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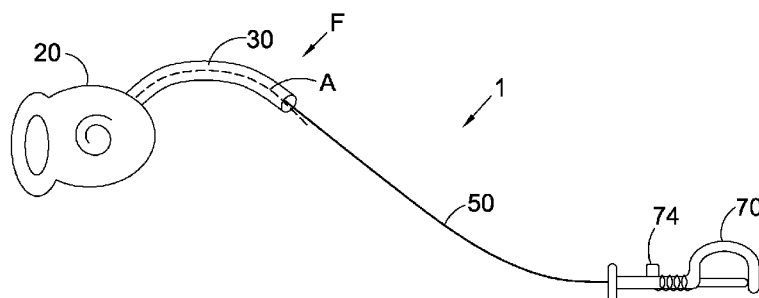


Fig. 1

(57) Abstract: A lead (1) (e.g. for an animal such as a dog), comprises a tether (50) and a stiffening arrangement (30), which may be disposed around the tether. The stiffening arrangement is configured to support at least a portion of the tether to allow the user to direct a clasp (70) located at one end of the tether for attachment to a collar worn by an animal. In at least one configuration, the stiffening arrangement is configured to flex under an applied force. For example, it may have sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use and/or to provide an animal attached to the tether freedom of movement. A handle (20) is attached to the tether at an opposite end to the clasp, the handle including a remote clasp operation mechanism (23) arranged to remotely operate the clasp.



An animal lead

The present invention relates to leads for animals such as, but not limited to, dogs. More particularly the invention relates to a lead that enables remote
5 attachment and release of an animal.

Leads for animals such as dogs typically comprise a handle, a tether (e.g. a flexible cable, string, ribbon, chain, strap or rope like structure which is flexible to allow the animal both freedom of movement and comfort), and a clasp (connecting device) at the end for attaching to e.g. the collar or harness of the animal. Such
10 leads can be retractable into the handle.

It is known in the art to have a means to release a dog from the end of a lead or anchor by remote operation, e.g. via a mechanism actuated at the handle of the lead. The usual reasons for doing so are for police dogs or protection of the dog owner, but also include uses such as for dog training in tracking its owner when
15 released from being tied to an anchoring object such as a tree (see DE 202006001291 U1), or for releasing a fighting dog safely (see FR 2582766 A1).

In general, the connector between the lead and the dog's collar or harness is in the form of a spring loaded clasp or karabiner; however other options also include spring biased jaws (see DE 3420967 A1, DE 8715034 U and US 4404927
20 A) which are forced together or apart. Such methods of attaching a lead to a dog are simple to operate and well known in the art.

In some cases, the dog is released not by disconnecting the connector between the lead and the dog (e.g. releasing the clasp from the collar/harness), but rather, by disconnecting another part of the lead. For example, US 4541364 A
25 discloses a lead whereby a velcro strap at the end of the lead which is fastened around the owner can be unfastened to release the dog. Alternatively, US 5103771 A discloses a lead whereby a solenoid connection part of the way along the lead can be disconnected remotely by use of a switch, looped string or radio control, thereby releasing the dog with a part of the lead still attached. Yet another example
30 can be found in DE 2832887 A1, where the dog is released from the lead and collar entirely.

There are several methods known in the art for activating the remote release of a dog. One predominant method known in the art is the use of a Bowden Cable. This comprises an inner cable transmitting a force and moving relative to an
35 outer cable. The cable runs the length of the entire lead and is flexible, but when a

dog pulls at the lead, thus creating tension in the cable, it enables a pulling force applied by the user to be transmitted to a spring biased clasp in order to open the clasp. The dog will then be released.

This and similar arrangements can be found in DE 102008038689 A1, DE 545136 A, DE 587614 A, DE 8715034 U1, US 2001/0037774 A1, US 4149492 A and US 5197410 A.

Other methods of remote release include electrical signal means (US 2011/0197824 A1).

One of the problems with the foregoing devices is that they only provide a means suitable for remote release of a dog and not for remote attachment. For example, tension provided in a cable by the dog straining to enable the clasp to open is clearly not available prior to attaching the dog.

One known method of providing remote attachment as well as remote release is taught in US 3910234. Here, the lead comprises a rigid tubing having a cable extending through it between a handle and a clasp. The clasp can be remotely operated at the handle by pulling on the cable via an actuation ring. However, such a rigid lead is not only uncomfortable for the dog since he has no freedom of movement, but is also highly impractical to carry around and store.

According to a first aspect, the present invention provides a lead comprising: a tether; and a stiffening arrangement; wherein the stiffening arrangement is configured to support at least a portion of the tether to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal; and wherein in at least one configuration the stiffening arrangement is configured to flex under an applied force. According to another aspect, the present invention provides a lead comprising: a tether; and a stiffening arrangement; wherein the stiffening arrangement is configured to support at least a portion of the tether; and wherein in at least one configuration the stiffening arrangement is configured to flex under an applied force. Preferably, the support of at least a portion of the tether is sufficient to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal. The lead is preferably an animal lead.

Thus, since the stiffening arrangement of the invention supports at least a portion of the tether to allow the user to direct the tether with the clasp at the end for attachment to a collar, the lead of the invention enables remote attachment as well as remote release. This means that, for example, people with restricted mobility or

disabilities for which it would be challenging, difficult or impossible to bend down and attach a clasp to an animal (e.g. a dog) in the normal way would be able to direct the tether and clasp at the animal's collar by virtue of the stiffening arrangement, and remotely attach the clasp. Thus, most preferably, the lead further
5 comprises a handle attached to the tether at an opposite end to the clasp. The handle preferably includes a remote clasp operation mechanism arranged to remotely actuate the clasp. This remote operation preferably enables both remote attachment to and remote release from the collar or harness of the animal.

The clasp may typically have weight in the range from 0.03kg to 0.06kg,
10 such as from 0.04kg to 0.05kg. Thus, the stiffening arrangement may be configured to support at least a portion of the tether to allow a user to direct a clasp of such a weight at an end of the tether for attachment to a collar or harness. A skilled person would readily be able to determine the stiffness required by the stiffening arrangement to implement this, dependent on the type of tether, type
15 and/or length of stiffening arrangement employed etc in the specific scenario. Various different embodiments of stiffening arrangements are described later.

The tether may be any suitable tether known in the art of animal leads. For example the tether may be a cord. The diameter of the cord may be chosen according to the type and size of animal it is intended to restrain. Such matters
20 would be readily appreciated by the skilled person. Since the stiffening arrangement is configured to support at least a portion of the tether, the stiffness required of the stiffening arrangement may depend on the weight and thus for example the diameter of the tether. Again, the skilled person would be readily able to assess what is required depending on the particular scenario.

25 In at least one configuration, the stiffening arrangement is configured to flex under an applied force. Thus, the stiffening arrangement is not completely stiff, in other words it has flexibility. This provides significant advantages for example in terms of allowing the animal freedom of movement.

For example, in at least one configuration, the stiffening arrangement may
30 be configured such that a lateral force of 10N applied to an end of the stiffening arrangement will cause the end of the stiffening arrangement to displace by a minimum of 0.02m. The skilled person will appreciate that this definition may be understood in the context of a cantilever beam having a fixed end and a free end, wherein a load applied to the free end causes displacement (deflection) of the free
35 end. This is a commonly understood engineering principle. Such a cantilever may

be considered as having a spring constant, K (also known as bending stiffness) wherein $K = F/Y$; where F is the force applied and Y is the deflection. Thus, in an embodiment where a force of 10N causes a minimum displacement of 0.02m, then the stiffening arrangement may be considered as having a maximum spring
5 constant of 500Nm^{-1} . In other words, the stiffening arrangement preferably has a spring constant of 500Nm^{-1} or less.

In other embodiments, the minimum displacement achieved by a lateral force of 10N may be greater than 0.02m, for example 0.03m, 0.04m, 0.05m, 0.06m, 0.07m, 0.08m, 0.09m, 0.10m or more. Clearly, the greater the minimum
10 displacement for a particular applied force, the greater the flexibility of the stiffening arrangement.

In one embodiment, the stiffening arrangement has sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.

This provides the flexibility required for easy carriage and storage. For
15 example, the stiffening arrangement may be configured such that it can be coiled up to a diameter of less than 20cm, preferably less than 15cm, more preferably less than 10cm. The stiffening arrangement can also be flexible enough during use when walking the animal so that the animal has freedom to move around. Thus the stiffening arrangement can flex upon application of a force e.g. applied by a user or
20 an animal attached to the lead.

Whilst the stiffness of the stiffening arrangement may be considered, since the stiffening arrangement supports the tether and thus directly affects the stiffness of the tether, the stiffness of the tether may also be considered. In one embodiment, in at least one configuration, the stiffening arrangement may be
25 configured to allow a lateral force of 10N applied to an end of the tether to cause the end of the tether to displace by a minimum of 0.02m. In other words, whilst the stiffening arrangement supports at least a portion of the tether, in at least one configuration it will allow the tether to flex under an applied force. In other embodiments, the stiffening arrangement may allow a lateral force of 10N applied to
30 an end of the tether to cause a minimum displacement of the end of the tether of at least 0.03m, at least 0.04m, at least 0.05m, at least 0.06m, at least 0.07m, at least 0.08m, at least 0.09m, at least 0.10m or more. Clearly, the greater the minimum displacement for a particular applied force, the greater the flexibility of the tether allowed by the stiffening arrangement.

In one embodiment, the stiffening arrangement is disposed at least partially around the tether. In addition or instead, the stiffening arrangement may be joined to the tether and/or be adjacent to the tether. The important feature is that the stiffening arrangement influences the tether so as to support at least a portion of the
5 tether.

The tether may be fixed-length. In this case, it is typically 0.6m to 2m long, most typically 1m long. However, preferably, the tether is retractable into the handle. Numerous retraction mechanisms are known in the art which may be used to retract the tether of the invention. A retractable (i.e. an extending) tether may
10 typically be 3m to 8m long, most typically 5m long.

Since the stiffening arrangement supports a portion of the tether to allow a user to direct a clasp located at an end of the tether for attachment to an animal, the length of the stiffening arrangement will typically reflect the distance between a user's hand and the collar/harness of the animal. Consequently, the stiffening
15 arrangement may have a length in the range from 0.3m to 1m, such as in the range from 0.4m to 0.9m, or 0.5 to 0.8m. However, the skilled person would understand that the length of the stiffening arrangement can be adapted to the particular scenario, dependent for example on the size of animal for which it is intended to be used, the height of the user, the length of the tether etc. The stiffening
20 arrangement is preferably self-supporting. Preferably it supports its own weight and that of the portion of the tether extending therethrough.

The skilled person would readily appreciate that there are many different ways that such a stiffening arrangement may be constructed. However, the stiffening arrangement preferably comprises a plurality of segments, preferably
25 annular segments, each disposed at least partially around the tether and arranged one after another along the tether.

In one embodiment, this may take the form of a sheath (e.g. a tube) of abutting segments. These preferably abut in a sufficiently stiff manner so that the sheath of abutting segments supports its own weight and the portion of tether
30 extending therethrough, in other words resists deflection under the weight of the segments and the portion of tether extending therethrough.

The sheath may extend all the way along the tether, but more preferably extends only part-way along the tether. It will generally be attached at one end to the handle of the lead. If retractable, the tether can retract within the sheath into
35 the handle, however preferably the clasp is sized so as to not fit through the sheath,

so during retraction the clasp will abut on the end of the sheath and prevent further retraction by the normal mechanism.

In one embodiment the stiffening arrangement may take the form of a sheath of interlocked segments that are interlocked in a sufficiently stiff manner so
5 that the sheath of interlocked segments supports its own weight and portion of tether extending therethrough, in other words resists deflection under the weight of the segments, but is arranged to flex under an applied load.

Preferably the sheath can flex under a load applied by a user acting to coil up the lead or an animal desiring to move around when attached to the lead. The
10 sheath may flex under a load applied in a direction perpendicular to the longitudinal direction of the sheath. It will be appreciated that in this embodiment, the "at least one configuration" in which the stiffening arrangement is configured to flex under an applied force is the same configuration in which it is configured to support at least a portion of the tether. In other words, the sheath of this embodiment of the stiffening
15 arrangement is configured to be both stiff enough to support the tether, and flexible enough to flex under an applied force.

Preferably there is sufficiently high friction at the joints (e.g. knuckles) between the segments to resist deflection under the weight of the segments and portion of tether extending therethrough. This sheath could be considered to be
20 semi-rigid in the sense that it is rigid enough to support its own weight but can also flex when a load is applied.

The interlocked segments are preferably interlocked in an articulated fashion, so as to be flexible at the joints between the segments. Thus preferably the sheath of interlocked segments can flex at the joints between the segments
25 under a force applied by a user or an animal to which the tether is attached. Thus, a user can coil up the sheath of interlocked segments when the tether is not in use, and an animal is allowed freedom of movement.

