

PATENT ASSIGNMENT COVER SHEET

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NATURE OF CONVEYANCE:	ASSIGNMENT
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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

BETWEEN: Patrick David Maguire, Campbell Allen Booth and Gary Alan Gibson

AND: Paul James Fricker

DESCRIPTION:

By this Deed the Assignors assign to Assignee
all their respective right, title and interest in the
Intellectual Property Rights relating to the
Invention.

JAMES & WELLS
INTELLECTUAL PROPERTY

Private Bag 11907
Level 9, Ellerslie Tower,
56 Cawley Street, Ellerslie
Auckland

DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

BETWEEN Patrick David Maguire, a New Zealand citizen of 31 Michie Street,
Belleknowes, Dunedin 9011, New Zealand

AND Campbell Allen Booth, a New Zealand citizen of 223 Musselburgh Rise,
Andersons Bay, Dunedin 9013, New Zealand

AND Gary Alan Gibson, a New Zealand citizen of 25 Moodie Street, Shiel Hill,
Dunedin 9013, New Zealand

(together the "Assignors")

AND Paul James Fricker, a New Zealand citizen of 53 Hargest Crescent, St Clair,
Dunedin, New Zealand

(the "Assignee")

ON THE BASIS THAT-

1.0 DEFINED TERMS

1.1. *Copyright* shall mean the property rights which exist in any *Copyright Work*.

1.2. *Copyright Works* shall mean:

1.2-1. a work of any of the types described in Section 14 of the New Zealand
Copyright Act 1994; and/or

1.2-2. a work in which copyright exists; and

which relates to the *Invention*.

1.3. *Design Rights* shall mean the right to apply for a registered design relating to the
Invention or equivalent protection in any country of the world and to claim priority under
international convention from any such applications and the rights conferred by such
registered designs or equivalent protection when granted.

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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

- 1.4. *Intellectual Property Rights* shall mean all intellectual property rights whatsoever relating to the *Invention* including without limitation the *Patent Rights*, the *Design Rights*, the *Copyright* and the *Technical Information*.
- 1.5. *Invention* shall mean an invention devised in the course of Evolver Project EV3 relating to Waste Buddy, as described in the draft provisional patent specification set forth in the Schedule to this Deed.
- 1.6. *Patent Rights* shall mean the right to apply for any patent relating to the *Invention* or equivalent protection in any country of the world and to claim priority under any international convention from any such application(s) and the rights conferred by such patents or equivalent protection when granted.
- 1.7. *Technical Information* shall mean all inventions, designs, drawings, tests, reports and procedures, models, manuals, formulae, tables of operating conditions and the like relating to the *Invention* and all other knowledge, know-how and show-how relating to the foregoing, whether or not capable of being protected by patent or otherwise.

2.0 BACKGROUND

- 2.1. The **Assignors** each devised the *Invention* in the course of Evolver Project EV3. Project EV3 was conducted under a business agreement between the **Assignee** and Otago Polytechnic, which provided that the *Intellectual Property Rights* would be owned by the **Assignee**.
- 2.2. The **Assignors** acknowledge that the **Assignee** is or should be the owner of the *Invention* and the *Intellectual Property Rights* as a result of the business agreements with Otago Polytechnic and hereby agree to assign same to the **Assignee** on the terms described below.

BY THIS DEED THE PARTIES AGREE –

3.0 THE ASSIGNMENT

- 3.1. The **Assignors** hereby assign all their right, title and interest in and to the *Intellectual Property Rights* to the **Assignee**.
- 3.2. The assignment will take effect on the date this Deed is fully executed by the **Assignors**.

