kontaktfläche (5, 41) oder beide Kontaktflächen, wenn diese einen getrennten Teil des Rohrabschnitts (34) darstellen, mittels einer von Hand angelegten Kraft verschiebbar sind, die auf die erste Kontaktfläche ausgeübt wird, und wobei die von Hand angelegte Kraft senkrecht nach unten ausgeübt und lateral abgelenkt werden soll, wenn die Kontaktfläche an einer lateralen Seite der Barriere vorgesehen ist.

8. Barriere nach einem der vorhergehenden Ansprüche, wobei entweder die erste Kontaktfläche (4, 40) oder die zweite Kontaktfläche (5, 41) oder beide Kontaktflächen, wenn diese einen getrennten Teil des Rohrabschnitts (34) darstellen, mittels einer von Hand angelegten Kraft verschiebbar sind, die auf die erste Kontaktfläche ausgeübt wird, und wobei die von Hand angelegte Kraft senkrecht nach unten und direkt auf die Kontaktfläche ausgeübt werden soll, wenn die Kontaktfläche an einer im Wesentlichen senkrecht nach unten gerichteten Seite der Barriere vorgesehen ist.

9. Barriere nach einem der vorhergehenden Ansprüche, wobei entweder die erste Kontaktfläche (4, 40) oder die zweite Kontaktfläche (5, 41) oder beide Kontaktflächen, wenn diese einen getrennten Teil des Rohrabschnitts (34) darstellen, mittels einer von Hand angelegten Kraft verschiebbar sind, die auf die erste Kontaktfläche ausgeübt wird, und wobei die von Hand angelegte Kraft senkrecht nach unten aus-

geübt und in die entgegengesetzte Richtung abgelenkt werden soll, wenn die Kontaktfläche an einer im Wesentlichen nach oben gerichteten Seite der Barriere vorgesehen ist.

10. Barriere nach einem der vorhergehenden Ansprüche, wobei die Ausübung einer lateralen Kraft auf entweder die erste Kontaktfläche (4) oder die zweite Kontaktfläche (5) oder beide Kontaktflächen durch eine von Hand nach unten angelegte Kraft erreicht wird und wobei die Ablenkung der von Hand angelegten Kraft durch einen Verbindungsmechanismus mit einem ersten Hebelarm (11), der von der von Hand angelegten Kraft betrieben wird, und einem zweiten Hebelarm (12), der entweder die erste Kontaktfläche (4) oder die zweite Kontaktfläche (5) oder beide Kontaktflächen in lateraler Richtung betreibt, erreicht wird.

11. Barriere nach einem der vorhergehenden Ansprüche, wobei die Ausübung einer im Wesentlichen senkrechten Kraft auf die Kontaktfläche (41), wenn die Kontaktfläche für das Anliegen an einem senkrechten Teil des Kanalisationssystems vorgesehen ist, durch eine von Hand nach unten angelegte Kraft erreicht wird und wobei die Ablenkung der von Hand angelegten Kraft durch einen Verbindungsmechanismus (45) mit einem ersten Hebelarm (44), der von der von Hand angelegten Kraft betrieben wird, und einem zweiten Hebelarm, der die Kontaktfläche (41) in Aufwärtsrichtung betreibt, erreicht wird.

12. Barriere nach einem der vorhergehenden Ansprüche, wobei ein Rohrabschnitt der Barriere ein Ende aufweist, das dafür vorgesehen ist, einem Rohrabschnitt des Kanalisationssystems zugewandt zu sein, wenn die Barriere in dem Kanalisationssystem eingebaut ist, und wobei ein gegenüberliegendes Ende des Rohrabschnitts eine Neigung (α) aufweist, die von einer oberen Fläche (53) des Rohrabschnitte zu einer unteren Fläche (54) des Rohrabschnitts (34) verläuft, wobei sich die Neigung (α), die in einer oberen Mantellinie entlang der oberen Fläche resultiert, weiter nach hinten in Bezug auf die Strömungsrichtung in der Kanalisation erstreckt, wenn die Barriere in dem Kanalisationssystem installiert ist, als eine Ausdehnung einer unteren Mantellinie entlang der untere Fläche (54).

13. Barriere nach einem der Ansprüche 1-12, wobei ein Rohrabschnitt der Barriere ein Ende aufweist, das dafür vorgesehen ist, einem Rohrabschnitt des Kanalisationssystems zugewandt zu sein, wenn die Barriere in dem Kanalisationssystem eingebaut ist, und wobei ein gegenüberliegendes Ende des Rohrabschnitts eine Neigung (α) aufweist, die von einer oberen Fläche (53) des Rohrabschnitte zu einer unteren Fläche (54) des Rohrabschnitts (34) verläuft, wobei sich die Neigung (α), die in einer oberen Mantellinie entlang der oberen Fläche resultiert, weiter nach vorne in Bezug auf die Strömungsrichtung in der Kanalisation erstreckt, wenn die Barriere in dem Kanalisationssystem installiert ist, als eine Ausdehnung einer unteren Mantellinie entlang der untere Fläche (54).

Revendications

1. Barrière destinée à empêcher des rats ou d'autres ravageurs de pénétrer dans un réseau d'égouts, ladite barrière comprenant

- au moins une trappe (1, 30, 31) suspendue à la barrière de façon pivotante autour d'un premier axe (2, 32) et possédant un centre de gravité situé sous l'axe, et ladite trappe (1, 30, 31) pouvant pivoter entre une première position angulaire (v) dans laquelle l'au moins une trappe forme un premier angle relativement plus grand avec le sens d'écoulement et empêche au moins substantiellement l'ouverture de la barrière, et une deuxième position angulaire (w) dans laquelle l'au moins une trappe forme un deuxième angle relativement plus petit avec le sens d'écoulement et maintient la barrière au moins en partie ouverte, où ladite barrière est destinée à être installée dans le réseau d'égouts, **caractérisée en ce que**
- ladite barrière est munie d'une première surface de contact (4, 40) pour buter contre un premier prolongement circonférentiel d'une paroi latérale d'un tuyau d'égout, et d'une deuxième surface de contact (5, 41) pour buter contre un deuxième prolongement circonférentiel de la paroi latérale du tuyau d'égout, et
- où une distance entre ladite première surface de contact (4, 40) et ladite deuxième surface de contact (5, 41) est relativement plus petite dans une première configuration, première configuration dans laquelle aucune force appliquée manuellement n'est présente entre la première surface de contact (4, 40) et la deuxième surface de contact (5, 41), et
- où une distance entre ladite première surface de contact (4, 40) et ladite deuxième surface de contact (5, 41) est relativement plus grande dans une deuxième configuration, deuxième configuration dans laquelle une force de répulsion est présente entre la première surface de contact (4, 40) et la deuxième surface de contact (5, 41), et
- où une force de répulsion appliquée manuellement ou automatiquement est destinée à pousser la première surface de contact vers le premier prolongement circonférentiel d'une pa-

roi latérale d'un tuyau d'égout et à pousser la deuxième surface de contact vers le deuxième prolongement circonférentiel d'une paroi latérale d'un tuyau d'égout.

2. Barrière selon la revendication 1, où ladite première surface de contact (4) est une surface de contact située au niveau d'une face latérale (6) de la barrière, et où ladite deuxième surface de contact (5) est une surface de contact située au niveau d'une autre face latérale (7) de la barrière, et où une force de répulsion appliquée entre la première surface de contact (4) et la deuxième surface de contact (5) est destinée à faire buter la première surface de contact et la deuxième surface de contact contre des tronçons orientés latéralement diagonalement opposés, respectivement, des parois latérales du réseau d'égouts.

3. Barrière selon la revendication 1, où ladite première surface de contact (40) est une surface de contact située au niveau d'une face dirigée vers le bas essentiellement verticale de la barrière, et où ladite deuxième surface de contact (41) est une surface de contact située au niveau d'une face dirigée vers le haut essentiellement verticale de la barrière, et où une force de répulsion appliquée entre la première surface de contact (40) et la deuxième surface de contact (41) est destinée à faire buter la première surface de contact et la deuxième surface de contact contre des tronçons orientés vers le bas et vers le haut essentiellement verticaux diagonalement opposés, respectivement, des parois latérales du réseau d'égouts.

4. Barrière selon l'une quelconque des revendications précédentes, où la première surface de contact (40) constitue une partie intégrée au tronçon de tuyau de la barrière, et où la deuxième surface de contact (41) constitue une partie individuelle du tronçon de tuyau, et ladite deuxième surface de contact individuelle peut être déplacée par rapport à la première surface de contact dans une direction latérale par rapport à un prolongement longitudinal du tronçon de tuyau.