In one embodiment, each segment comprises a male portion at one end and a female portion at the other end, wherein the male portion of one segment is
30 received in a female portion of an adjacent segment. For example, each segment may comprise a ball at one end and a socket at the other end, wherein the ball of one segment is received in the socket of an adjacent segment. The ball can rotate within the socket thus allowing the sheath to flex at the joints between the segments when a force is applied. In order for the sheath to support its own weight and that
35 of the portion of tether extending therethrough, the friction fit of the ball and socket

should be sufficiently stiff that the sheath (with tether extending therethrough) does not flex under the force of gravity, but rather requires a force to be applied by a user or an animal. Preferably, the stiffness is such that a lateral force of 10N applied to an end of the sheath will cause the end of the sheath to displace by a minimum of
5 0.02m.

A suitable sheath of interlocked segments may include a modular hose, for example "Loc-Line®" modular hose of Lockwood Products, www.loc-line.com.

Preferably, the stiffening arrangement e.g. the sheath of interlocked segments is rigid in the axial direction such that it cannot be compressed axially.

10 In another embodiment, the stiffening arrangement may have a first configuration in which it is flexible and a second configuration in which it is stiff enough to support its own weight and the portion of the tether extending therethrough, thereby supporting at least a portion of the tether to allow the user to direct the clasp located at one end of the tether for attachment to a collar or
15 harness. It will be appreciated that this first configuration corresponds to the "at least one configuration" in which the stiffening arrangement can flex under an applied force, as discussed above.

In one embodiment, in the first configuration the stiffening arrangement may be flexible such that the user can coil up the stiffening arrangement when the lead
20 is not in use.

This stiffening arrangement may comprise a plurality of segments each disposed at least partially around the tether, wherein in the second configuration the segments abut against each other to support at least a portion of the tether extending therethrough. The segments may be caused to abut one another by
25 being forced towards each other along the tether. Preferably, in the first configuration, the segments can be displaced apart from one another along the tether such that the stiffening arrangement (i.e. the group of segments), is flexible, and the tether extending therethrough is therefore also flexible. The segments may therefore move freely along the tether in the first configuration.

30 The segments may be annular segments, such segments may each form an open or closed ring (circular or of other shape) around the tether. By "open ring" it is meant that a segment does not extend entirely around the tether, but rather has for example a gap at some point around its circumference. However this gap would need to be small enough to prevent the tether passing therethrough and thus the

segment slipping off the tether. Preferably, the segments are annular segments disposed entirely around the tether, e.g. forming a closed ring.

Preferably, in such an embodiment, the tether is retractable into a handle attached to the tether at an opposite end to the clasp, wherein in the first
5 configuration the tether is at least partially extended and the segments can displace apart from one another such that the stiffening arrangement is flexible, and in the second configuration the tether is retracted such that the segments are compressed together between the clasp and the handle in order to form a sheath of abutting segments that supports the portion of the tether extending therethrough (the clasp
10 is preferably sized to as to not fit through the sheath of abutting segments, so during retraction the clasp will abut on the end of the sheath and prevent further retraction by the normal mechanism). It will be understood that in the first configuration, since the stiffening arrangement is flexible (because the segments can displace apart from one another), this allows the tether extending therethrough
15 to also be flexible.

The stiffening arrangement may be sufficiently flexible to e.g. allow the user to coil it up when the lead is not in use. It may thus allow the tether sufficient flexibility for it to be coiled up.

A displacement mechanism at the handle may enable additional retraction
20 of the tether to further force the abutting segments together to further stiffen the stiffening arrangement. Preferably, this displacement mechanism also enables remote actuation of the clasp, which will be described later.

The segments may take any suitable shape. For example, they may be spherical, ovoid, cylindrical or any other shape. They may be all the same shape,
25 or they may be different shapes. They may be beads.

In one embodiment of the lead of the invention the same type and shape of segment is used for all the segments, but in other embodiments different types and/or shapes may be used.

The segments may be profiled (e.g. shaped) to fit together and preferably
30 interlock at the abutting surfaces. For example, each segment may have a protrusion at one axial end, and a recess at the opposite axial end, such that the protrusion of one segment fits within the recess of an adjacent segment. Preferably, adjacent segments interlock with one another.

Each segment may further comprise at least one magnetic portion, such that
35 adjacent segments can attract one another and be held together by magnetic force.

In the case of segments with magnetic portions, it may not be necessary to compress the segments together by the retraction of the tether, since magnetic force on its own may be adequate to force the segments together to create a stiffening arrangement. Thus in this embodiment in particular a non-retractable
5 tether may be used.

In one embodiment, one or more elasticated cords run between the segments to provide an additional stiffening effect to the stiffening arrangement created by the segments.

In one preferred embodiment, the lead further comprises a handle attached
10 to the tether at an opposite end to the clasp, the handle including a remote clasp operation mechanism arranged to remotely operate the clasp. The tether and clasp are operatively connected such that displacement of the tether away from the clasp can apply a force to the clasp acting to open the clasp. The clasp may be openable by drawing part of the tether into the handle. The remote clasp operation
15 mechanism may comprise a displacement mechanism located in the handle for drawing part of the tether into the handle to thereby open the clasp. This displacement of the tether by drawing part of the tether into the handle may be implemented in addition to the retraction provided by a standard retractable lead, or may be applied to a non-retractable lead.

20 In the case of implementation with a retractable lead, this described displacement of the tether by drawing part of the tether into the handle will be carried out in addition to and after the normal retraction of the lead. Normal retraction of the tether will cause the tether to retract into the handle until the clasp abuts on the end of the stiffening arrangement, since preferably an axial end of the
25 clasp that is attached to the end of the tether has a cross section such that the clasp cannot pass through the stiffening arrangement whereas the tether to which it is attached can pass through the stiffening arrangement. The displacement mechanism then enables further retraction of the tether by applying a further force to the tether. The tether is preferably operably attached to a pin of the clasp, such
30 that further retraction of the tether directly retracts the pin of the clasp, thereby opening the clasp. By releasing the tether from its further retracted state, the clasp is thereby closed.

Preferably, the clasp comprises a pin moveable to open and close the clasp, preferably further comprising a spring biasing the pin in a closed position. The
35 remote clasp operation mechanism comprises a trigger disposed at the handle for

operating the displacement mechanism; wherein an axial end of the clasp that is attached to the end of the tether has a cross section such that the clasp cannot pass through the stiffening arrangement whereas the tether to which it is attached can pass through the stiffening arrangement; wherein when the trigger is activated, the displacement mechanism draws part of the tether into the handle, thereby applying a force to the pin to which the tether is attached against the bias of the spring and thereby opening the clasp; and wherein when the trigger is subsequently released, the portion of the tether that was drawn into the handle by the displacement mechanism is released such that the force applied to the pin against the bias of the spring is removed, whereby the pin is biased back into a closed position by the spring, thereby closing the clasp.

The clasp of the lead may further comprise a safety catch arranged to lock the clasp in a closed position, the safety catch being further arranged to unlock the clasp when the tether is fully retracted.

In one embodiment, the lead further comprises a sleeve surrounding the stiffening arrangement. This is most useful when the stiffening arrangement comprises a plurality of segments disposed around the tether that can displace apart from one another along the tether in a first flexible configuration, and abut each other thereby stiffening the tether in a second stiff configuration. The sleeve is preferably attached at one end to the handle, and extends along the tether away from the handle, with the segments being enclosed therein. Thus, in the flexible configuration, the segments are free to move along the tether only to the extent of the sleeve and no further. This means that the segments will not slide down to the clasp-end of the lead and impede the movement and/or comfort of the attached animal. The sleeve can also protect the lead e.g. keeping out dirt, and can be used for printed branding or other logos or text. The sleeve can be made from any suitable flexible material, for example fabric or thin plastic such as PVC. Preferably, the sleeve is elasticated. This can provide an additional stiffening effect to the segments.

In another embodiment, the stiffening arrangement itself comprises an elasticated sleeve arranged over the tether. Such an elasticated sleeve provides stiffness to the tether whilst still allowing some flexibility. Instead or in addition, the stiffening arrangement may include an elasticated cord arranged adjacent the tether. Such an elasticated cord may be attached to the tether. It will provide stiffness whilst still allowing some flexibility.

In at least some preferred embodiments, the animal's collar or harness to which the lead is connected and from which it is disconnected includes an attachment ring or similar mounted thereon, which the clasp of the lead can be connected to and disconnected from. This is preferably readily accessible by projecting radially outwardly from the collar, thereby allowing convenient and easy remote attachment of the lead. For example, the attachment ring may be arranged to project outwardly from the collar or harness at an angle in the region of 45° to 90°, e.g. 60° to 90° or 75° to 90°, but preferably at an angle of 90° to the collar or harness. In one embodiment, the attachment ring may be moveable between one configuration in which it lies flat against the collar or harness so as to be less obtrusive, and another configuration in which it projects outwardly at e.g. at an angle in the region of 45° to 90°, e.g. 60° to 90°, 75° to 90°, but preferably at an angle of 90°. In this embodiment means may be provided for the user to lock the attachment ring in one or in each configuration.

When remotely attaching a lead to a collar or harness it should be remembered that the user will generally only be able to direct the lead towards, and thus attach the lead to, the part of the collar or harness that is accessible from above (unlike when attaching a lead in the normal way directly by hand, when any part of the collar or harness can be accessed). Preferably, to address this issue, the collar or harness includes two or more attachment rings in different positions on the collar or harness, to ensure that an attachment ring is always accessible to the user from above, e.g. irrespective of the degree of rotation of a collar about the neck of the animal. For example, in the case of a collar, two attachment rings may be mounted diametrically opposite one another on the collar.

The attachment ring(s) may for example be O-rings or D-rings. They may be attached to the collar or harness by means of rivets, bolts or any other means known in the art. The collar or harness may be formed of leather, fabric or any other materials known to the skilled person.

Whilst embodiments of the stiffening arrangement described above comprise a plurality of segments, other stiffening arrangements are envisaged which are formed in different ways. For example, in a different embodiment the stiffening arrangement may be a one piece member, such as a tubular member being both stiff enough to support at least a portion of the tether and being configured to flex under an applied force. The tubular member may be made from

a material that has such properties, or may be constructed in such a way so as to provide this.

According to another aspect, the present invention provides: a lead comprising: a tether, the tether having a clasp at one end thereof and a handle at the other end thereof; a stiffening arrangement disposed at least partially around at least a portion of the tether; the stiffening arrangement comprising a sheath of interlocked segments connected together in a sufficiently stiff manner so that the stiffening arrangement supports both its own weight and the weight of the at least a portion of the tether disposed therethrough, so as to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal; and wherein the stiffening arrangement is arranged to flex under an applied load. In another aspect, the invention provides a lead comprising: a tether, the tether having a clasp at one end thereof and a handle at the other end thereof; a stiffening arrangement disposed at least partially around the tether; the stiffening arrangement comprising a sheath of interlocked segments connected together in a sufficiently stiff manner so that it supports its own weight and the weight of the at least a portion of the tether disposed therethrough; and wherein the stiffening arrangement is arranged to flex under an applied load.

Since the stiffening arrangement is configured to flex under an applied force, it is not completely stiff, in other words it has flexibility. This provides significant advantages for example in terms of allowing the animal freedom of movement.

For example, the stiffening arrangement may be configured such that a lateral force of 10N applied to an end of the stiffening arrangement will cause the end of the stiffening arrangement to displace by a minimum of 0.02m. The skilled person will appreciate that this definition may be understood in the context of a cantilever beam, as described previously above. In other embodiments, the minimum displacement achieved by a lateral force of 10N may be greater than 0.02m, for example 0.03m, 0.04m, 0.05m, 0.06m, 0.07m, 0.08m, 0.09m, 0.10m or more. Clearly, the greater the minimum displacement for a particular applied force, the greater the flexibility of the stiffening arrangement. In one embodiment, the stiffening arrangement is arranged to flex under an applied load such that the user can coil up the stiffening arrangement when the lead is not in use.

According to a further aspect, the present invention provides a lead comprising: a tether, the tether having a clasp at one end thereof and a handle at the other end thereof; a stiffening arrangement disposed at least partially around at

least a portion of the tether, wherein the stiffening arrangement comprises a plurality of annular segments; wherein the stiffening arrangement has a first configuration in which the segments can displace apart from one another along the tether such that the tether is flexible, and wherein the stiffening arrangement has a
5 second configuration in which the segments abut against each other to support the portion of the tether extending therethrough, so as to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal. In another aspect, the present invention provides a lead comprising: a tether, the tether having a clasp at one end thereof and a handle at the other end
10 thereof; a stiffening arrangement disposed at least partially around the tether, wherein the stiffening arrangement comprises a plurality of annular segments; wherein the stiffening arrangement has a first configuration in which the segments can displace apart from one another along the tether such that the tether is flexible; and wherein the stiffening arrangement has a second configuration in which the
15 segments abut against each other to support the at least a portion of the tether extending therethrough. In this second configuration, preferably the stiffening arrangement supports its own weight.

Thus, the stiffening arrangement is flexible in the first configuration to allow the flexibility of the tether.

20 In the first configuration in which the tether is flexible, the animal is allowed freedom of movement. The tether may be flexible such that the user can coil up the tether when it is not in use.