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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

4.0 CONSIDERATION

4.1. In consideration for the assignment detailed in clause 3.1, the Assignee will pay to each of the Assignors upon execution of this Deed the sum of one New Zealand dollar (NZ\$1.00), the receipt and sufficiency of which is acknowledged by the Assignors. The Assignee acknowledges and agrees that he is bound by the terms of the business agreement with Otago Polytechnic for Project EV3 referred to at clause 2.1, which include an ongoing obligation to pay to the Otago Polytechnic a royalty on revenues generated from the licence, sale or other commercial returns from the *Intellectual Property Rights*, or a defined buy-out payment to Otago Polytechnic in the case of outright sale of any or all of the *Intellectual Property Rights* to an arms length third party. Unless he has prior written consent from Otago Polytechnic, the Assignee shall refrain from assigning the *Intellectual Property Rights* without first obtaining an agreement from the prospective purchaser to pay said royalty on revenues or defined buy-out payment to Otago Polytechnic, said agreement enforceable at the suit of Otago Polytechnic.

4.2. Any and all rights of the Assignors with respect to the *Invention* and *Intellectual Property Rights* will pass to the Assignee upon the effective date of this Deed.

5.0 ASSIGNORS' OBLIGATIONS

5.1. The Assignors undertake to (at the Assignee's cost) execute any documents and authorisations, and depose to or swear any declarations or oaths as may be requested by the Assignee for vesting absolutely all their rights, title and interest to the *Invention* and *Intellectual Property Rights* in favour of the Assignee, and for conferring on the Assignee the right to take action against any third party who copies the *Invention* or infringes the *Intellectual Property Rights*.

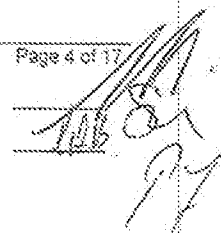
5.2. The Assignors hereby waive all their moral rights in relation to the *Copyright*.

5.3. At the request of the Assignee, the Assignors shall at Assignee's expense execute all documents and do all acts necessary or convenient to enable Assignee to:

5.3-1. make, prosecute or register in Assignee's name an application for a patent, registered design, registered trade mark, plant variety rights or other intellectual property protection in respect of any of the *Intellectual Property Rights*;

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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

- 5.3-2. defend opposition proceedings in respect of any of the *Intellectual Property Rights* against a third party or conduct opposition proceedings against a third party in respect of any application for intellectual property protection that may adversely affect **Assignee's** ability to exploit the *Intellectual Property Rights*;
- 5.3-3. defend proceedings in any court, tribunal or other forum which relate to the validity of any of protection obtained in respect of the *Intellectual Property Rights*;
- 5.3-4. enforce the *Intellectual Property Rights* including obtaining all such remedies as may be available for infringement of the *Intellectual Property Rights*.
- 5.4. The **Assignors** shall, at the request of the **Assignee**, and to the extent outstanding, furnish the **Assignee** with full details of and relating to the *Invention*, and the *Intellectual Property Rights* (including the circumstances of invention, creation and/or design of same) and where possible all original versions of the *Invention* and the *Copyright Works*.
- 5.5. The **Assignors** agree to treat as confidential all information relating to the *Invention* and the *Intellectual Property Rights* and shall not use, disclose or publish same without the express prior written consent of the **Assignee**. Such obligations shall not extend to information which already is in or which enters the public domain through no fault of the **Assignors**. The **Assignors** agree to seek prior clearance from the **Assignee** in any case of uncertainty.
- 6.0. **ASSIGNORS' WARRANTIES**
- 6.1. The **Assignors** warrant:
- 6.1-1. The **Assignors** have title to the *Intellectual Property Rights*;
- 6.1-2. There are no encumbrances or other matters affecting the **Assignors'** capacity to assign the *Invention* and/or the *Intellectual Property Rights* to the **Assignee** free of any encumbrances or interests whatsoever; and
- 6.1-3. The *Copyright Works* are the **Assignors'** original works and are not copied in whole or in part from any other work.

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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

6.2. Each of the Assignors consents to the other assigning their respective rights in the *Intellectual Property* to the Assignee.

7.0 GOVERNING LAW

7.1. This Deed and any disputes relating to it shall be governed by and construed in all respects in accordance with the laws of New Zealand.