5. Barrière selon l'une quelconque des revendications précédentes, où la première surface de contact (40) constitue une partie intégrée au tronçon de tuyau de la barrière, et où la deuxième surface de contact (41) constitue une partie intégrée au tronçon de tuyau, et ladite première surface de contact et ladite deuxième surface de contact peuvent être déplacées l'une par rapport à l'autre dans une direction latérale par rapport à un prolongement longitudinal du tronçon de tuyau.

6. Barrière selon l'une quelconque des revendications précédentes, où la première surface de contact (4, 40) constitue une partie individuelle du tronçon de tuyau de la barrière, et où la deuxième surface de contact (5, 41) constitue une partie individuelle du tronçon de tuyau (34), et ladite première surface de contact et ladite deuxième surface de contact peuvent être déplacées l'une par rapport à l'autre dans une direction latérale par rapport à un prolongement longitudinal du tronçon de tuyau (34).

7. Barrière selon une quelconque des revendications précédentes, où soit la première surface de contact (4, 40) soit la deuxième surface de contact (5, 41) soit les deux, lorsqu'elles constituent une partie individuelle du tronçon de tuyau (34), peuvent être déplacées au moyen d'une force appliquée manuellement exercée sur la première surface de contact, et où la force appliquée manuellement est destinée à être appliquée verticalement vers le bas et à être déviée latéralement, quand la surface de contact est située au niveau d'une face latérale de la barrière.

8. Barrière selon une quelconque des revendications précédentes, où soit la première surface de contact (4, 40) soit la deuxième surface de contact (5, 41) soit les deux, lorsqu'elles constituent une partie individuelle du tronçon de tuyau (34), peuvent être déplacées au moyen d'une force appliquée manuellement exercée sur la première surface de contact, et où la force appliquée manuellement est destinée à être appliquée verticalement vers le bas et à être directement appliquée sur la surface de contact, quand la surface de contact est située au niveau d'une face dirigée vers le bas essentiellement verticale de la barrière.

9. Barrière selon une quelconque des revendications précédentes, où soit la première surface de contact (4, 40) soit la deuxième surface de contact (5, 41) soit les deux, lorsqu'elles constituent une partie individuelle du tronçon de tuyau (34), peuvent être déplacées au moyen d'une force appliquée manuellement exercée sur la première surface de contact, et où la force appliquée manuellement est destinée à être appliquée verticalement vers le bas et à être déviée dans le sens opposé, quand la surface de contact est située au niveau d'une face dirigée vers le haut essentiellement verticale de la barrière.

10. Barrière selon l'une quelconque des revendications précédentes, où l'application d'une force latérale sur soit la première surface de contact (4) soit la deuxième surface de contact (5) soit les deux est obtenue au moyen d'une force appliquée vers le bas manuellement, et où la déviation de la force appliquée manuellement est obtenue au moyen d'un mécanisme de liaison possédant un premier bras de levier (11) actionné par la force appliquée manuellement, et un deuxième bras de levier (12) manoeuvrant soit la

première surface de contact (4) soit la deuxième surface de contact (5) soit les deux dans une direction latérale.

11. Barrière selon l'une quelconque des revendications précédentes, où l'application d'une force essentiellement verticale sur la surface de contact (41), quand la surface de contact est destinée à buter contre une partie verticale du réseau d'égouts, est obtenue au moyen d'une force appliquée vers le bas manuellement, et où la déviation de la force appliquée manuellement est obtenue au moyen d'un mécanisme de liaison (45) possédant un premier bras de levier (44) actionné par la force appliquée manuellement, et un deuxième bras de levier manoeuvrant la surface de contact (41) vers le haut.

12. Barrière selon l'une quelconque des revendications précédentes, où un tronçon de tuyau de la barrière possède une extrémité destinée à faire face à un tronçon de tuyau du réseau d'égouts, quand la barrière est installée dans le réseau d'égouts, et où une extrémité opposée du tronçon de tuyau forme une pente (α) allant d'une surface supérieure (53) du tronçon de tuyau vers une surface inférieure (54) du tronçon de tuyau (34), ladite pente (α) créant une génératrice supérieure le long de la surface supérieure qui s'étend plus loin vers l'arrière par rapport à un sens d'écoulement des eaux d'égout, quand la barrière est installée dans le réseau d'égouts, qu'un prolongement d'une génératrice inférieure le long de la surface inférieure (54).

13. Barrière selon l'une quelconque des revendications 1 à 12, où un tronçon de tuyau de la barrière possède une extrémité destinée à faire face à un tronçon de tuyau du réseau d'égouts, quand la barrière est installée dans le réseau d'égouts, et où une extrémité opposée du tronçon de tuyau forme une pente (α) allant d'une surface supérieure (53) du tronçon de tuyau vers une surface inférieure (54) du tronçon de tuyau (34), ladite pente (α) créant une génératrice supérieure le long de la surface supérieure qui s'étend plus loin vers l'avant par rapport à un sens d'écoulement des eaux d'égout, quand la barrière est installée dans le réseau d'égouts, qu'un prolongement d'une génératrice inférieure le long de la surface inférieure (54).