For example, the tether may be flexible such that a lateral force of 10N applied to an end of the tether will cause the end of the tether to displace by a
25 minimum of 0.02m. The skilled person will appreciate that this definition may be understood in the context of a cantilever beam, as described previously above. In other embodiments, the minimum displacement achieved by a lateral force of 10N may be greater than 0.02m, for example 0.03m, 0.04m, 0.05m, 0.06m, 0.07m, 0.08m, 0.09m, 0.10m or indeed much more. Clearly, the greater the minimum
30 displacement for a particular applied force, the greater the flexibility of the tether.

In yet another aspect, the present invention provides: a lead comprising: a handle having an actuator; a clasp; a tether extending between the handle and the clasp; wherein the tether has a first configuration in which it is flexible and a second configuration in which at least a portion of the tether is stiffened; and
35 wherein the actuator, upon actuation, is arranged to apply force to the tether so as

to effect a transition between the first configuration and the second configuration. Preferably, in the first configuration, the tether is sufficiently flexible to allow a user to coil up the tether when not in use and in the second configuration the tether is sufficiently stiff to enable a user to direct the clasp for attachment to a collar or
5 harness worn by an animal.

The invention further extends to a kit comprising a lead according to any preceding aspect and a collar or harness for attachment thereto, the collar or harness comprising at least one attachment ring, preferably two or more attachment rings. The various preferred features of the attachment ring described above are
10 also particularly applicable to this kit.

It is envisaged that the stiffening arrangement discussed above may be retrofitted to an existing lead, such as an existing retractable lead, in order to provide the advantages of the invention. Accordingly, the invention also provides a kit of parts for retrofitting to an animal lead having a tether and a handle; the kit of
15 parts comprising: a stiffening arrangement for disposal around the tether; a clasp for attachment to an end of the tether and openable by drawing back part of the tether thereby; and a displacement mechanism for attachment to the handle and for drawing back part of the tether to thereby open the clasp; wherein the stiffening arrangement is configured to support at least a portion of the tether to allow a user
20 to direct the clasp for attachment to a collar or harness worn by an animal, while having sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.

Typically, with such a retrofit kit, the existing clasp of the lead will need to be removed, and the new clasp of the kit attached e.g. by means of a knot. The
25 displacement mechanism will typically be connectable to the handle, e.g. by means of glue or screws. The retrofit kit may be brand and/or model specific.

According to yet another aspect, the present invention provides a lead comprising: a tether; and a stiffening arrangement disposed around the tether, the stiffening arrangement being configured to support at least a portion of the tether to
30 allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal, while having sufficient flexibility to allow the animal freedom of movement when attached to the tether. It will be understood that this is an alternative way of defining the flexibility of the stiffening arrangement than that used in the first aspect of the invention discussed above.

According to another aspect, the present invention provides a lead comprising: a tether; and a stiffening arrangement disposed around the tether, the stiffening arrangement being configured to support at least a portion of the tether to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal while allowing the user to coil up the stiffening arrangement when the lead is not in use. The lead is preferably an animal lead.

The numerous optional and preferred features described above in relation to the lead of the first aspect of the invention may also be used with the other described aspects of the invention.

10 In any of the above-mentioned aspects, operation of the clasp may be by an electro-mechanical device. For example, a trigger or button may be provided on the handle which, when activated, sends an electrical signal or pulse to the clasp, causing a motor therein to operate the clasp (e.g. open and close the clasp). Such a signal may also be sent via radio waves or other electromagnetic means which do not require a physical means e.g. a wire running along the tether (or the tether itself) for transmission of the signal. This would have the advantage of avoiding the additional weight associated with a physical wire etc, and the risk of this being broken. The motor which actuates the clasp may be provided with a battery for powering both the motor and a signal receiving device for receiving the transmitted signal.

20 This arrangement could be used for both opening and closing the clasp. For example, a "fail-safe" mechanism may be provided, wherein, when no signal is sent, the clasp remains closed. In the case where the trigger is pulled or the button is pressed, a signal is sent continuously, but only for as long as the trigger or button is activated. Consequently, as soon as the trigger or button is released, the motor actuates the clasp to return the clasp to its "fail-safe" state of being closed.

Among the advantages of such an arrangement is that a mechanical arrangement in the handle to e.g. further draw back the tether so as to open the clasp (as described previously) is not required. Furthermore, the force to which the tether is subjected by this additional retraction and consequential application of force is avoided, thus reducing the wear on and increasing life of the tether.

30 It will be appreciated that features described above in relation to particular aspects or embodiments of the invention may be applicable to other aspects or embodiments, and vice versa.

Preferred embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 illustrates a lead according to a first embodiment of the invention in an extended position;

5 Figure 2 illustrates a stiffening arrangement in the form of a sheath utilised in the embodiment of Figure 1;

Figure 3 is a cross-section of part of the sheath of Figure 2;

Figure 4 illustrates the lead of Figure 1 in a fully retracted position;

Figure 5a illustrates a clasp having a safety catch in a locked configuration;

10 Figure 5b illustrates the clasp of Figure 5a in an unlocked configuration;

Figure 5c illustrates a clasp having an alternative safety catch in a locked configuration;

Figure 6 is a cross-section through a handle of the lead;

Figure 7 is a cross-section through an alternative handle of the lead;

15 Figure 8 illustrates a lead according to a second embodiment of the invention in an extended position;

Figure 9 is a cross-section of part of the lead of Figure 8 in an extended position;

20 Figure 10 is a cross section of part of the lead of Figure 8 in a retracted position;

Figure 11 is a perspective view of the segments of Figures 9 and 10;

Figure 12 illustrates a segment with a magnetic portion at either end;

Figure 13 illustrates a segment with a magnet inside;

25 Figure 14 illustrates an embodiment similar to that of Figure 8, but additionally comprising an outer sleeve;

Figure 15 illustrates an embodiment of an attachment ring;

Figure 16 is a plan view of the attachment ring of Figure 15;

30 Figure 17a is a perspective view of a configuration in which the attachment ring of Figures 15 and 16 is free to rotate about an axis parallel to the surface of the collar or harness to which it is attached;

Figure 17b is a perspective view of a configuration of the attachment ring in which it is locked in a position perpendicular to the collar/harness to which it is attached.

35 Figure 18 illustrates a kit of parts according to an embodiment of the invention, retrofitted to an existing retractable lead; and

Figure 18b is a close-up view of part of Figure 18.

An animal lead 1 (e.g. for a dog) according to a first embodiment of the invention is shown in Figure 1. It comprises a handle 20, a tether (in the form of a cord 50) and a clasp 70 for attaching the cord 50 to a collar, harness or equivalent of an animal. The cord 50 is at least partially retractable into the handle by means of a retraction mechanism 21 located in the handle.

The handle 20 is illustrated further in Figure 6. The retraction mechanism 21 includes rotating guide pins 15 which guide the cord 50 to wind onto and from spring loaded cable storage drum 16. A cable drum locking pin 17 engages teeth on the cable storage drum so as to lock the drum in place upon actuation of a locking button 27. This locking button 27 is spring biased towards the open position to allow the cable storage drum 16 to rotate freely. Upon pressing the locking button 27, the locking pin is moved to engage the cable storage drum 16 to prevent rotation, thus locking it in place and preventing the tether from extending or retracting. When the locking button 27 is released by releasing pressure applied to it, the locking pin disengages from the cable storage drum 16 which can then rotate again. A securing catch 24 is also provided which, when the locking button 27 is pressed to prevent rotation of the storage drum 16, can be operated to secure the locking button 27 in place, so that the user does not have to permanently keep their finger on the locking button 27 to lock the drum 16.

This type of means of retraction, and other suitable means of retraction are well known in the art and thus will not be described in further detail here. It should be understood that the present invention includes the easy adaptation, as would be understood by the skilled person, to an animal lead with any means of retraction.

The lead 1 further comprises a stiffening arrangement disposed around cord 50. In this first embodiment this takes the form of a sheath 30 attached to the handle 20 and extending at least partially along the cord 50. This sheath 30 is stiff when compressed in a direction parallel to its longitudinal axis A but can flex in a direction perpendicular to the longitudinal axis A of the sheath 30 when a force F is applied in a direction perpendicular to the longitudinal axis A.

One possible non-limiting example of such a sheath 30 can be seen in Figure 2. This comprises a plurality of interlocked segments in the form of a ball 32 and socket 31 arrangement. Each segment comprises a ball 32 at one end and a socket 31 at the other, the ball of one segment is received in the socket of an adjacent segment and can rotate within that socket 31 thus allowing the sheath 30

to flex at that point. The ball 32 is however received in the socket 31 sufficiently tightly so that friction between the surfaces of each creates a level of stiffness. A cross-section of such an arrangement is illustrated in Figure 3. This is similar to articulated modular hose that is commercially available, for example "Loc-Line®" as discussed previously. With such an arrangement, the stiffness / flexibility is such that a lateral force of 10N applied to an end of the sheath 30 will cause the end of the sheath 30 to displace by a minimum of 0.02m.

When a user activates the retraction mechanism 21, the cord 50, if it is at that time extended, begins to be retracted into the handle. The largest dimension of the cross section of the cord 50 in a plane perpendicular to the longitudinal axis of the cord 50 is smaller than an inner diameter of the sheath 30, thus the cord 50 gets drawn through the sheath 30 into the handle 20 of the animal lead 1.

The largest dimension of the cross section of the clasp 70 in a plane perpendicular to the longitudinal direction of the extended lead 1 is larger than the inner diameter of the sheath 30. Thus, once the retraction progresses so that clasp 70 abuts the sheath 30, no further movement of the clasp can take place, since the clasp 70 is unable to pass through the sheath 30. The tether (i.e. cord 50) is thereby pulled taut.

In the retracted position, the lead 1, as seen in Figure 4, thus essentially resembles a stiff stick (sheath 30) having a handle 20 at one end and a clasp 70 at the other end, with the cord 50 being obscured from view within the sheath 30 and the handle 20. A user can thus hold the handle and direct the clasp 70 towards the animal's collar or harness, e.g. towards an attachment ring on a collar or harness, to which it is to be attached. The attachment ring will be described in further detail below.

The handle 20 further comprises a trigger, lever or similar device 23 for remotely operating the clasp 70. Activation of the trigger 23, in the case of this embodiment, is by sliding it in the direction marked 23A (see Figure 6). This draws the cord 50 further back into the handle 20, thereby opening the clasp 70, which is described in further detail below with reference to Figure 6.

With continued reference to Figure 4, the clasp 70 comprises a pin 71 which is biased by a spring 72 against a fixed portion 73 of the clasp 70. The pin 71 is operatively attached to the cord 50 at one end, such that the cord retraction provided by the trigger activation acts to draw back pin 71 of the clasp towards the handle 20 (since the whole clasp itself cannot be drawn back towards the handle

due to abutment on the sheath), thus causing the pin 71 to compress the spring 72 and move against the biasing direction, thereby opening the clasp 70.

In the open-clasp configuration, the user can attach the clasp 70 to the collar of an animal and then release the trigger 23. Releasing the trigger 23
5 releases the cord that has been drawn back and thereby removes the opening force from acting on the pin 71. Consequently, the spring 72 pushes the pin 71 back towards the fixed portion 73 of the clasp 70, thereby closing the clasp 70.

While the user is attaching the open clasp 70 to an animal collar, the clasp 70 is at a distance from the handle 20 held by the user, thereby allowing an animal
10 to be connected to the animal lead 1 without the user having to bend down to, or reach, the animal directly.

The retractable animal lead 1 can then be used as any conventional lead for walking an animal and subsequently, to release the animal, the lead can be retracted as described above, the locking pin 17 engaged and the trigger 23
15 activated to open the clasp 70 and the animal released.

The clasp 70 may also comprise a manual opening device 74, to allow the animal to be released from the clasp 70 e.g. in the case that the remotely operated mechanism fails. Such a manual device would comprise a lever or similar as is conventionally used to manually operate a clasp 70.

20 An embodiment of the clasp 70 which additionally includes a safety catch 75 is illustrated in Figures 5a and 5b. The safety catch 75 acts to lock the clasp 70 in a closed position unless/until the cord 50 is fully retracted. Figure 5a illustrates a locked configuration and Figure 5b illustrates an unlocked configuration of the clasp 70. This clasp 70 comprises a pin 71, spring 72 and fixed portion 73 just as in the
25 embodiment of Figure 4. However it also comprises a safety catch 75, a locking arm 77 and a sliding surface 78 arranged on pin 71. The safety catch 75 and locking arm 77 are interconnected and pivot about a pivot point 74. They are sprung loaded (spring not shown), i.e. spring biased, in an anti-clockwise direction. Furthermore, the end of the stiffening arrangement (e.g. sheath 30 or segments 40,
30 see below) comprises actuating portion 79 and clasp pin-to-cord connection 76.

As shown in Figure 5a, when the cord 50 is not fully retracted and thus the clasp 70 is not pulled against the end of the stiffening arrangement, the actuating portion 79 does not contact the safety catch 75. Consequently, the safety catch 75 and locking arm 77 arrangement remains sprung biased in an anti-clockwise
35 direction as described above. In this position, the radially outward end of locking

arm 77 abuts against a side edge of sliding surface 78 on pin 71. Since the locking arm is biased in this position, it acts to prevent the pin 71 from being retracted and opening the clasp 70.