7.2. Each party to this Deed submits to the non-exclusive jurisdiction of the courts of New Zealand.

Executed as a Deed this
Patrick David Maguire

21st day of September

2011 by

Signature

Witnessed by:

GRFF HUMPHREYS
Name

Signature

BUILDING DESIGNER
Occupation

DUNEDIN
Place of Residence

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Executed as a Deed this
Campbell Allen Booth

24 day of November

2011 by

Signature

Witnessed by:

Marcus Colin Booth
Name

Signature

Occupation

240 Rossmore Court Chicago
Place of Residence

Executed as a Deed this
Gary Alan Gibson

21 day of Sep.

2011 by

Signature

Witnessed by:

Griff Humphreys
Name

Signature

Occupation

BUILDING DESIGNER
Place of Residence

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DEED OF ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS

Executed as a Deed this
Paul James Fricker

day of

2011 by

Signature

Witnessed by:

Name

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SCHEDULE

Method and Apparatus for Navigating Longitudinal Bores

TECHNICAL FIELD

The present invention relates to improvements in and relating to methods and apparatus for navigating longitudinal bores. The present invention has particular advantage in navigating pipes which define a convoluted path or which include one or more sharp bends.

BACKGROUND ART

The present invention relates to a method and apparatus for navigating and clearing blockages in pipes and tubes.

For the purposes of clarity only, the background to the present invention will now be provided in terms of household pipes. However, it will be appreciated the invention may have application in the navigation of, and in some embodiments clearing of blockages from, any number of pipe or tube like constructions. For example, the present invention may have application to navigating: veins and arteries, or other body orifices, exhaust pipes, rainwater down pipes, pipe systems or the like.

Blocked household pipes and drains are a fact of life; typically household blockages occur in the water outlet pipes. The main reason such blockages arise is due to the fact that rain water and household waste water typically carry additional matter which can become stuck in the drainage pipes. Over the years numerous devices have been created to clear, or free, blockages from pipes. Preferably, a blockage is cleared remotely from the point of the blockage by applying and releasing pressure to and from the pipe, thereby breaking up the blockage. Typically a plunger is used for this purpose. However, particularly stubborn blockages, or blockages which are remote from a pipe's access point, cannot be removed via a plunger and either need a more directly applied force to effect physical removal.

Physical removal can be a particularly disruptive, unpleasant, and expensive job as the blocked pipe may need to be dug up, wall or floor panels removed and the blocked portion cut open to remove the blockage.

Applying a more direct force typically involves pushing a flexible non-compressible elongate device down the pipe. Once the end of the elongate device hits the blockage pressure can be applied directly to break up, or hook, the blockage. One commonly used type of elongate device is a standard garden hose. A garden hose has the further advantage of being able to apply a jet of water at the site of the blockage further improving the ability to free the blockage.

A problem with using a hose or piece of wire to apply a more direct force to the blockage is that the hose/wire may not readily go around sharp corners in a pipe system. In particular pipe corners joints that are 90 degree bends do not normally permit a hose to navigate its way around the bend -- much to the frustration of the person seeking to remove the blockage.

In some cases an Electric EelTM drainage clearing apparatus can be used. This device either includes a drum of cable or requires a number of interconnecting spring steel sections and geared motors which rotate the drum and cable or spring steel sections. In cable versions the cable and an attached head flail about inside the pipe, hopefully clearing any blockage in the process. Where spring steel section are used the sections form a drive shaft for driving a cutting head. Needless to say these machines are relatively specialized and expensive and require some know how to operate.

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Another method uses a hydro jet cutter, which forces water at high pressure through flexible hoses. The hose is flexible enough to negotiate bends and is pushed down a pipe until an obstruction is reached. The blockage is cleared by direct pressure from the water jet. These devices are expensive as very high pressures are involved, requiring the use of a specialist hose. A disadvantage is that the hose is difficult to force around sharp bends. Furthermore, as pressure is applied the water jet can push the hose back down the pipe away from the blockage, reducing the effectiveness of the clearing action of the jet on the blockage.