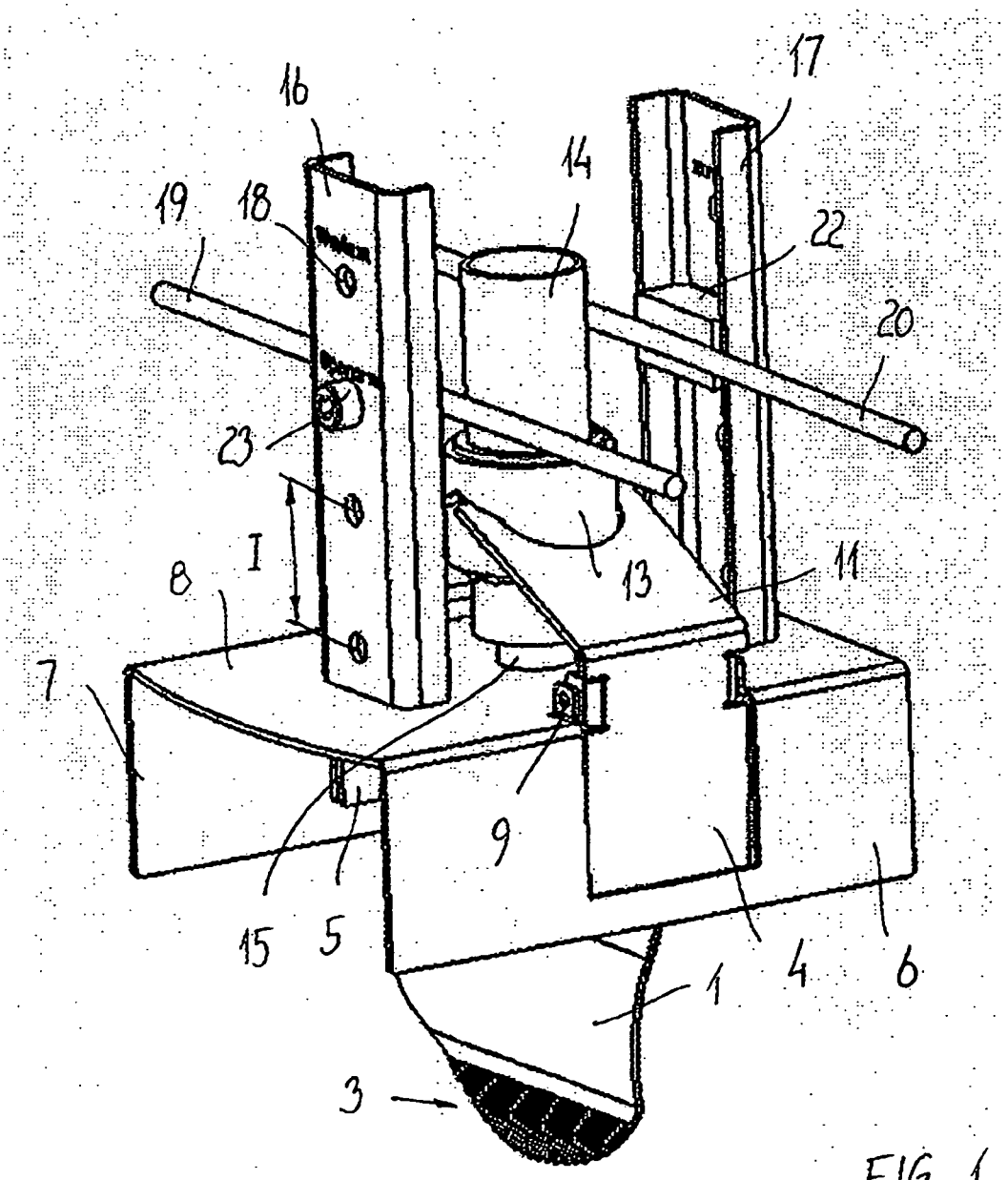

FIG. 1

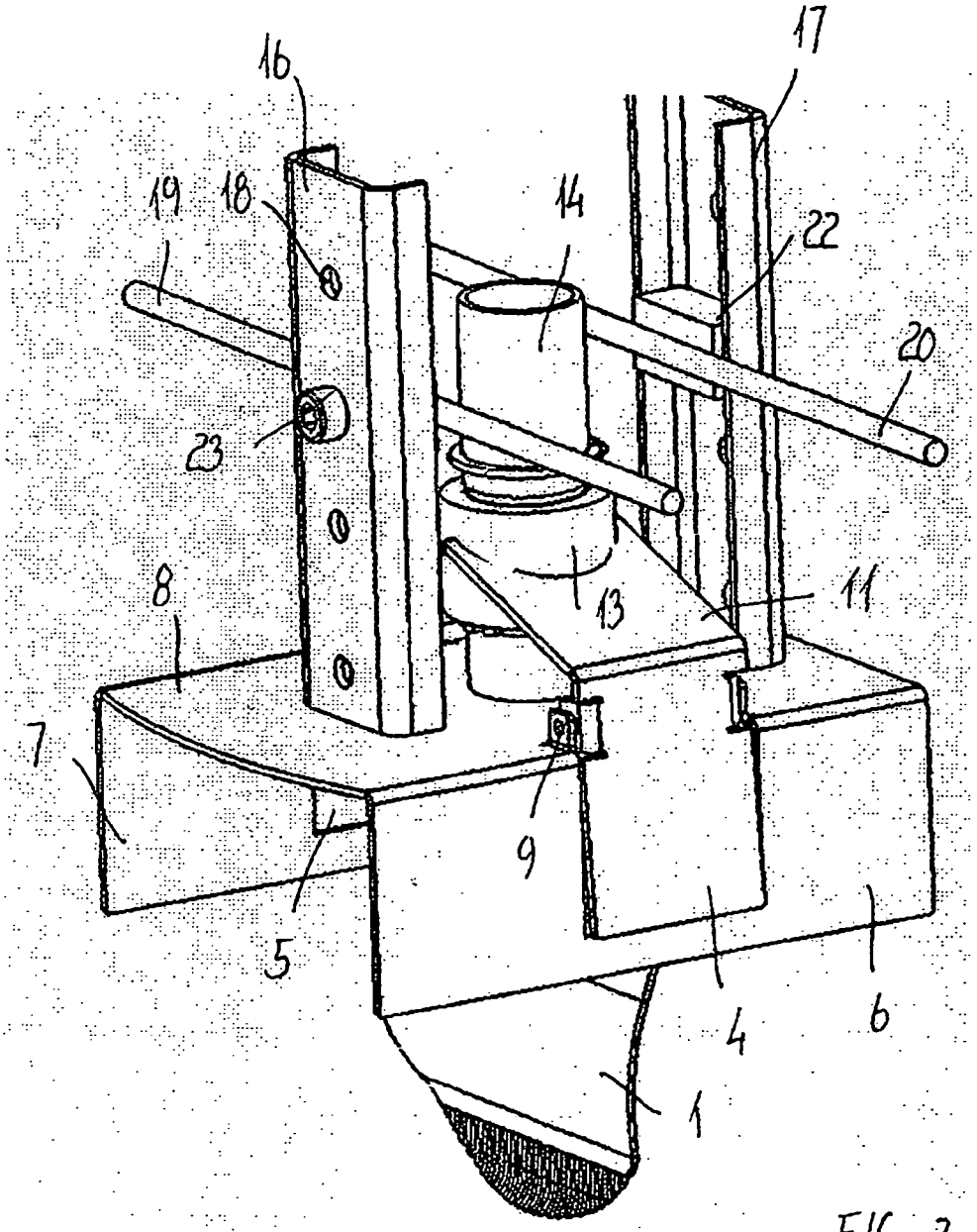

FIG. 2

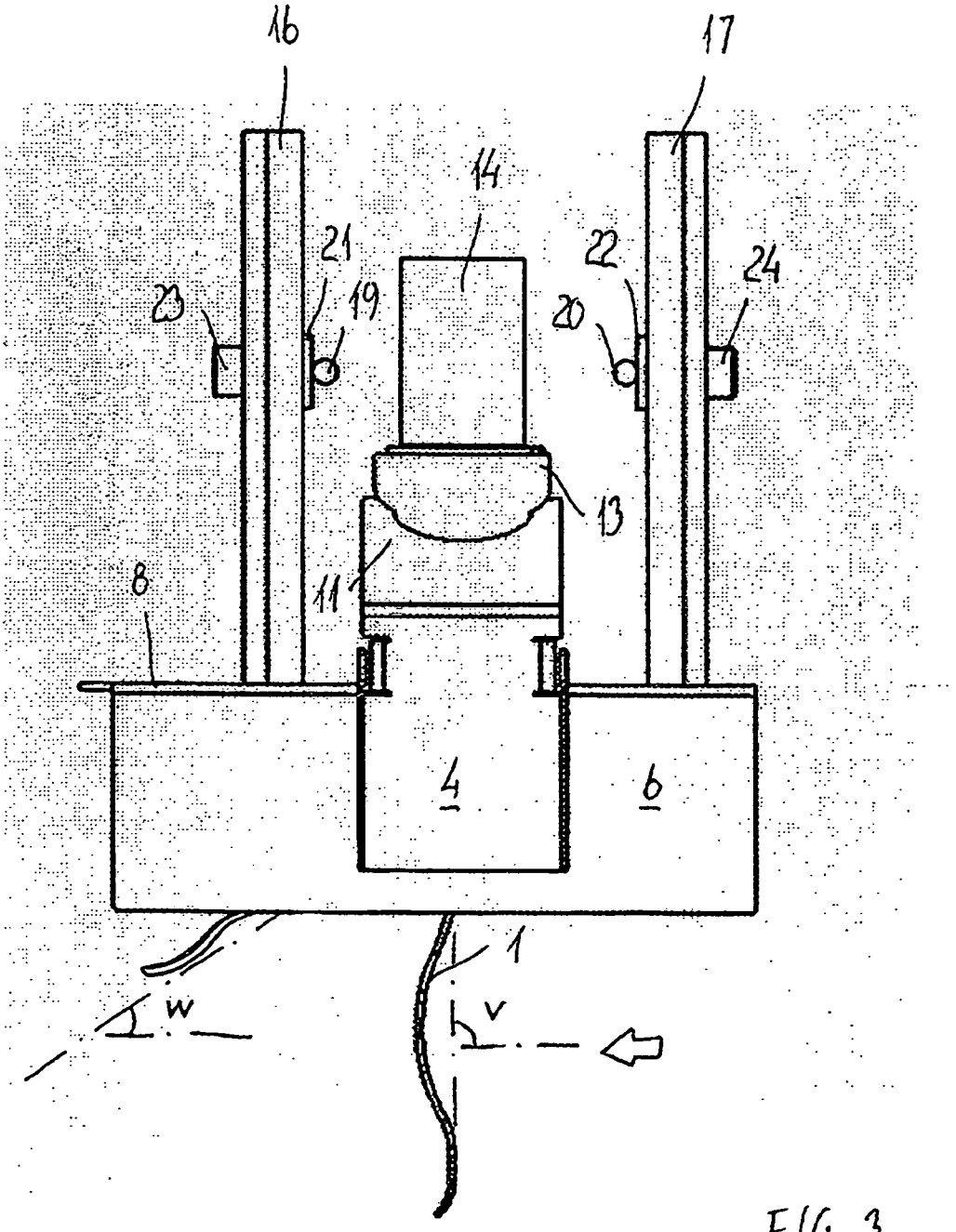

FIG. 3