As shown in Figure 5b, when the cord 50 is fully retracted, the end of the stiffening arrangement, in particular actuating portion 79, abuts against the end of the clasp 70 and safety catch 75. As a result, actuating portion 79 forces safety catch 75 to rotate in a clockwise direction against the anti-clockwise action of the spring bias, which consequently rotates locking arm 77 attached thereto. The radially outer end of locking arm 77 slides along sliding surface 78 until it disengages from the pin 71, thus allowing the pin 71 to be retracted. Figure 5b illustrates the disengaged locking arm 77 but the pin 71 has not been retracted in this Figure. A manual opening device 74 is not included in the clasp 70 of Figures 5a and 5b, but this could easily be provided by the skilled man if required.

Thus, in this embodiment, the clasp 70 is locked in the closed position by safety catch 75 and cannot be opened unless the cord 50 is fully retracted.

A clasp having an alternative safety catch 115 is illustrated in Figure 5c. This embodiment is similar to that of Figures 5a and 5b, but instead of rotating safety catch 75, there is provided a safety catch 115 in the form of a spring loaded plunger. The locked configuration is shown in the Figure. When the cord 50 is not fully retracted and thus the clasp 70 is not pulled against the end of the stiffening arrangement, the actuating portion 79 does not contact the side portion 115a of the plunger 115. The spring loading of the plunger 115 acts to maintain the plunger 115 in the position shown, with the end of the plunger 115 held in recess 116 of the pin 71. This prevents the pin 71 from being accidentally retracted and opening the clasp 70. Such a mechanism may provide a stronger locking effect, which could be useful in preventing the undesired release of bigger, stronger animals.

When the cord 50 is fully retracted, the actuating portion 79 of the stiffening arrangement applies a force to the side portion 115a of the plunger 115, acting to lift the plunger 115 against its spring bias. The plunger 115 is thus lifted out of engagement with the recess 116 of the pin 71, thereby enabling the pin 71 to be retracted.

Whilst it will be appreciated that in the described embodiments the stiffening arrangement will in any event only be allowed to function and enable the clasp to be opened at the handle if the cord 50 is retracted, the safety catch 75 provides a

useful additional mechanism to prevent an animal from being inadvertently released.

Due to the flexibility offered by the sheath 30 as described above, when an animal is connected to the lead, the sheath 30 is not particularly restrictive on the animal's movements. Furthermore, when the lead 1 is not in use, the user can e.g.
5 coil up the sheath portion 30, with the cord 50 inside, to make it easier to carry / transport.

The trigger activation of the clasp 70 can be understood more clearly by reference to the exemplary non-limiting mechanism shown in Figure 6. In this
10 example, the handle 20 includes two pins 25a, 25b (which may be serrated pins) slidably attached to a base plate 29a so that they may slide towards and away from each other in a plane parallel to the surface of the base plate 29a. The handle 20 also comprises guide grooves 26a, 26b for guiding the movement of the respective pins 25a, 25b, and a spring 29b arranged to bias the position of the base plate 29a
15 and thus the pins 25a, 25b.

Activation of the trigger 23 causes the cord 50 to be drawn back further as follows. When the trigger 23 is activated, which in this exemplary embodiment includes being pulled back by the operator or user, the base plate 29a is caused to move against the bias of the spring 29b so as to operatively push the two pins 25a,
20 25b along respective guide grooves 26a, 26b.

The respective guide grooves 26a, 26b are not parallel, but are at a relative angle to one another, so that when the trigger 23 is activated, the sliding pins 25a, 25b are guided towards one another by the approaching curves (in this case diagonals) of the guide grooves 26a, 26b. When the trigger 23 is released, the bias
25 of spring 29b moves the base plate 29a and thus the pins 25 back to their original position, the pins 25a, 25b being guided away from one another by the grooves 26a, 26b.

The cord 50 passes between the sliding pins 25a, 25b. When the pins 25a, 25b are drawn towards one another, they pinch, or grip the cord 50 in the closing
30 gap between the pins 25a, 25b. Since the grooves 26 are curved, the pins 25a, 25b slide in a direction having two orthogonal directional components, one parallel and one perpendicular to the longitudinal direction of the cord 50. Consequently, as the pins 25a, 25b grip the cord 50, they also move partly in the longitudinal direction of the cord 50 and act to pull the gripped cord 50 and thereby draw the cord further
35 back within the handle 20. This displacement of the cord 50 is transmitted to the

pin 71 in the clasp 70 thereby drawing the pin back and causing the clasp 70 to open as previously described.

An alternative exemplary embodiment of a handle 80 is illustrated in Figure 7. In this embodiment, the handle 80 includes two rotating guide pins 81, 82 which
5 guide the cord 50 inside the handle 80 towards the cable storage drum 16. The handle 80 also comprises a claw 83 at least partially surrounding the cord 50 at a point between the two guide pins 81, 82, and which is attached to the trigger 23 via a rod 84. The claw 83 is arranged so that when the trigger 23 is not activated, claw 83 at least partially surrounds but does not contact the cord 50 within the handle 80.
10 When the trigger 23 is activated, the motion of the trigger 23 translates the rod 84 such that the claw 83 contacts the cord 50 and pulls the cord 50 in a direction perpendicular to the longitudinal direction of the cord 50.

To open the clasp 70 in this embodiment, the cord 50 must first be retracted onto the drum 16 and the cable drum locking pin 17 engaged to prevent further
15 rotation of the cable drum 16. The trigger 23 is then activated, which in turn causes the claw 83 to contact the cord 50 and pull to the cord 50 in a direction perpendicular to the longitudinal direction of the cord 50. Accordingly, as the cord 50 cannot unwind from the locked cable drum 16, a portion of the cord 50 extending from the handle 80 is drawn further back inside the handle. This displacement of
20 the cord 50 causes the clasp 70 to open in the manner described above, by the longitudinal movement of the pin 71 against the biasing spring 72.

As an alternative to a claw 83, a pin could be attached to the end of the rod 84 and positioned on the far side of the cord 50. When the trigger 23 is not
activated, the pin could either act as an additional guide pin or alternatively, not
25 contact the cord 50 at all. When the trigger 23 is activated, the translational motion of the rod 84 and consequently the pin would cause the pin to apply a displacement to the cord 50 perpendicular to the longitudinal direction of the cord 50.

An advantage of this embodiment of the handle 80 (with either the claw 83 or a pin) is that, as can be understood from Figure 7, the distance through which
30 the cord 50 is further retracted by the trigger 23 is greater than the distance moved by the trigger. In other words, this mechanism increases the relative motion of the cord 50 compared to the movement of the trigger 23. This can be an advantage over the other clasp opening mechanism of the handle 20 described with reference to Figure 6, wherein the amount by which the cord 50 is retracted is equal to the
35 distance moved by the trigger 23. It is possible that in some applications, in

particular the embodiment of the stiffening arrangement comprising segments 40 that can be displaced apart from one another as described below, the available motion of the trigger 23 (and thus the maximum amount by which the cord 50 can be further retracted in the Figure 6 embodiment) may not be enough to cause the segments 40 to interlock and open the clasp 70.

The two above mechanisms (of handles 20 and 80) for applying further retraction and force to the cord 50 to open the clasp are intended to be non-limiting examples. Further methods, including for example pulleys which would be apparent to the person skilled in the art, could alternatively be used.

A lead 2 of a second embodiment of the present invention is shown in Figure 8. In this embodiment the stiffening arrangement (sheath 30) of Figure 1 is replaced with a number of segments 40 that surround the tether (in the form of cord 50) and can be displaced apart from one another along the cord 50. These could be considered as "floating" segments that translate along the cord 50. Thus in this configuration, the stiffening arrangement comprising the group of segments is flexible, as is the cord within it. The same handle 20 or 80 (as embodied in the examples of Figure 6 and Figure 7) and the same clasp 70 as utilised in the lead 1 of the first embodiment and as embodied in the examples of either Figure 4 or Figures 5a and 5b can also be used here.

When the cord 50 is retracted, the segments 40 are moved closer to each other and caused to abut one another, thereby forming a stiffening arrangement around the cord 50 with an initial degree of stiffness. With such an arrangement, the stiffness / flexibility is such that a lateral force of 10N applied to an end of the stiffening arrangement will cause the end of the sheath to displace by a minimum of 0.02m. The largest dimension of the cross section of the clasp 70 in a plane perpendicular to the longitudinal direction of the extended lead 2 is larger than the inner diameter of the segments 40. Thus, once the retraction progresses so that clasp 70 abuts the end segment of the stiffening arrangement, no further movement of the clasp can take place, since the clasp 70, unlike the cord 50, is unable to pass through the segments 40. The cord is thereby pulled taut.

Activation of the trigger 23 draws the cord 50 further back into the handle, such that the end of the clasp 70 is pulled harder against the end segment. This applied force causes the segments 40 to be further pressed together, thus increasing the friction between abutting faces of the segments 40, and thereby increasing the stiffness of the stiffening arrangement. Further activation of the

trigger 23 will operate the clasp 70, in the manner described above in relation to the first embodiment.

In one embodiment as shown in the cross-sectional view of Figure 9, each segment 40 comprises a protrusion 41 at one axial end and a recess 42 at the opposite axial end. This is also shown in perspective view in Figure 11. The protrusion 41 of each segment 40 can interlock with the recess 42 of an adjacent segment 40, to create an even stiffer stiffening arrangement than that formed by the segments merely abutting, as shown in the cross-sectional view of Figure 10. In other embodiments, the segments 40 do not interlock with one another but merely abut one another.

In one embodiment as illustrated in Figure 12, the segments 40 comprise a magnetic portion 43a, 43b at either axial end of each segment 40 enabling the segments 40 to lock together by magnetic force. This provides a further degree of stiffness than merely abutting segments 40. In an alternative embodiment as shown in Figure 13, the segments 40 comprise a single magnet 43 disposed in each segment. The segments 40 may additionally interlock, for example, as described in relation to the protrusion 41 and recess 42 structures above, or the segments 40 may just abut one another in the longitudinal direction of the cord 50.

In operation, in the second embodiment of the lead 2 the segments 40 can slide freely along the extent of the cord 50 when the lead 2 is extended. However in an alternative embodiment as illustrated in Figure 14, there is provided an additional loose sleeve 60. The sleeve 60 is attached at one end 61 to the handle 20 (or 80) and extends along the cord 50 away from the handle 20 (or 80) for a distance at least as long as the combined axial length of the segments 40 when the lead 2 is in the retracted position. The far end 62 of the sleeve 60 (i.e the axial end which is distal from the handle 20 or 80) is open to an extent whereby the cord 50 can pass through an opening 63 of the sleeve 60, but the opening 63 is narrow enough such that the segments 40 cannot pass through the opening 63. Consequently, the segments 40 are enclosed within the sleeve 60, such that they are free to move along the cord 50 only to the extent of the sleeve 60 and no further. Among the advantages of the sleeve 60 are that the segments 40 will not slide down to the clasp-end of the lead and impede the movement and/or comfort of the attached animal.

Additionally, the sleeve 60 can be loose enough not to have significant friction with the segments 40, while being flexible enough not to significantly impede the axial compression of the segments 40 when the cord 50 is retracted.

The above sleeve 60 can also be applied to the embodiment of Figure 1 comprising the sheath 30, and can, in both embodiments, have additional purposes and advantages, such as to keep dirt out of the mechanism, protect the mechanism and/or to provide a surface for printed branding or other logos or text.

In some embodiments, the sleeve 60 may further be elasticated, so as to provide an additional stiffening effect to the segments 40. An optimum amount of elasticity would allow relatively flexible movement of the cord 50 when the lead is extended, whilst, when the cord 50 is retracted, keeping the segments close enough together such that the amount by which the segments need to be moved together so as to form the stiffening arrangement is minimized. Accordingly, the amount of travel of the trigger 23 necessary before the clasp 70 is opened is minimised.

In some embodiments, one or more elasticated cords extend through the segments 40 to provide an additional stiffening effect to the stiffening arrangement created by the segments.

A collar or harness to which the clasp 70 can be attached may include at least two attachment rings mounted diametrically opposite one another on the collar, to ensure that the clasp 70 will always be able to attach to a clip from above the animal. The collar may also comprise more than two clips, which may be spread around the circumference of the collar, either equidistantly or otherwise, to ensure that a clip will always be accessible to the clasp 70 from above the collar irrespective of the degree of rotation of the collar about the neck of the animal.

The clips may be attached to the collar or harness by means of rivets, bolts, or any other means known to the skilled person. The collar or harness may be formed of leather, fabric or any other materials known to the skilled person.

Figures 15, 16, 17a and 17b illustrate an embodiment of an attachment ring 90, taking the form of a D-shaped ring 91 (hereinafter "D-ring"). Figure 15 is a side view, Figure 16 is a plan view and Figures 17a and 17b are perspective views of a configuration in which the attachment ring is free to rotate about an axis parallel to the surface of the collar or harness and one in which it is locked in a position perpendicular to the collar or harness to which it is attached, respectively.