It would therefore be useful if there was a less expensive, less complicated apparatus for accessing pipe systems and the like which could be easily used and/or owned by the average homeowner.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

Throughout this specification, the word "comprise", or variations thereof such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF THE INVENTION

This specification details a system for navigating and if required clearing blocked longitudinal bores such as, but not limited to, drains and the like. The present invention includes, at its leading end, at least a portion which is capable of extending in length when fluid pressure is applied to the apparatus. When inserted into a pipeline both the present invention and the prior art will become jammed when a sharp corner or blockage is encountered. By applying pressure to the apparatus of the present invention at least a portion extends in length and thereby applies a force substantially at or near the corner or blockage. This results in a foremost utility head of the apparatus being pushed around the corner or into the blockage.

According to one aspect of the present invention there is provided an apparatus for accessing longitudinal bores which includes:

- a length of corrugated elastomeric tube which can exist in either an extended (stretched) state or a non-extended (resting) state;

wherein one end of the tube has a utility head thereon;

wherein the other end of the tube is configured to be connected to a physical energy source which can apply a force to the tube causing the tube to extend in length whilst the force is applied, and wherein the length of the tube retracts when the force ceases to be applied.

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In preferred embodiments the apparatus includes a control device which enables the user to control when the force is applied to the length of tube.

In preferred embodiments the longitudinal bore is a pipe system, however it will be appreciated that the apparatus has application in accessing any elongate tubular network and therefore it should not be seen as being limited to pipe systems.

In preferred embodiments the tube is configured to be connected to a physical energy source by way of a hose fitting.

It will be understood that in the context of the present invention the length of tube used by the apparatus is not limited to a particular length.

In some embodiments the length of tube used includes a relatively short portion that is configured to be inserted into a pipe. In such embodiments an attached hose may also be inserted into the pipe to push the length of tube into the pipe to a greater depth than the length of the tube itself, the insertion depth of the tube only being limited by the length of the hose.

It will be appreciated that the percentage that the tube is able to lengthen over its non-extended state is a determining factor in the length of the apparatus. For example, if a 30cm extension is desired and the tube used is capable of 30% extension under pressure, the length of tube would need to be a minimum of 1m long.

In one preferred embodiment the length of tube may be substantially 5m long. In a further preferred embodiment the length of tube may be greater than 10 m long.

In preferred embodiments the apparatus may be substantially tubular in shape.

In preferred embodiments a portion of the apparatus may be flexible at pipe pressure.

It will be appreciated by a person skilled in the art that pipe pressure refers to a point of equilibrium between the pressure inside the apparatus and the pressure in the pipe into which the apparatus is inserted.

In preferred embodiments the apparatus may become substantially rigid when sufficient pressure is applied to the energy receiving port.

In all embodiments the elongate body becomes further elongated when sufficient force is applied by the physical energy source.

Sufficient force should be understood to depend upon the type of material the apparatus is constructed from. For example, a particularly flexible material may require substantially more pressure to achieve the same level of rigidity as a material that is less flexible. Equally a less extensible tube may require significantly more force to achieve the same level of elongation as a more extensible tube.

In preferred embodiments the utility head may be configured to more easily slide along the walls of a pipe. Non limiting examples of such easily slid utility heads include:

- a ball head;
- a head including slide portions;

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- a head including a wheel or wheels; and
- a head including one or more water jet outlets directed outward towards the sides of the tube.

The utility head may be configured to aid in the unblocking of a pipe. Non limiting examples of utility heads features configured to help unblock pipes include:

- one or more forward facing water jet outlets;
- one or more abutting portions configured to butt up against a blockage; and
- one or more telescoping protrusions for penetrating a blockage.

In some preferred embodiments the utility head may include one or more attachments, such as, but not limited to:

- cutting blades;
- camera(s); and
- manipulators such as fingers.