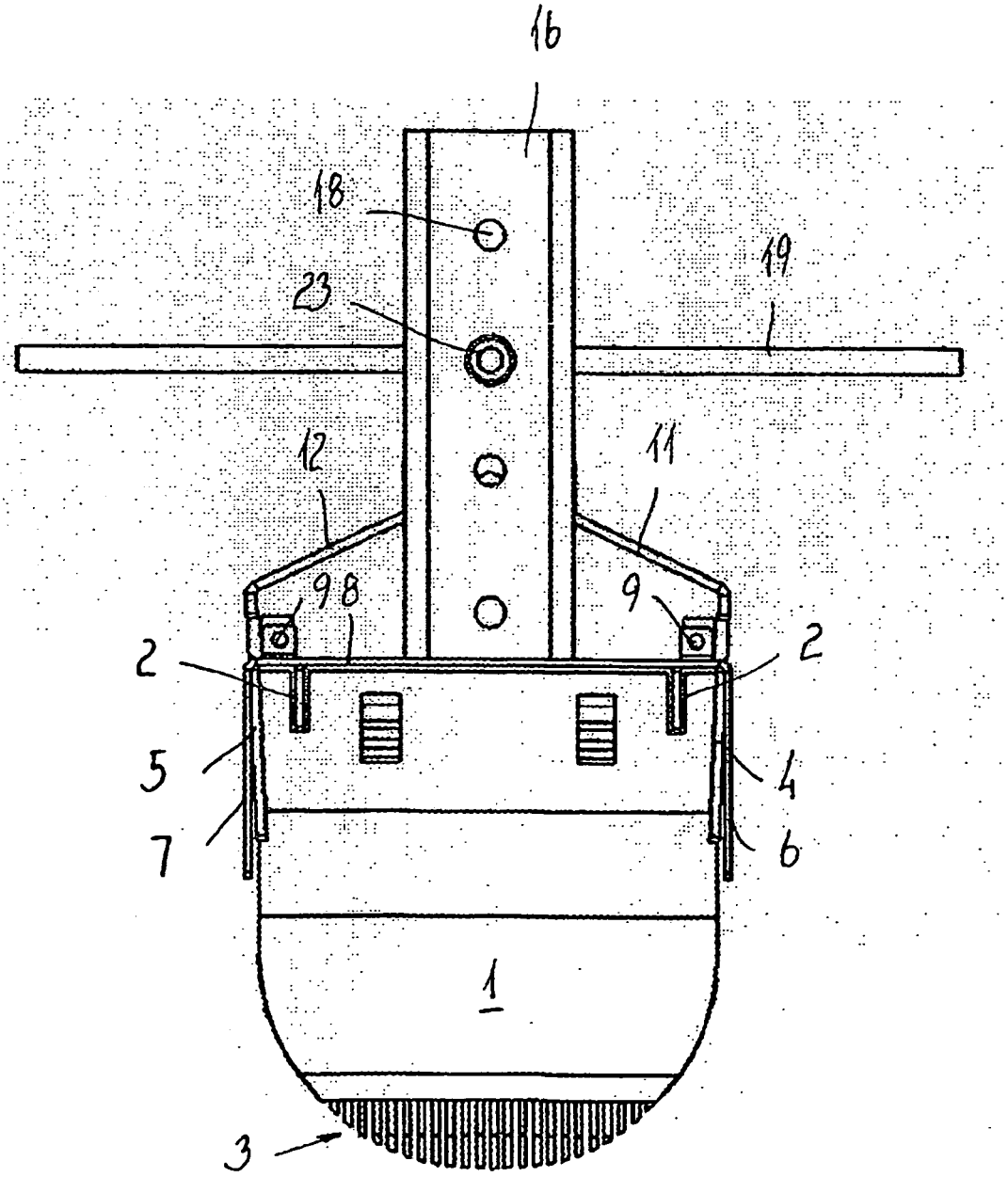

FIG. 4

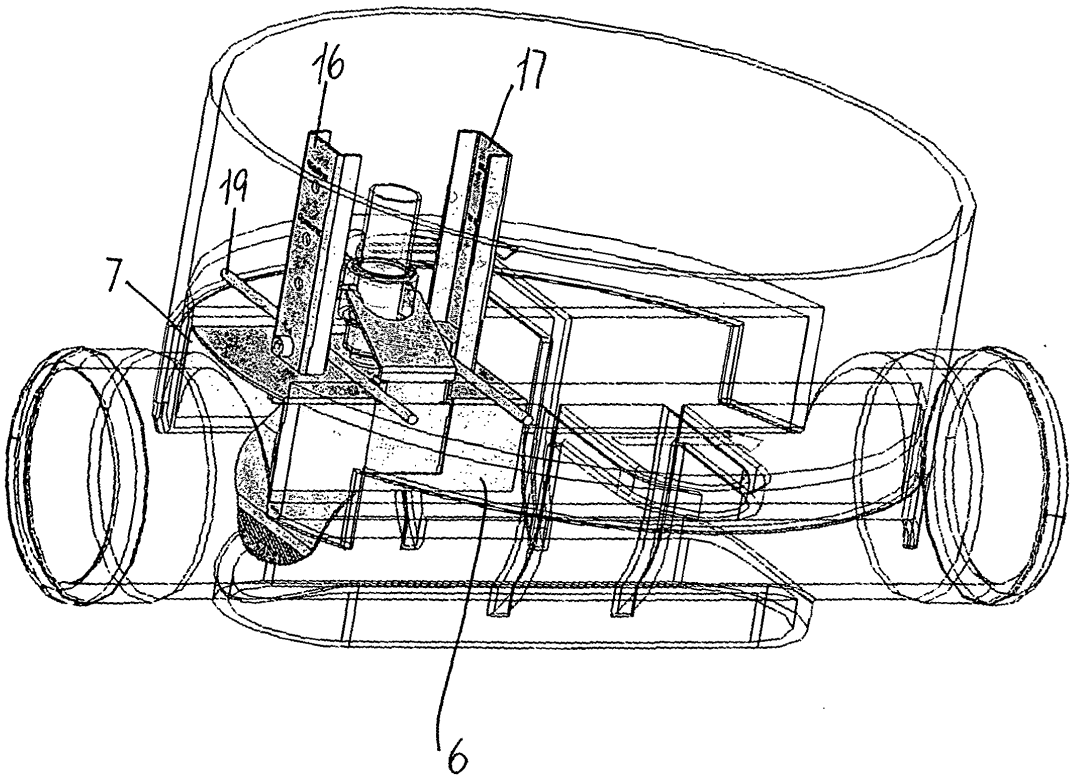

FIG. 5

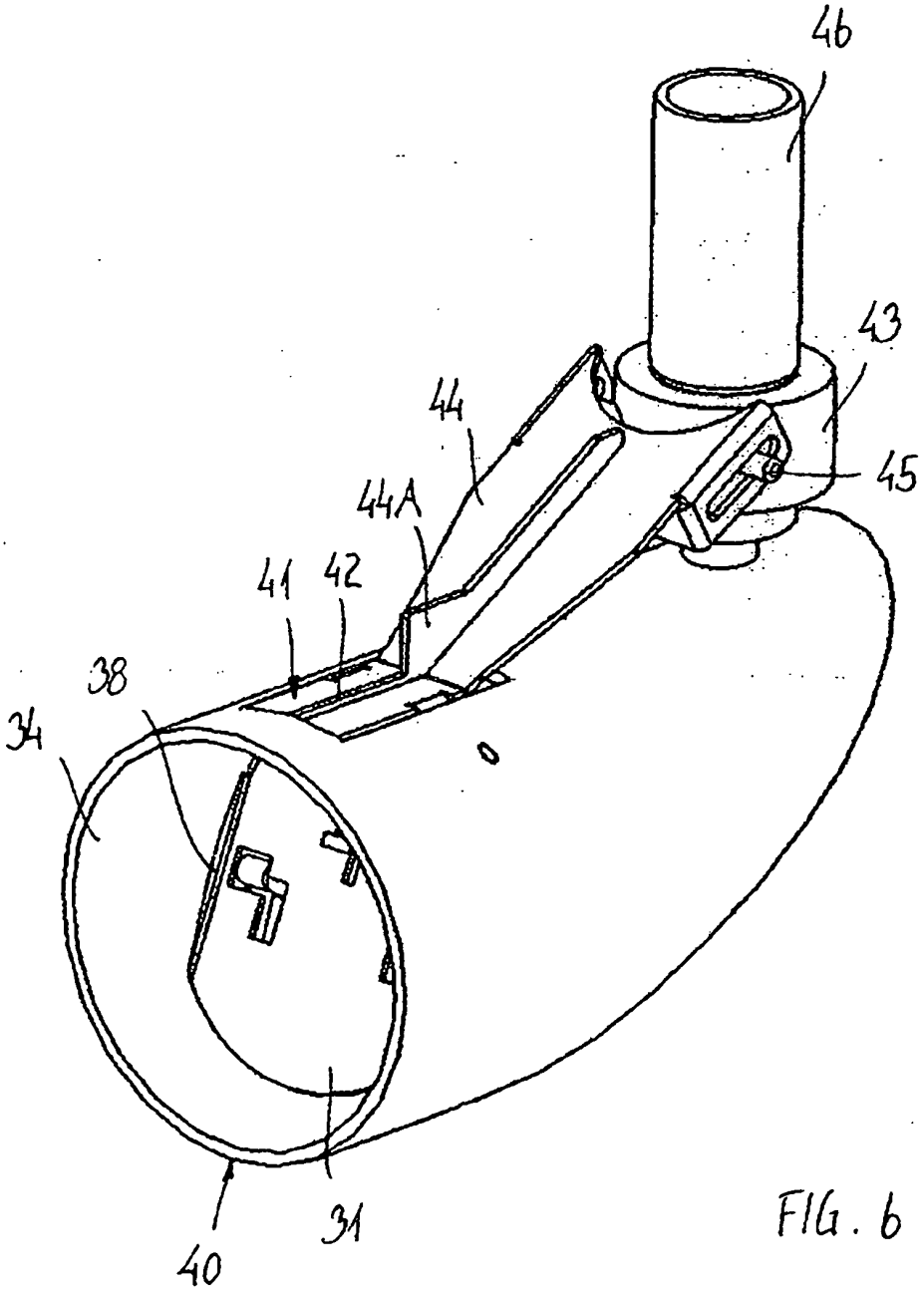

FIG. 6