The D-ring 91 comprises an arch portion 91a closed at its base by a cross-member 91b joining the arch supports. The cross-member 91b is in this embodiment hinged 93 at each end to a mounting boss 92 on a baseplate 96 that is attached to a collar or harness, allowing the D-ring 91 to either lie flat against the collar or harness or, at the other extreme, to be arched perpendicularly away from the collar.

A sprung arm 95 is pivotally connected by a central pivot pin 94 to the underside of the cross-member 91b. The sprung arm lies closely against the underside of the cross-member 91b, this underside being substantially flat.

When the sprung arm 95 is pivotally rotated to a position where the sprung arm 95 lies longitudinally parallel to the cross-member 91b as is illustrated in Figure 17a, then the presence of the sprung arm 95 does not affect the motion of the D-ring and thus the D-ring 91 is free to rotate about the hinges 93 so that it can lie flat against the collar or harness or otherwise have an orientation at any possible degree of rotation about the hinges 93 between being flat against the collar or harness, or arched orthogonal to the collar or harness.

Conversely, as can be seen in Figure 17b and illustrated in plan view in Figure 16, when the sprung arm 95 is rotated to an open "deployed" position where the sprung arm 95 lies longitudinally orthogonal to the cross-member 91b, then the D-ring 91 is pushed to and held in a position in which the arch 91a extends substantially perpendicularly away from the baseplate 96, the D-ring 91 being at least substantially prevented from rotating about its hinges 93. This is because in this position of the sprung arm 95, if the D-ring 91 acts to rotate about its hinges 93, an edge of the sprung arm 95, which is connected to an underside of the cross-member 91b, abuts against the baseplate 96, which thereby acts to prevent the rotation about the hinges 93, and thus prevent the D-ring 91 rotating to a position flat against the collar. Consequently, the D-ring 91 is held where the arch 91a extends perpendicularly away from the baseplate 96 of the collar or harness. This latter position in which the arch 91a of the D-ring 91 extends substantially perpendicularly away from the baseplate 96 enables easy connection of the clasp 70 to the attachment ring 90.

Figure 18 illustrates a kit of parts according to an embodiment of the invention, retrofitted to an existing retractable lead having a handle 105 and a tether 106. The kit of parts comprises a stiffening arrangement which may be the sheath 30 of the first embodiment of the lead 1, or the segments 40 of the second

embodiment of the lead 2. This stiffening arrangement is for disposal around the tether and is shown disposed around the tether 106. In the case of a sheath 30, the tether may be threaded through the sheath 30. In the case of segments 40, equally the tether may be threaded through the segments or it can be envisaged that the segments 40 are hinged so as to have open and closed positions, wherein in the open position the segments can be placed adjacent the tether and can then be closed around the tether.

The kit also includes a clasp 70 such as that described in relation to previous embodiments, which is openable by applying drawing back the tether. The existing clasp of the lead is removed e.g. by cutting it off, and the clasp 70 is attached to the end of the tether 106 e.g. by knotting.

The kit furthermore includes a displacement mechanism 100 for attachment to the handle 105 and for displacing the tether 106 to thereby open the clasp 70. This displacement mechanism 100 includes a mounting boss 101 which is shown attached to the existing handle 105. The mounting boss 101 can be affixed by glue or screws. It is placed around the exit of the tether 106 from the handle 105 so that the tether 106 extends therethrough. As shown in more detail in the close-up view of Figure 18b, the displacement mechanism 100 includes a ring 102 which is attached round the tether 106, and which is attached via activation cord 103 to activation toggle 104.

When such a kit has been retrofitted, in use, the tether 106 is retracted in the normal way in accordance with the existing handle 105. Then, additional displacement can be applied to the tether 106 by pulling on activation cord 103 which in turn causes the ring 102 to pull on and displace the tether 106. In this way, the tether is additionally displaced so as to open the clasp 70 in the way described in relation to previous embodiments.

The retrofit kit is typically brand and/or model specific.

The following clauses set out features of the present disclosure which may or may not presently be claimed in this application but which may form basis for future amendments or a divisional application.

1. A lead comprising:
 - a tether
 - a stiffening arrangement disposed around the tether, the stiffening arrangement being configured to support at least a portion of the tether to allow a

user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal, while having sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.

2. A lead as in clause 1, further comprising a handle attached to the tether at an opposite end to the clasp, the handle including a remote clasp operation mechanism arranged to remotely actuate the clasp.

3. A lead as in clause 1 or 2, wherein the stiffening arrangement comprises a plurality of segments each disposed at least partially around the tether and arranged one after another along the tether.

4. A lead as in clause 2 or 3, wherein the tether is retractable into the handle.

5. A lead as in any preceding clause, wherein the stiffening arrangement comprises a sheath of interlocked segments that are interlocked in a sufficiently stiff manner so that the sheath of interlocked segments supports its own weight and that of the portion of tether extending therethrough, but is arranged to flex under an applied load.

6. A lead as in clause 5, wherein joints between the interlocked segments are articulated such that the sheath can flex at the joints under an applied load.

7. A lead as in any preceding clause, wherein each segment comprises a male portion at one end and a female portion at the other end, wherein the male portion of one segment is received in a female portion of an adjacent segment such as in a ball-and-socket arrangement.

8. A lead as in any of clauses 5 to 7, wherein the sheath of interlocked segments is rigid in the axial direction such that it cannot be axially compressed.

9. A lead as in any of clauses 1 to 4, wherein the stiffening arrangement has a first configuration in which it is flexible thereby allowing the user to coil up the stiffening arrangement when the lead is not in use and a second configuration in which the stiffening arrangement is stiff enough to support its own weight and that of the portion of tether extending therethrough, thereby supporting at least a portion of the tether to allow the user to direct the clasp located at one end of the tether for attachment to a collar or harness.

10. A lead as in clause 9, wherein the stiffening arrangement comprises a plurality of segments each disposed at least partially around the tether, wherein in the second configuration the segments abut against each other to support the portion of the tether extending therethrough.

11. A lead as in clause 10, wherein in the first configuration the segments can displace apart from one another along the tether such that the tether is flexible.
12. A lead as in any of clauses 9 to 11, wherein the tether is retractable into the handle, wherein in the first configuration the tether is at least partially extended, and
5 wherein in the second configuration the tether is retracted such that the segments are compressed together between the clasp and the handle in order to form a sheath of abutting segments that supports the portion of the tether extending therethrough.
13. A lead as in any of clauses 3 to 12, wherein the segments are all the same
10 shape, which is preferably cylindrical, ovoid or spherical.
14. A lead as in any of clauses 3 to 13, wherein adjacent segments are profiled to fit together, e.g. interlock, at the abutting surfaces.
15. A lead as in any of clauses 3 to 14, wherein each segment comprises:
a protrusion at one axial end of the segment; and
15 a recess at the opposite axial end of the segment;
such that adjacent segments can interlock with one another.
16. A lead as in any of clauses 3 to 15, wherein each segment further comprises at least one magnetic portion, such that adjacent segments can attract one another and be held together by magnetic force.
- 20 17. A lead as in any preceding clause, further comprising a handle attached to the tether at an opposite end of the clasp, the handle including a remote clasp operation mechanism arranged to remotely operate the clasp; wherein the clasp is openable by drawing part of the tether into the handle, and wherein the remote clasp operation mechanism comprises a displacement mechanism located in the
25 handle for drawing part of the tether into the handle to thereby open the clasp.
18. A lead as in clause 17, wherein the clasp comprises a pin moveable to open and close the clasp, and further comprising a spring biasing the pin in a closed position.
19. A lead as in clause 18, wherein the remote clasp operation mechanism
30 comprises a trigger disposed at the handle for operating the displacement mechanism; wherein
an axial end of the clasp that is attached to the end of the tether has a cross section such that the clasp cannot pass through the stiffening arrangement whereas the tether to which it is attached can pass through the stiffening arrangement;

when the trigger is activated, the displacement mechanism draws part of the tether into the handle, thereby applying a force to the pin to which the tether is attached against the bias of the spring and thereby opening the clasp; and

when the trigger is subsequently released, the portion of the tether that was
5 drawn into the handle by the displacement mechanism is released such that the force applied to the pin against the bias of the spring is removed, whereby the pin is biased back into a closed position by the spring, thereby closing the clasp.

20. A lead as in any of clauses 4 to 19, wherein the clasp further comprises a safety catch arranged to lock the clasp in a closed position, the safety catch being
10 further arranged to unlock the clasp when the tether is fully retracted.

21. A lead as in any preceding clause, further comprising a sleeve surrounding the stiffening arrangement, the sleeve preferably being elastically.

22. A lead comprising:
a tether, the tether having a clasp at one end thereof and a handle at the
15 other end thereof;
a stiffening arrangement disposed around the tether;
the stiffening arrangement comprising a sheath of interlocked segments connected together in a sufficiently stiff manner so that it supports its own weight and the weight of the portion of tether disposed therethrough, so as to allow a user
20 to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal;

and wherein the stiffening arrangement is arranged to flex under an applied load such that the user can coil up the stiffening arrangement when the lead is not in use.

25 23. A lead comprising:
a tether, the tether having a clasp at one end thereof and a handle at the other end thereof;
a stiffening arrangement disposed around the tether, wherein the stiffening arrangement comprises a plurality of segments;
30 wherein the stiffening arrangement has a first configuration in which the segments can displace apart from one another along the tether such that the tether is flexible; and

wherein the stiffening arrangement has a second configuration in which the segments abut against each other to support the portion of the tether extending

therethrough, so as to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal.

24. A lead comprising:

a handle having an actuator;

5 a clasp;

a tether extending between the handle and clasp;

wherein the tether has a first configuration in which it is flexible and a second configuration in which at least a portion is stiffened;

10 and wherein the actuator, upon actuation, is arranged to apply force to the tether so as to effect a transition between the first configuration and the second configuration.

25. A kit comprising a lead as in any preceding clause and a collar or harness for attachment thereto, the collar or harness comprising at least one attachment ring, preferably two or more attachment rings.

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26. A kit as in clause 25, wherein the attachment ring projects outwardly at an angle in the region of 45° to 90°, preferably 60° to 90°, more preferably 75° to 90°, most preferably at an angle of substantially 90° to the collar or harness; wherein preferably the attachment ring is lockable in this outwardly projecting position.

20 27. A kit of parts for retrofitting to an animal lead having a tether and a handle; the kit of parts comprising:

a stiffening arrangement for disposal around the tether,

a clasp for attachment to an end of the tether and openable by drawing back part of the tether thereby; and

25 a displacement mechanism for attachment to the handle and for drawing back part of the tether to thereby open the clasp;

wherein the stiffening arrangement is configured to support at least a portion of the tether to allow a user to direct the clasp for attachment to a collar or harness worn by an animal, while having sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.

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28. A lead or kit as in any preceding clause, wherein the clasp is operable by an electro-mechanical device.

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Claims

1. A lead comprising:
a tether; and
5 a stiffening arrangement; wherein the stiffening arrangement is configured to support at least a portion of the tether to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal; and wherein in at least one configuration the stiffening arrangement is configured to flex under an applied force.
10
2. A lead as claimed in claim 1, wherein in the at least one configuration the stiffening arrangement has sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.
- 15 3. A lead as claimed in claim 1 or 2, wherein in the at least one configuration the stiffening arrangement has sufficient flexibility to allow the animal freedom of movement when attached to the tether.
4. A lead as claimed in any preceding claim, wherein in the at least one
20 configuration the stiffening arrangement is configured such a lateral force of 10N applied to an end of the stiffening arrangement will cause the end of the stiffening arrangement to displace by a minimum of 0.02m.
5. A lead as claimed in any preceding claim, wherein in the at least one
25 configuration the stiffening arrangement is configured to allow a lateral force of 10N applied to an end of the tether to cause the end of the tether to displace by a minimum of 0.02m.
6. A lead as claimed in any preceding claim, wherein the stiffening
30 arrangement is disposed at least partially around the tether and/or is joined to the tether and/or is adjacent to the tether.
7. A lead as claimed in any preceding claim, further comprising a handle
attached to the tether at an opposite end to the clasp.

8. A lead as claimed in claim 7, wherein the tether is retractable into the handle.
9. A lead as claimed in any preceding claim, wherein the stiffening
5 arrangement comprises a plurality of segments each disposed at least partially around the tether and arranged one after another along the tether.
10. A lead as claimed in any preceding claim, wherein the stiffening
10 arrangement comprises a sheath of interlocked segments that are interlocked in a sufficiently stiff manner so that the sheath of interlocked segments supports its own weight and that of the portion of tether extending therethrough, but is arranged to flex under an applied load.
11. A lead as claimed in claim 10, wherein joints between the interlocked
15 segments are articulated such that the sheath can flex at the joints under an applied load.
12. A lead as claimed in any of claims 9 to 11, wherein each segment
20 comprises a male portion at one end and a female portion at the other end, wherein the male portion of one segment is received in a female portion of an adjacent segment such as in a ball-and-socket arrangement.
13. A lead as claimed in any of claims 10 to 12, wherein the sheath of
25 interlocked segments is rigid in the axial direction such that it cannot be axially compressed.
14. A lead as claimed in any of claims 1 to 9, wherein the stiffening arrangement
30 has a first configuration in which it is flexible and a second configuration in which the stiffening arrangement is stiff enough to support its own weight and that of the portion of tether extending therethrough, thereby supporting at least a portion of the tether to allow the user to direct the clasp located at one end of the tether for attachment to a collar or harness.
15. A lead as claimed in claim 14, wherein the stiffening arrangement comprises
35 a plurality of segments each disposed at least partially around the tether, wherein in

the second configuration the segments abut against each other to support the portion of the tether extending therethrough.