In some preferred embodiments different pressures may be used to activate different water jets. For example:

- a low pressure may result in substantial extension of at least the extensible member;
- a medium pressure may result in further extension and/or activation one or more head mounted water jet outlets directed outward towards the sides of the tube, thereby aiding slideability; and
- a high pressure may result in full extension and/or disabling the side water jets and activation of a forward facing blockage clearing water jet.

In preferred embodiments upon application of force to the tube results in substantially longitudinal extension of the tube with little or no cross-sectional expansion.

In especially preferred embodiments the tube is a polypropylene blow molded corrugated hose.

In use the tube extends in length without any substantial cross-sectional expansion. It will be appreciated that under equilibrium conditions a corrugated tube has a defined length and sidewall sections which alternate between greater and smaller diameter, the sections connected together to form a homogenous pipe structure. When the internal pressure of the corrugated pipe exceeds the external pressure, the spacing between the greater and smaller diameter sections increases, thereby resulting in an overall extension of the tube. As the tube increases in length the corrugations formed by the larger and smaller diameter sections flatten.

In preferred embodiments the physical energy source may take any number of forms without departing from the scope of the invention and therefore should not be seen as being limiting. Non limiting examples include:

- a household water supply;

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- the fluid output of a compressor;
- the output of a water blaster or the like; and
- a reciprocating machine which imparts a vibrational frequency to the tube.

In preferred embodiments the force supplied to the apparatus may be turned on and off by way of a tap.

In other preferred embodiments the force supplied to the apparatus may be turned on and off by way of a manually activated valve, such as a foot switch or a hand held trigger.

In preferred embodiments the fluid supplied to the apparatus may be turned on and off by way of an electronic circuit controlling a solenoid valve.

In preferred embodiments the electronic circuit switches the solenoid valve on and off repeatedly.

In especially preferred embodiments the force is supplied to the apparatus as a pressurised fluid. Most preferably the fluid is water.

In some preferred embodiments the pressurised fluid may be applied to the apparatus at a range of different pressures.

In some preferred embodiments the pressurised fluid may be varied by way of a variable pressure valve.

In preferred embodiments the apparatus reverts to substantially the same pressure as a surrounding pipe by way of the internal pressure of the apparatus feeding to the outside of the apparatus by way of an aperture in the apparatus.

In preferred embodiments the aperture in the apparatus may be located in the utility head.

In preferred embodiments the aperture in the utility head acts as a water jet when the pressurised fluid supply is turned on.

According to a third aspect of the present invention there is provided a conveyance device which includes:

- a handle portion having a trigger;
- an outlet port; and
- an inlet port,

wherein the handle is configured to support a fixed length of hose and/or a length of tube which can be fed out from the handle or can be retrieved back towards the handle; and

wherein operation of the trigger operates a valve positioned between the inlet port and the outlet port to move from an open to a closed position, or vice versa; and

wherein the outlet port is in fluid communication with the hose and/or length of corrugated elastomeric tube; and

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wherein the inlet port is configured to be attached to a pressurised fluid supply.

In preferred embodiments the system may be used for navigating pipes.

In preferred embodiments the handle portion may be configured to allow a person's hand to simultaneously grip both the handle and a portion of the length of hose or tube being fed out or retrieved.

According to a further aspect of the present invention there is provided a method of accessing longitudinal bores with an apparatus including a length of corrugated elastomeric tube having a utility head at one end and being connected to a physical energy source at the other end which can apply a force to the tube causing the tube to extend in length whilst the force is applied, and wherein the length of the tube retracts when the force ceases to be applied, the method including the steps of:

- a) manually feeding the tube into a pipe system;
- b) when the tube encounters an obstacle, applying a force to the tube by way of the physical energy source whilst maintaining manual feeding pressure, and then releasing said force; and
- c) if necessary, repeating the application and release of the force on the tube until the said obstacle has been overcome.

Preferably, the tube is inserted into the pipe system to find a blockage or other region(s) of interest.