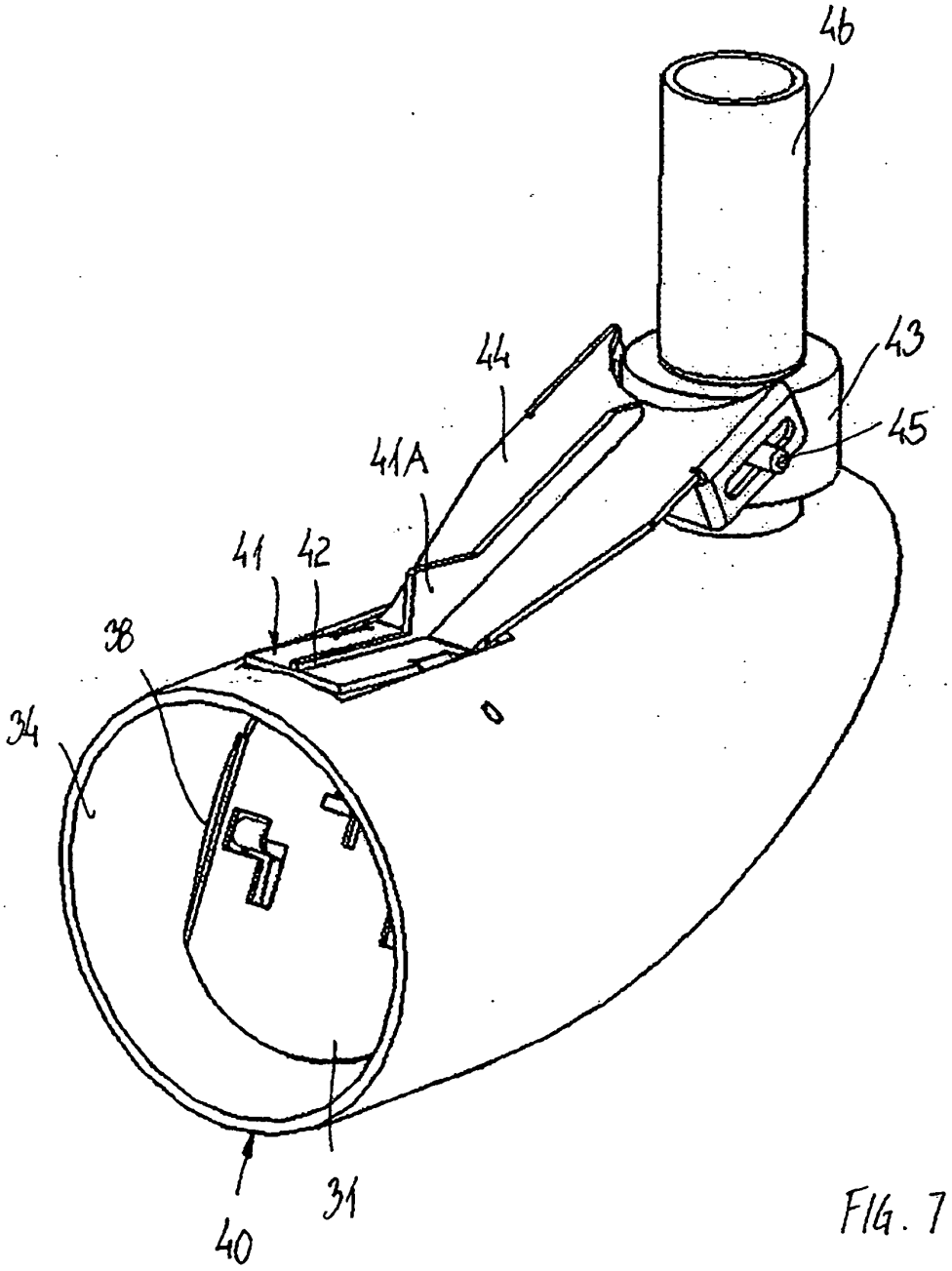

FIG. 7

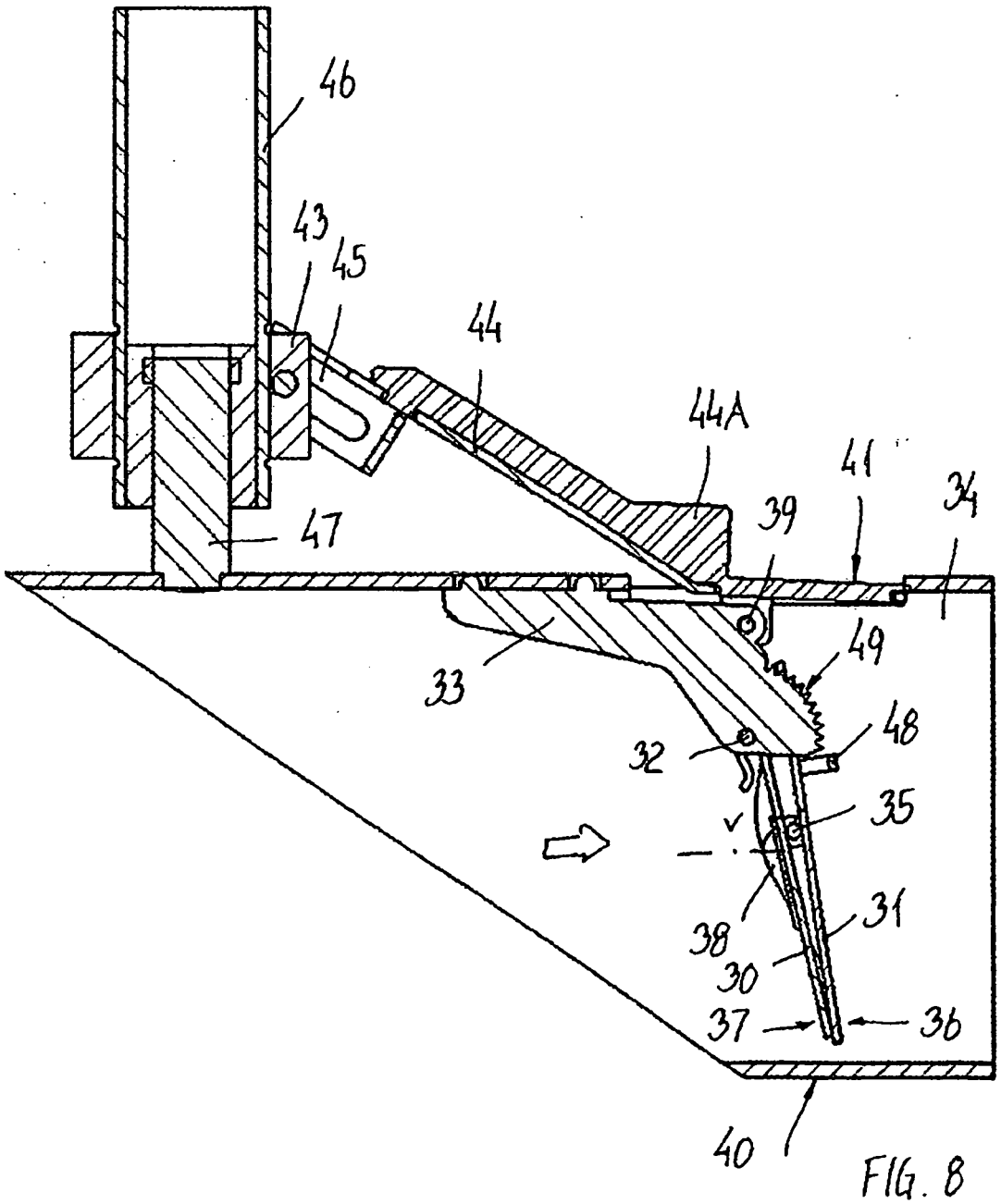

FIG. 8

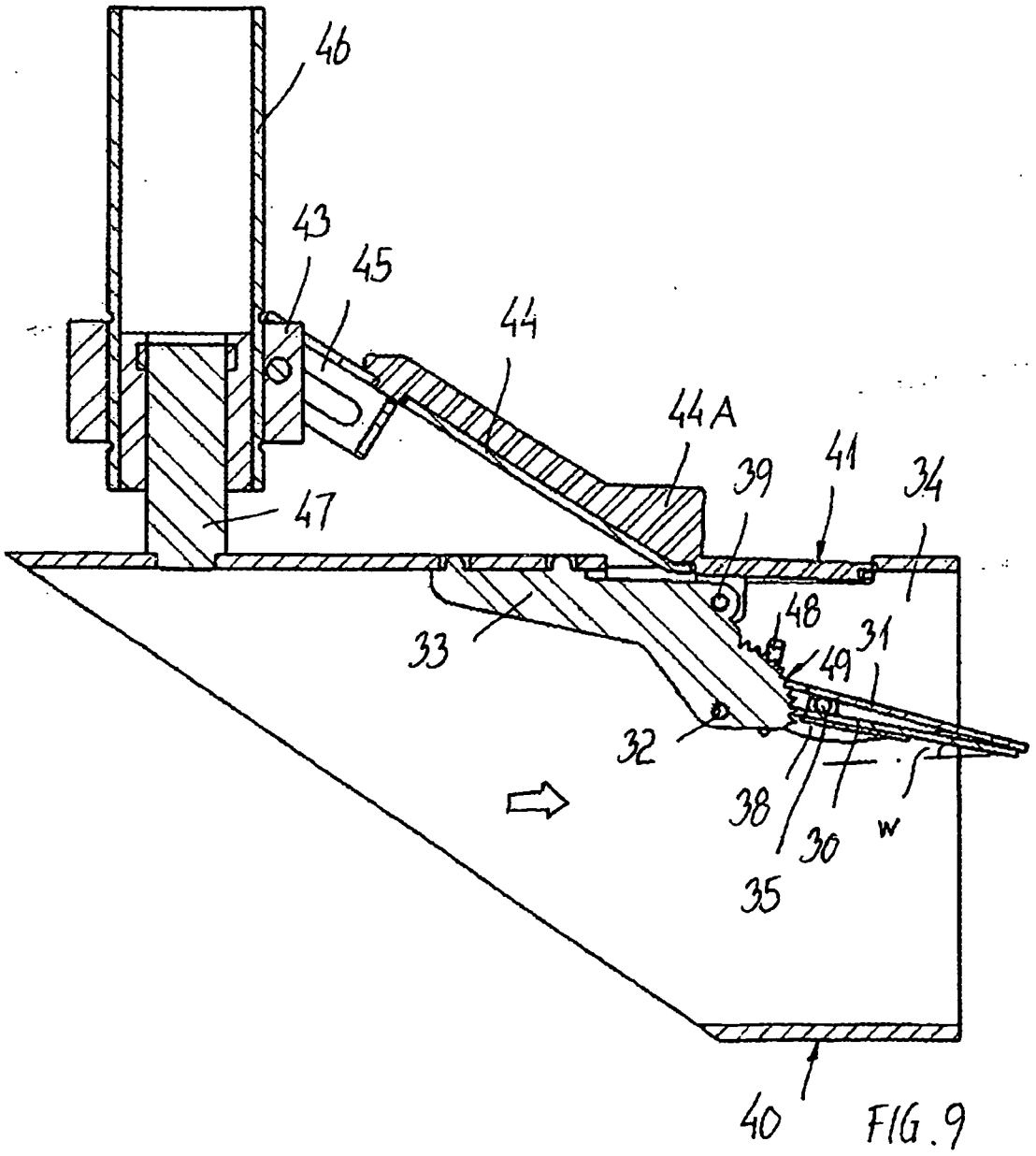

FIG. 9