16. A lead as claimed in claim 15, wherein in the first configuration the segments can displace apart from one another along the tether such that the tether is flexible.

17. A lead as claimed in any of claims 14 to 16, wherein the tether is retractable into a handle attached to the tether at an opposite end to the clasp, wherein in the first configuration the tether is at least partially extended, and wherein in the second configuration the tether is retracted such that the segments are compressed together between the clasp and the handle in order to form a sheath of abutting segments that supports the portion of the tether extending therethrough.

18. A lead as claimed in any of claims 8 to 17, wherein the segments are different shapes; or wherein the segments are all the same shape, which is preferably cylindrical, ovoid or spherical.

19. A lead as claimed in any of claims 8 to 18, wherein adjacent segments are profiled to fit together, e.g. interlock, at the abutting surfaces.

20. A lead as claimed in any of claims 8 to 19, wherein each segment comprises:

a protrusion at one axial end of the segment; and
a recess at the opposite axial end of the segment;
such that adjacent segments can interlock with one another.

21. A lead as claimed in any of claims 8 to 20, wherein each segment further comprises at least one magnetic portion, such that adjacent segments can attract one another and be held together by magnetic force.

22. A lead as claimed in any preceding claim, further comprising a handle attached to the tether at an opposite end to the clasp, the handle including a remote clasp operation mechanism arranged to remotely operate the clasp.

23. A lead as claimed in claim 22, wherein the tether and clasp are operatively connected such that displacement of the tether away from the clasp can apply a force to the clasp acting to open the clasp.
- 5 24. A lead as claimed in claim 23, wherein the clasp is openable by drawing part of the tether into the handle, and wherein the remote clasp operation mechanism comprises a displacement mechanism located in the handle for drawing part of the tether into the handle to thereby open the clasp.
- 10 25. A lead as claimed in claim 12, wherein the clasp comprises a pin moveable to open and close the clasp; preferably further comprising a spring biasing the pin in a closed position.
26. A lead as claimed in claim 25, wherein the remote clasp operation
15 mechanism comprises a trigger disposed at the handle for operating the displacement mechanism; wherein
an axial end of the clasp that is attached to the end of the tether has a cross section such that the clasp cannot pass through the stiffening arrangement whereas the tether to which it is attached can pass through the stiffening arrangement;
20 when the trigger is activated, the displacement mechanism draws part of the tether into the handle, thereby applying a force to the pin to which the tether is attached against the bias of the spring and thereby opening the clasp; and
when the trigger is subsequently released, the portion of the tether that was drawn into the handle by the displacement mechanism is released such that the
25 force applied to the pin against the bias of the spring is removed, whereby the pin is biased back into a closed position by the spring, thereby closing the clasp.
27. A lead as claimed in any of claims 8 to 26, wherein the clasp further comprises a safety catch arranged to lock the clasp in a closed position, the safety
30 catch being further arranged to unlock the clasp when the tether is fully retracted.
28. A lead as claimed in any preceding claim, further comprising a sleeve surrounding the stiffening arrangement, the sleeve preferably being elastically.

29. A lead as claimed in any of claims 1 to 8 or 22 to 27, wherein the stiffening arrangement comprises an elasticated sleeve arranged over the tether and/or an elasticated cord arranged adjacent the tether.

5 30. A lead comprising:

a tether, the tether having a clasp at one end thereof and a handle at the other end thereof;

a stiffening arrangement disposed at least partially around at least a portion of the tether;

10 the stiffening arrangement comprising a sheath of interlocked segments connected together in a sufficiently stiff manner so that it supports its own weight and the weight of the at least a portion of the tether disposed therethrough, so as to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal;

15 and wherein the stiffening arrangement is arranged to flex under an applied load.

31. A lead as claimed in claim 30, wherein the stiffening arrangement is arranged to flex under an applied load such that the user can coil up the stiffening arrangement when the lead is not in use.

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32. A lead comprising:

a tether, the tether having a clasp at one end thereof and a handle at the other end thereof;

25 a stiffening arrangement disposed at least partially around at least a portion of the tether, wherein the stiffening arrangement comprises a plurality of segments; wherein the stiffening arrangement has a first configuration in which the segments can displace apart from one another along the tether such that the tether is flexible; and

30 wherein the stiffening arrangement has a second configuration in which the segments abut against each other to support the at least a portion of the tether extending therethrough, so as to allow a user to direct a clasp located at one end of the tether for attachment to a collar or harness worn by an animal.

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33. A lead comprising:
a handle having an actuator;
a clasp;
a tether extending between the handle and clasp;
5 wherein the tether has a first configuration in which it is flexible and a second configuration in which at least a portion is stiffened;
and wherein the actuator, upon actuation, is arranged to apply force to the tether so as to effect a transition between the first configuration and the second configuration.
- 10 34. A kit comprising a lead as claimed in any preceding claim and a collar or harness for attachment thereto, the collar or harness comprising at least one attachment ring, preferably two or more attachment rings.
- 15 35. A kit as claimed in claim 34, wherein the attachment ring projects outwardly at an angle in the region of 45° to 90°, preferably 60° to 90°, more preferably 75° to 90°, most preferably at an angle of substantially 90° to the collar or harness; wherein preferably the attachment ring is lockable in this outwardly projecting position.
- 20 36. A kit of parts for retrofitting to an animal lead having a tether and a handle; the kit of parts comprising:
a stiffening arrangement for disposal around the tether,
a clasp for attachment to an end of the tether and openable by drawing back
25 part of the tether thereby; and
a displacement mechanism for attachment to the handle and for drawing back part of the tether to thereby open the clasp;
wherein the stiffening arrangement is configured to support at least a portion of the tether to allow a user to direct the clasp for attachment to a collar or harness
30 worn by an animal, while having sufficient flexibility to allow the user to coil up the stiffening arrangement when the lead is not in use.
37. A lead or kit as claimed in any preceding claim, wherein the clasp is operable by an electro-mechanical device.

38. A lead or kit as substantially hereinbefore described with reference to the accompanying drawings.

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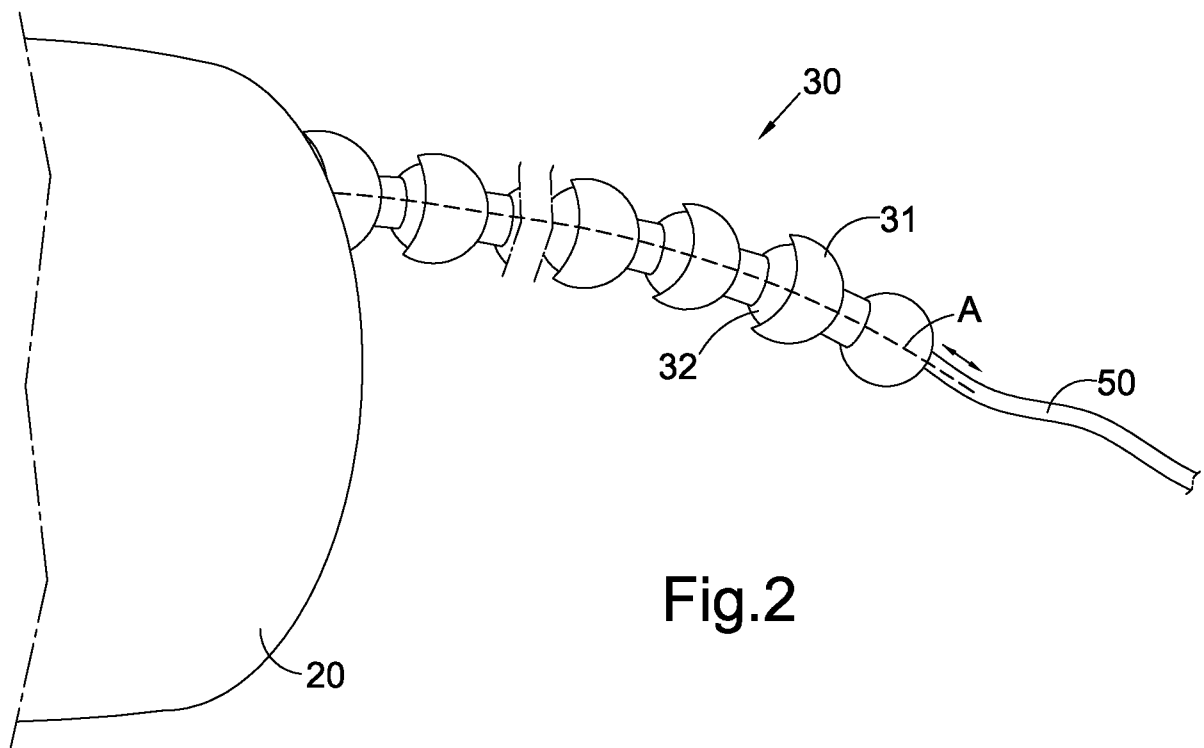
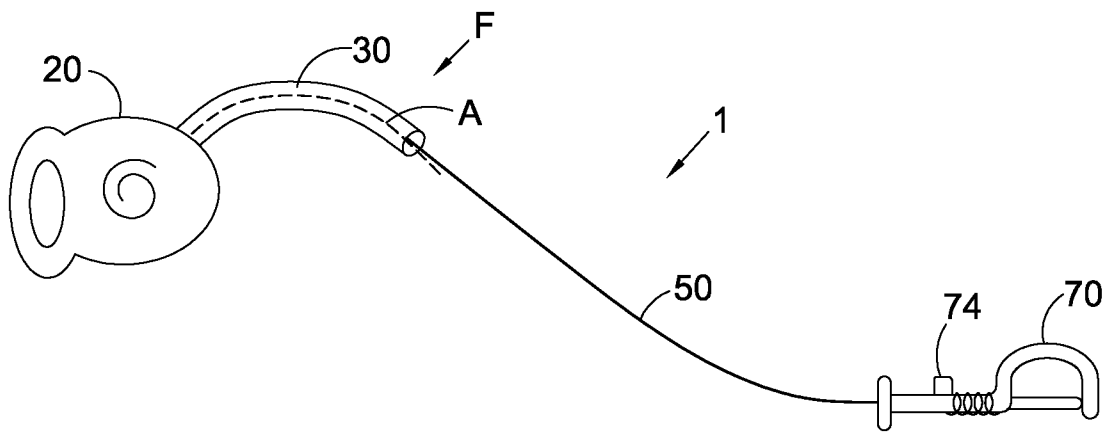
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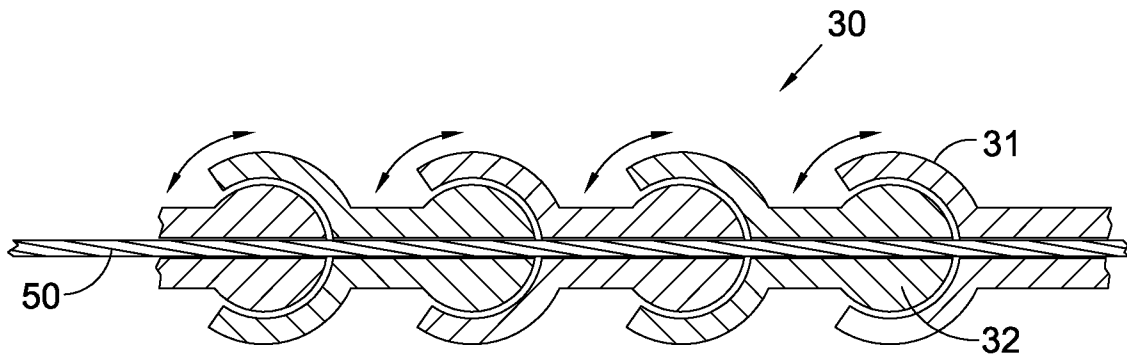