Preferably the method substantially as described above includes the additional step of:

- d) applying force by way of the physical energy source to elongate the hose and make the hose rigid so it can be driven into a blockage.

Preferably the method substantially as described above includes the additional step of:

- e) intermittently interrupting the supply of pressurised fluid to the hose so the hose repeatedly moves between a rigid stretched and flexible relaxed state and thereby acts like a hydraulic piston.

The present invention may provide a number of advantages over the prior art, including, but not being limited to:

- providing a system which may relatively easily navigate a pipe system having a number of corners;
- providing a system whereby a force may be applied at a distal end of a pipe cleaning system so as to overcome an obstacle such as a corner or blockage in the said pipe system;
- providing a system which may be easily transported to and from a blocked pipeline;
- providing a system whereby a combination of direct impacting and/or application of a water jet may be used to breakup or otherwise free a blockage; and/or

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- providing an apparatus that may be easily fitted to the end of an existing hose to aid in the clearing of a blocked pipeline.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

- Figure 1 shows a profile view of a system for navigating pipes in accordance with one preferred embodiment of the present invention;
- Figure 2 shows an isometric view of the system shown in Figure 1;
- Figure 3 shows a cross-sectional view of the system shown in Figure 1;
- Figure 4a shows a pipeline including a blockage;
- Figure 4b shows the pipeline of Figure 4 with the system of Figure 1;
- Figure 4c shows the pipeline of Figure 4 with the system of Figure 1;
- Figure 5a shows a detail view of a section of the pipeline and system shown in Figure 4b;
- Figure 5b shows a detail view of a section of the pipeline and system shown in Figure 4b;
- Figure 6a shows a length of non-pressurized corrugated tube in accordance with one preferred embodiment of the present invention; and
- Figure 6b shows the length of corrugated tube shown in Figure 6a under pressure.

BEST MODES FOR CARRYING OUT THE INVENTION

With respect to Figures 1 - 3 there is shown an apparatus for accessing longitudinal bores (not shown) as generally indicated by arrow 1. The system 1 includes a length of blow molded corrugated tube 13. For clarity the corrugated tube 13 is not shown in full length, but should be understood to loop at the left end of Figure 1. The tube 13 is configured to attach at one end to a physical energy source in the form of a pressurized water supply (not shown) by way of hose fitting 3. The other end of tube 13 includes a utility head 12 in the form of a capped hose end with an aperture 12a there through. Aperture 12a allows the corrugated tube to depressurise to an un-stretched rest state when no pressure is applied or to emit a forward direct jet of fluid when pressurised.

The apparatus of Figures 1 - 3 is attached to conveyance device 4 at outlet port 7.

Conveyance device 4 includes a handle portion 5 having a trigger 6. The trigger 6 activates valve assembly 9, shown in Figure 3. In use, the valve assembly 9 allows force in the form of a pressurized fluid from the water supply to flow from the conveyance device 4 inlet port 10 to outlet port 7 and therefore into tube 13.

Whilst not shown in the Figures, it will be appreciated that inlet port 10 is configured for attachment to one end of a hose (not shown) wherein the other end of the hose is connected to a pressurised fluid generated by a physical energy source (not shown).

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The handle portion 5 is configured to allow a person's hand (not shown) to simultaneously grip both the handle 5 and, as generally indicated by arrow 11, a portion of the tube 13. It will be appreciated that the length of tube 13 that can be fed out and retrieved is dictated by the length of corrugated tube 13 available. In some embodiments (not shown) a substantially non-extensible hose is connected between the corrugated tube 13 and the outlet port 7 of the conveyance device 4.