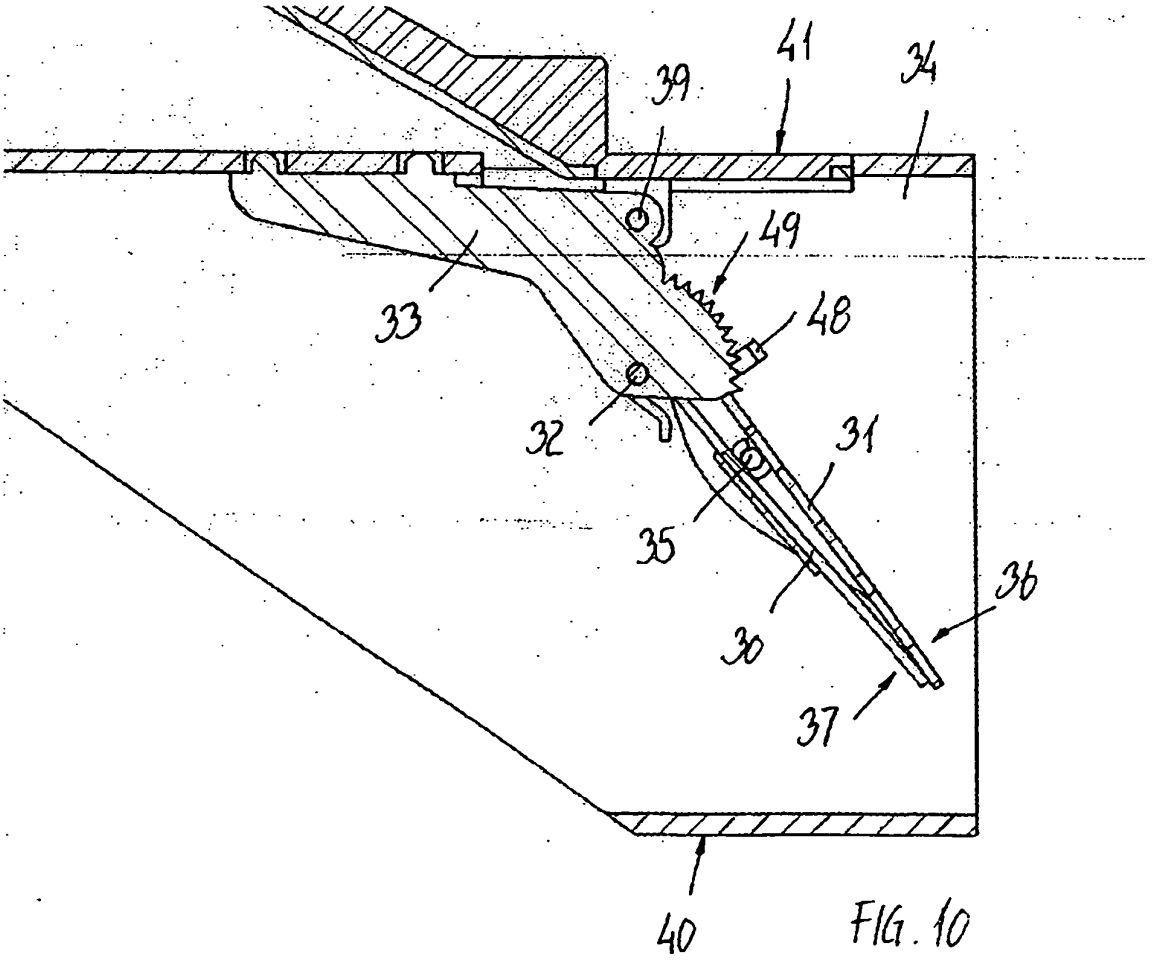

FIG. 10

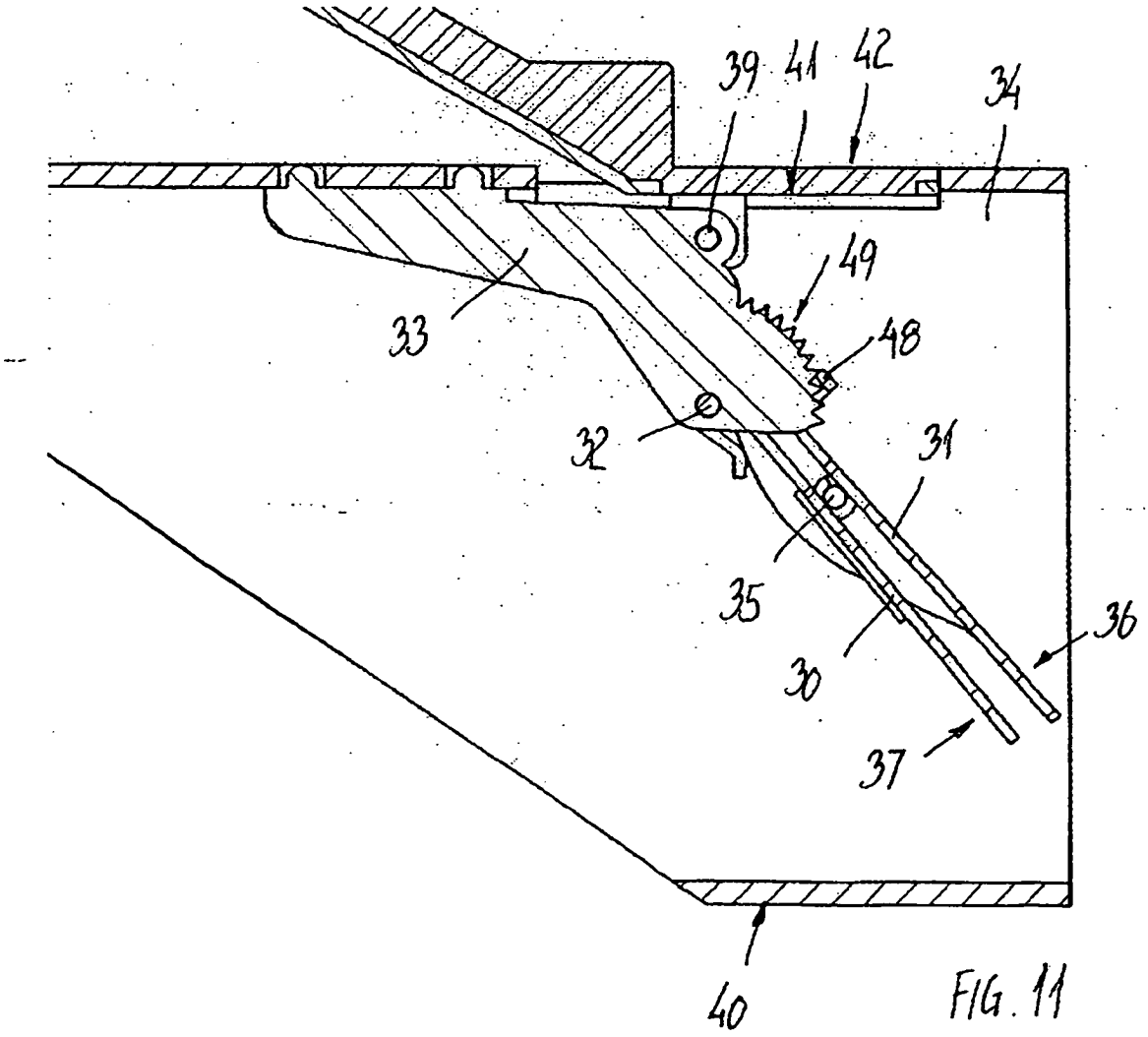

FIG. 11

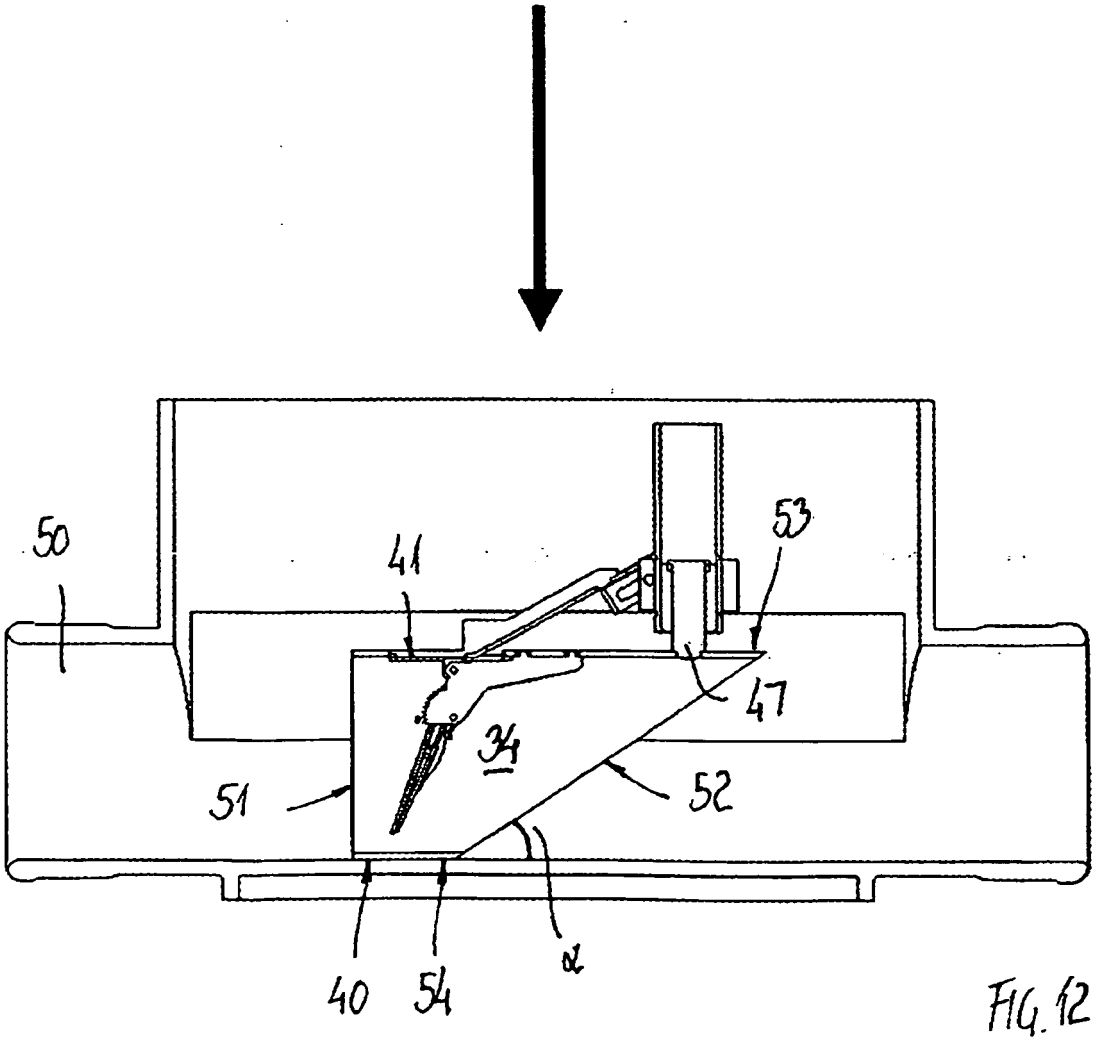