Fig.3

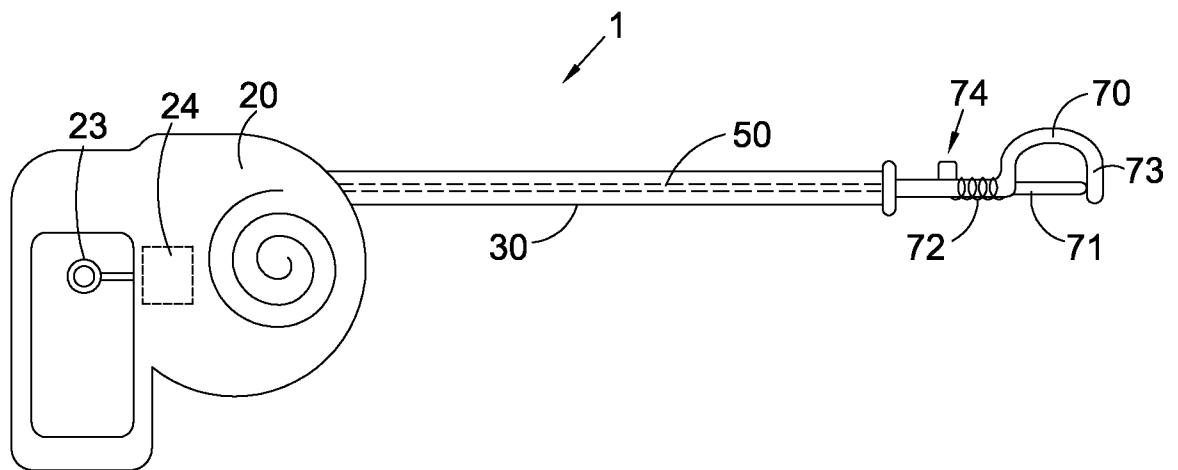


Fig.4

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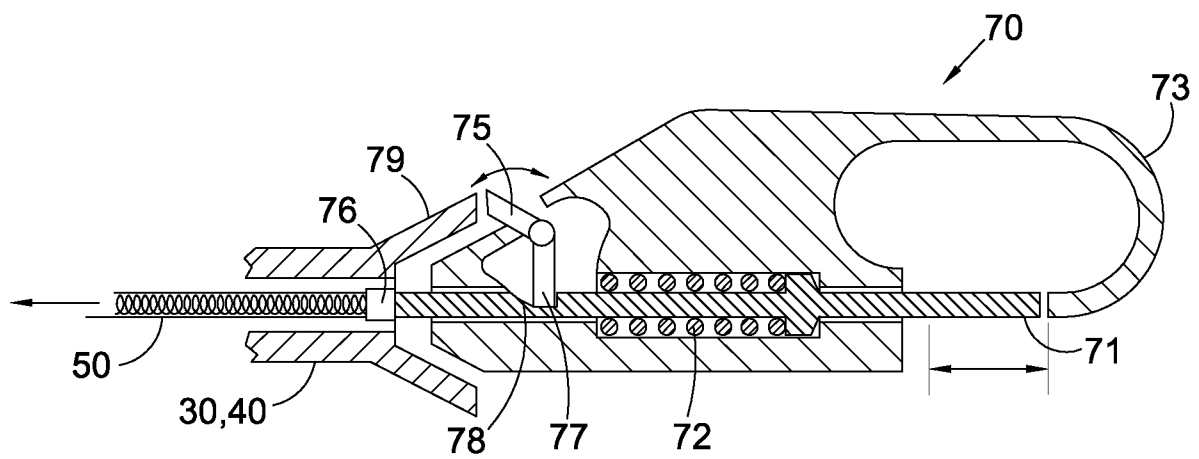