The use of the apparatus for accessing a longitudinal bore is best described by way of example. In this regard a pipeline 100 is shown in Figures 4a - 4c. Access to the pipeline 100 is available at first end 102. The pipeline 100 includes a blockage 101 which is separated from access point 100 by a number of corners 103a, 103b, 103c and 103d. Traditional means of pushing a flexible material such as a hose down the pipe may, with persistence, be able to navigate bends 103a and 103b due to their large radii. However bends 103c and 103d are unlikely to be easily navigated by the hose. The reason for this is evident in Figures 4b and 5a, which shows the utility head 12 and a portion of the corrugated tube 13 inside the pipeline 100. In Figures 4b and 5a the corrugated tube 13 is in its non pressurized un-stretched state. It will be appreciated that further application of longitudinal force A will result in the hose maintaining its straight trajectory and hitting the pipe wall at point 104. Because the corrugated tube 13, or a regular hose for that matter, requires a degree of resiliency in order to be pushed into the pipeline 100 it is likely to become stuck as the relatively short portion that extends across the corner is not flexible enough to bend around the corner without a substantial force being applied. This issue is further exacerbated by the previous corners 103a, 103b and 103c each of which reduce the force that can be applied to push the corrugated tube 13 utility head 12 around corner 103d. This problem is not solved by using a more flexible tube as instead of sliding along the pipeline a highly flexible tube would simply concertina or bunch up on itself.

Figure 5b shows the corrugated tube 13 of Figure 5a once a pressurised fluid source is applied to the tube 13. In the embodiment of Figures 1 - 3 the pressurised fluid source is applied by way of pulling trigger 6. Prior to pulling trigger 6 the corrugated tube 13 is manually fed into the pipe system 100 until an obstruction is felt, the pipe is then held in place at the pipe entry 102 by the operator (not shown). As the corrugated tube 13 extends under pressure it tends to jam itself in the pipeline 100, particularly at any corners 103a, 103b, 103c. Because the tube 13 is held in place at the pipe entry 102 by the operator, the end 12 receives a large proportion of the pressure induced extension force. The extension force acts to drive at least the utility head 12 and a portion of the corrugated tube 13 around the corner 103d. Further feeding force by the operator as the pressurised fluid source is disconnected results in the corrugated tube being able to be fed around the corner 103d. As the pressurised fluid source is disconnected fluid pressure is lost through an aperture 12a in the end of the utility head 12 until the tube 13 internal pressure reaches equilibrium with the pipe 100 pressure.

Figure 4c shows the pipeline 100 with a tube length of tube 2 inserted to the point whereby the blockage 101 has been reached by the utility head 12. If simply pushing more of the tube 2 into the pipeline 100 fails to dislodge the blockage 101, the user can connect the pressurised fluid (not shown) to the tube 13 by pulling trigger 6. This application of pressure results in the utility head 12 extending forward and butting against the blockage 101. At the same time a jet of water sprays from aperture 12a in the end of the utility head 12. This jet of water assists in breaking up and freeing the blockage.

By pulling the trigger on and off, the utility head 12 effectively batters the blockage until it becomes dislodged. In some systems an electronic controller may be used which electronically controls connection of the pressurised fluid by way of a solenoid valve. Such embodiments will provide a number of settings, such as extend, retract and pulse. In the pulse mode the tube 13 repeatedly lengthens and relaxes in a pulsing or vibrating motion.

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Figures 6a and 6b illustrate the elongation and retraction of a section of corrugated tube 13 upon the application and removal of internal fluid pressure. In Figure 6a the length of corrugated tube 13 has an equal internal and external fluid pressure and the corrugated tube 13 takes its natural unstretched form having length A. In Figure 6b the length of corrugated tube 13 has an internal pressure substantially higher than the external pressure, the higher internal pressure causes the corrugated tube 13 to stretch and elongate to length A'. At the same time the internal fluid pressure forces jets of fluid (not shown) out of apertures 12a. The jets of fluid aid in clearing blockages and also allow the internal corrugated tube 13 pressure to return to equilibrium once the pressurized fluid source is disconnected. Once the internal fluid pressure has fallen to below the pressure required to elongate the corrugated tube, the corrugated tube returns to its natural unstretched form having length A.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

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