FIG. 12

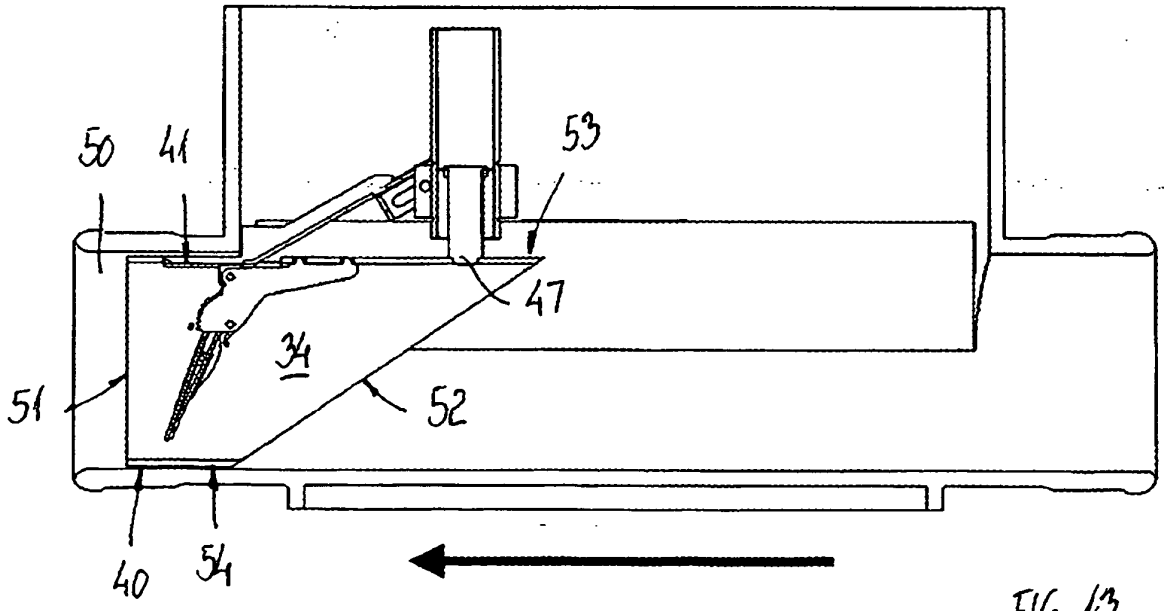

FIG. 13

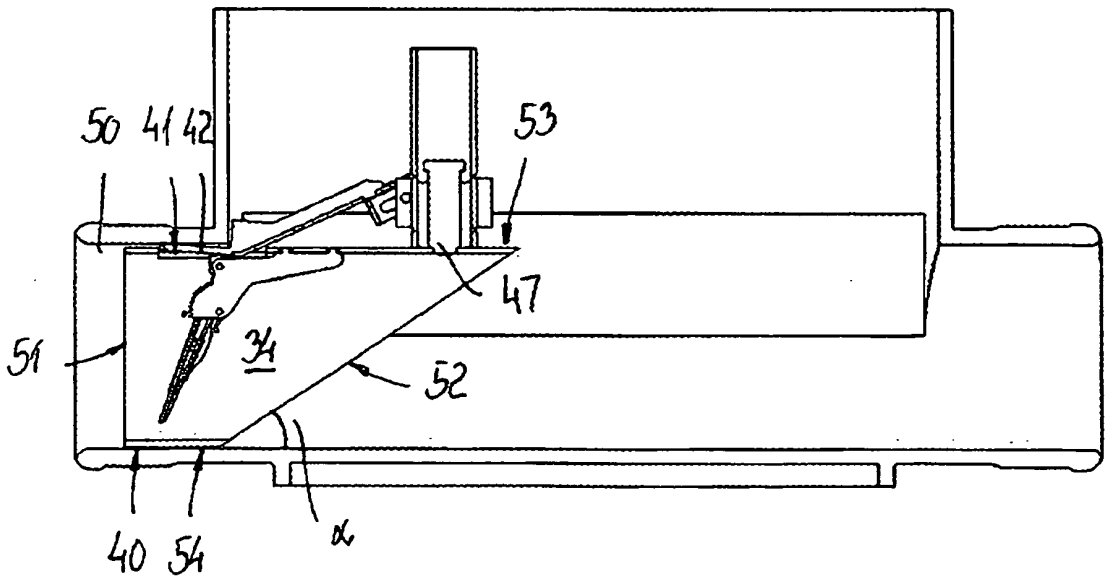

FIG. 14

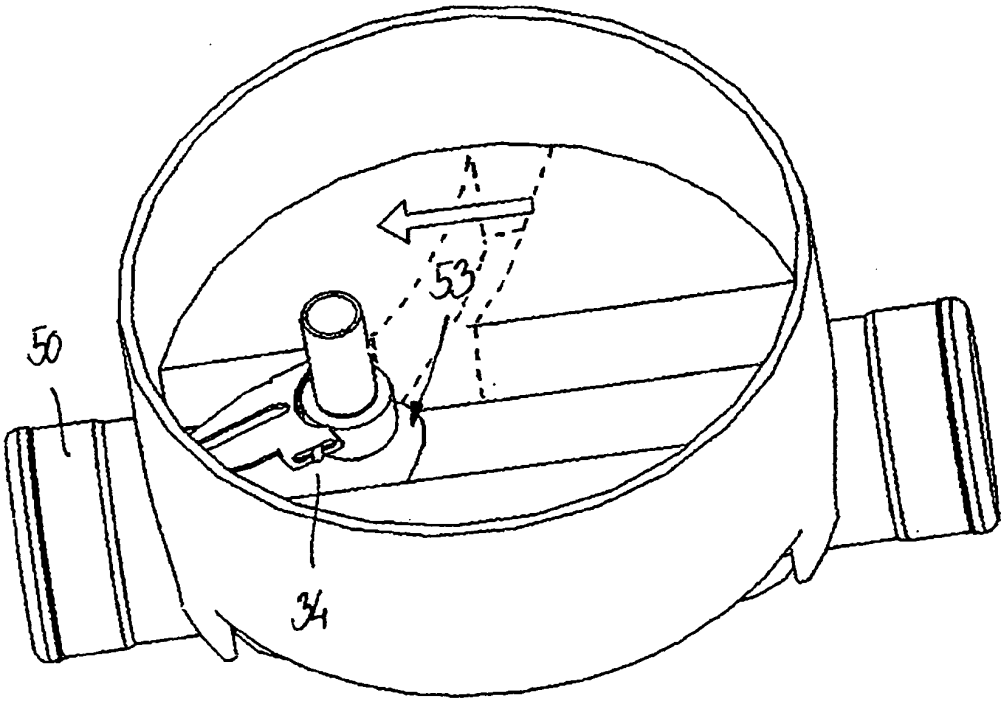

FIG. 15

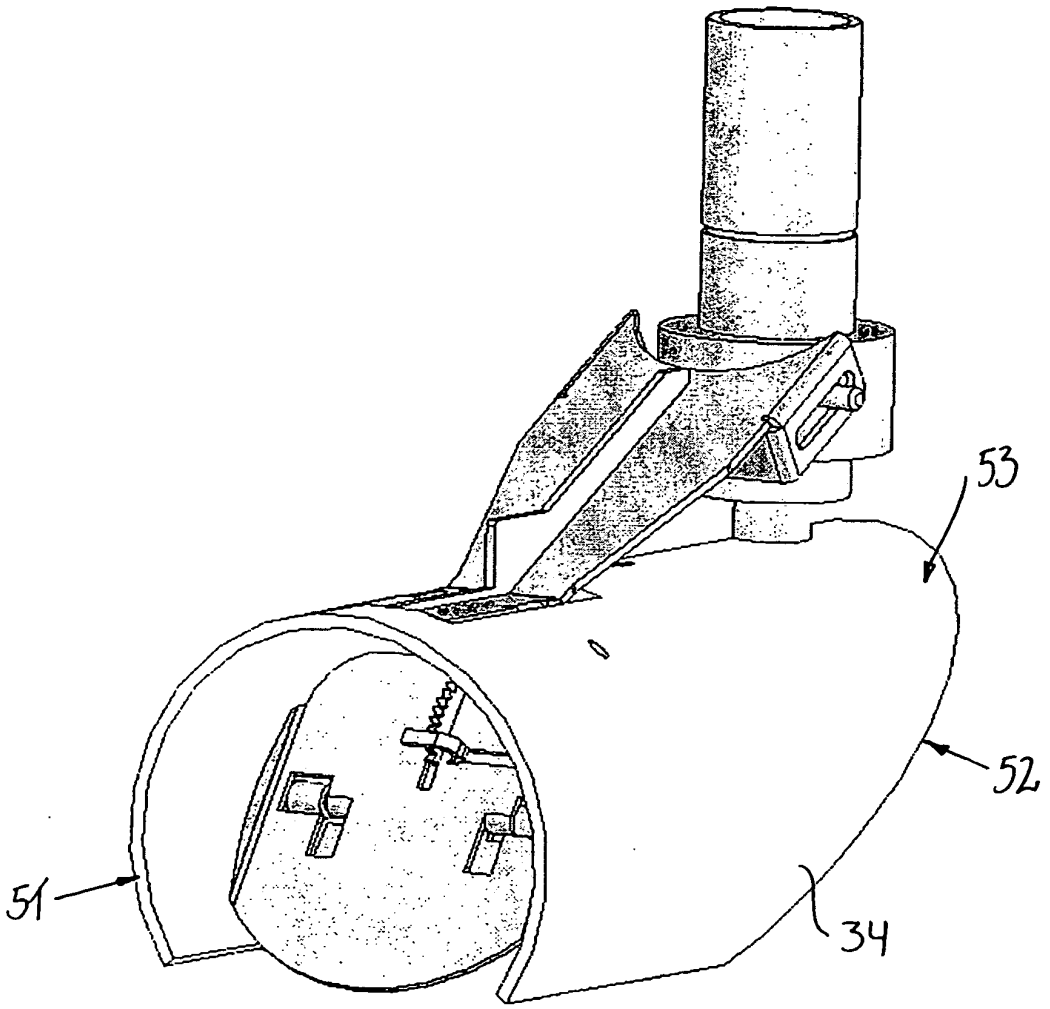

FIG. 16

REFERENCES CITED IN THE DESCRIPTION

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