Fig.5a

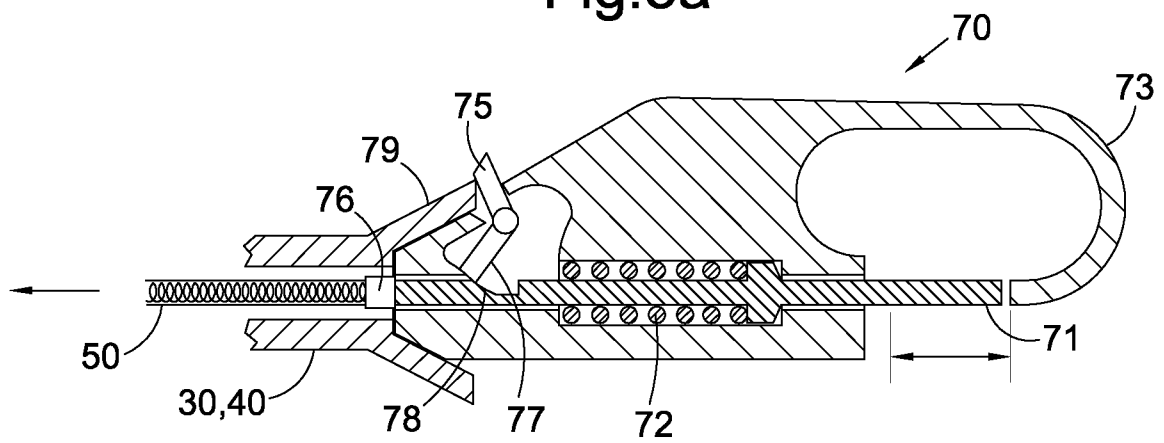


Fig.5b

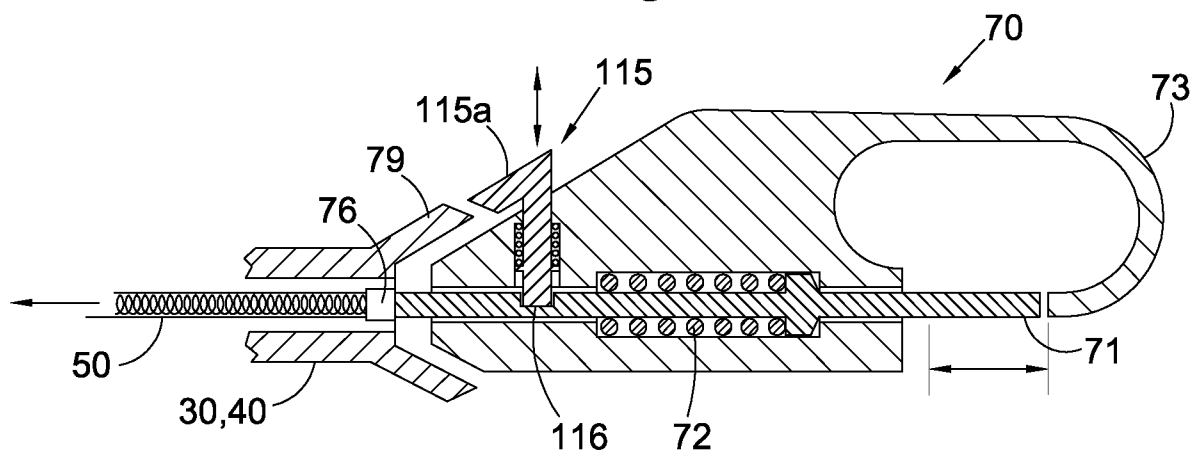


Fig.5c

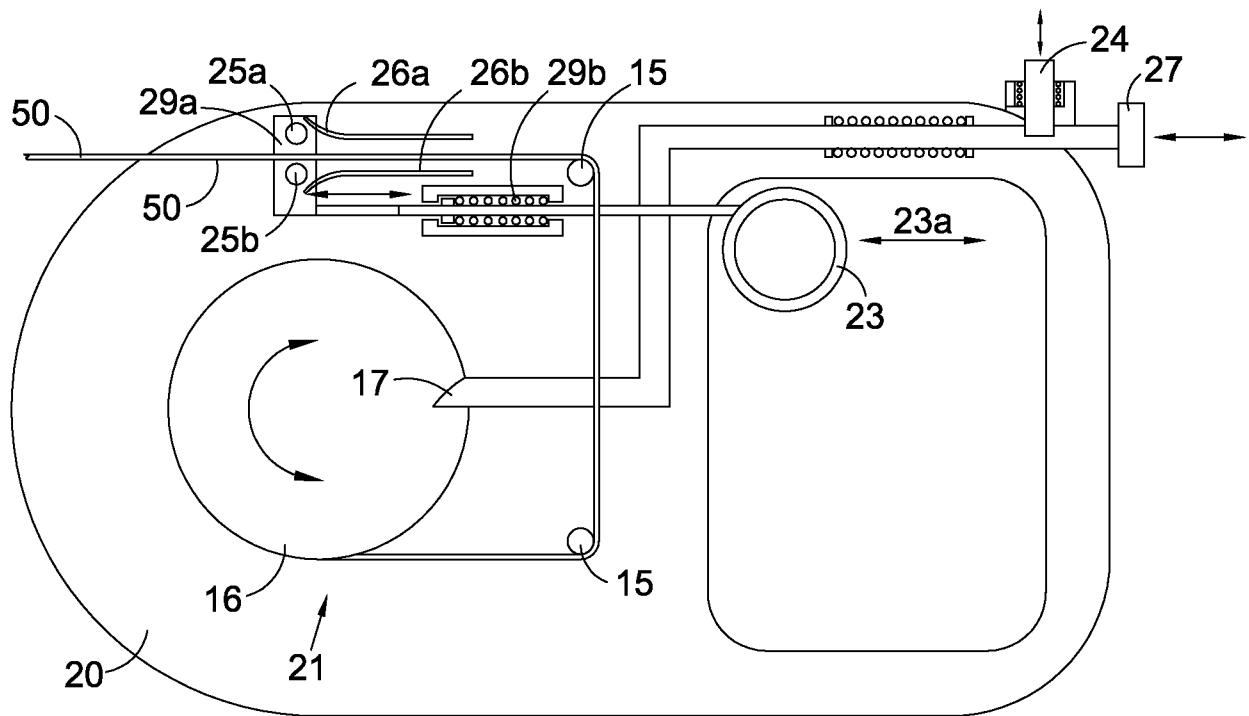


Fig.6

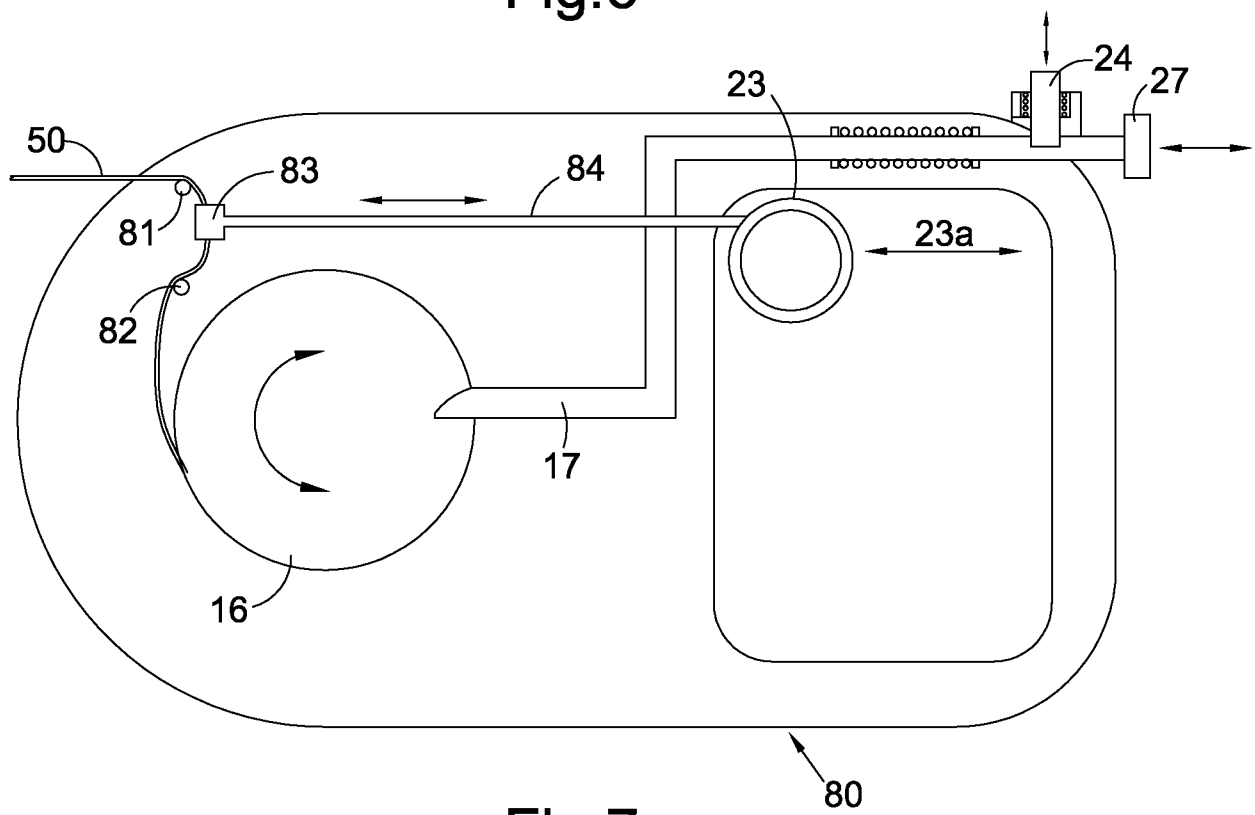


Fig.7

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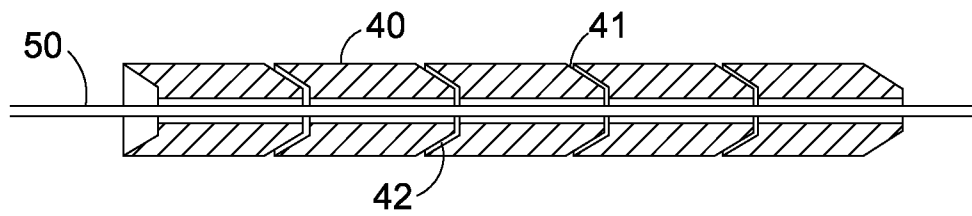
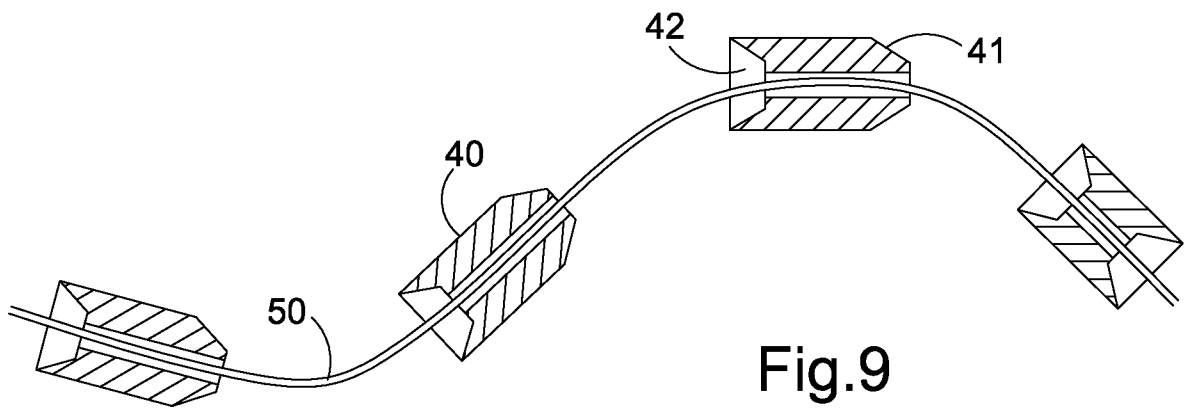
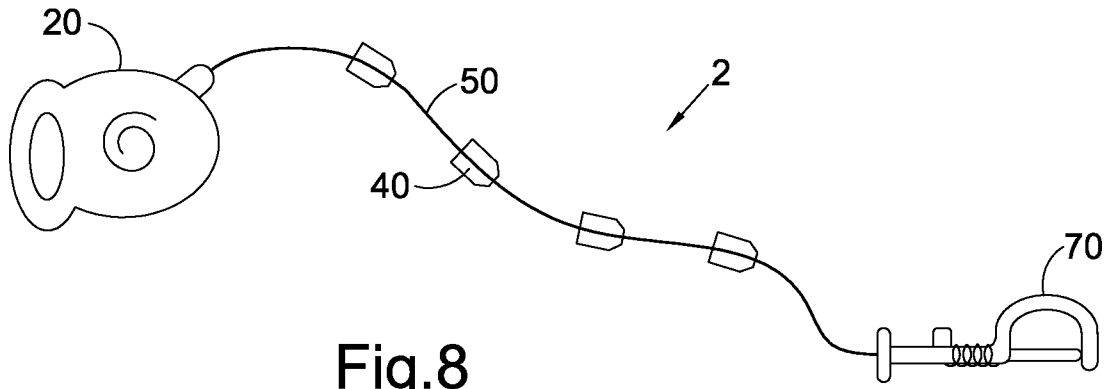


Fig.10

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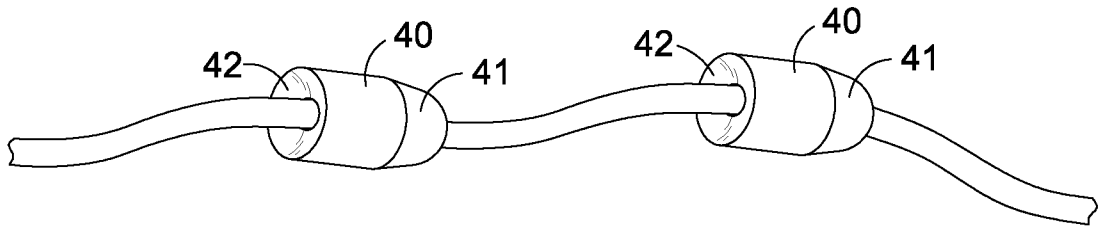


Fig.11

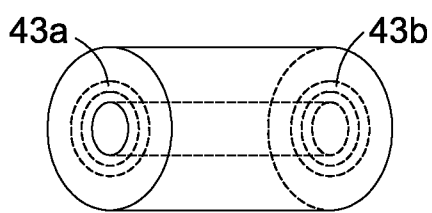


Fig.12

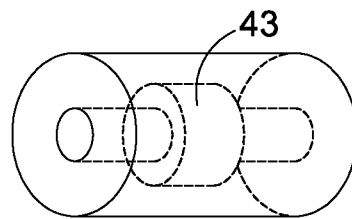


Fig.13

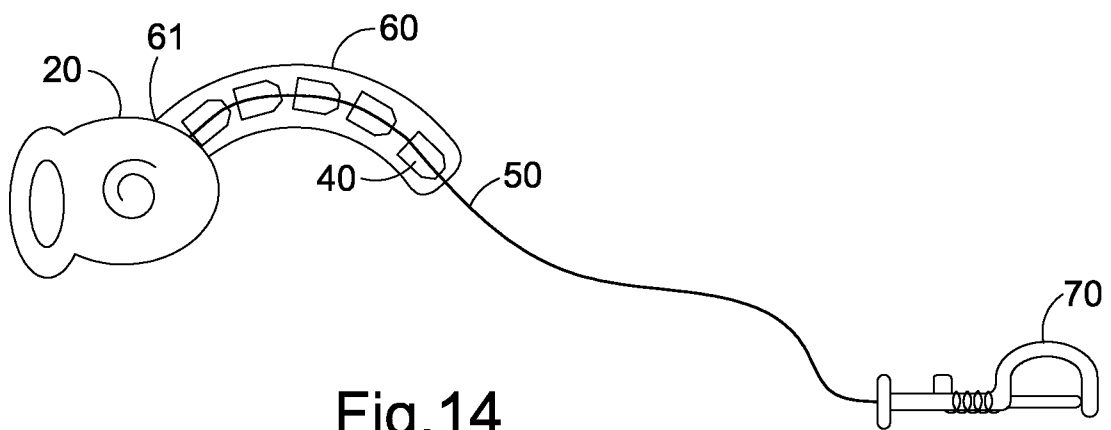


Fig.14

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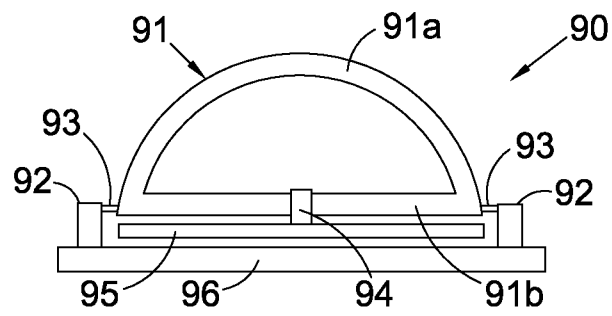


Fig.15

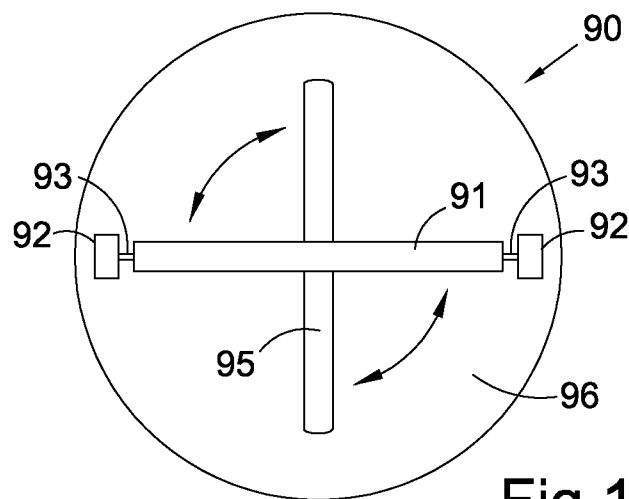


Fig.16

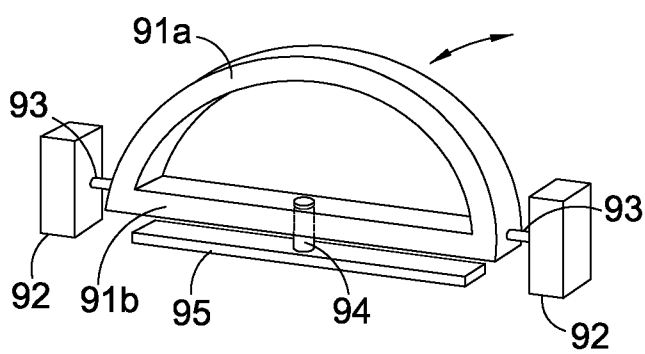


Fig.17a

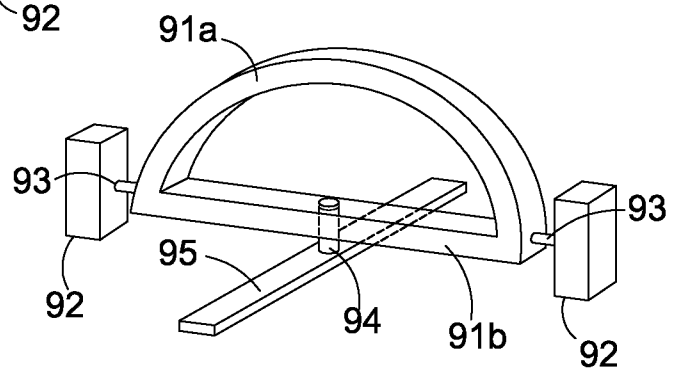
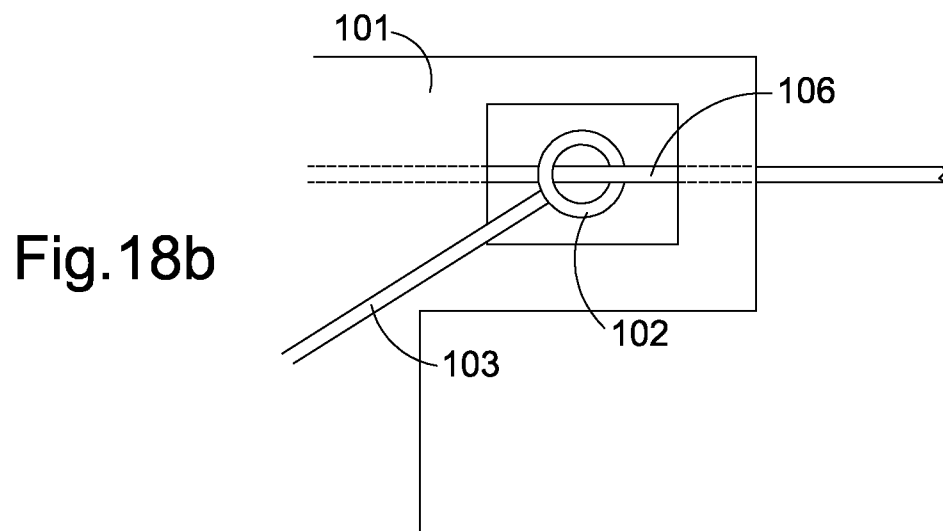
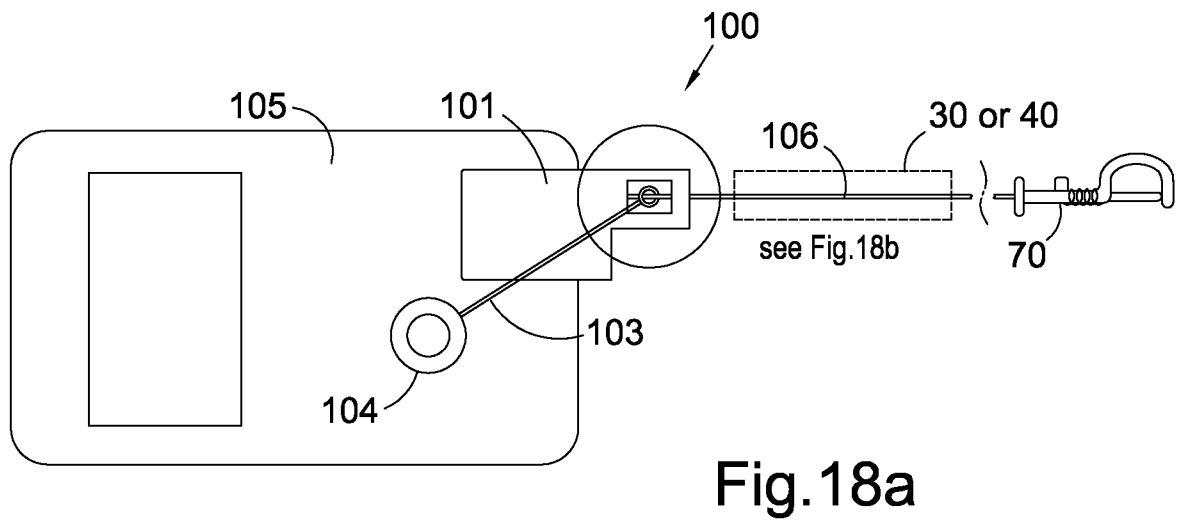


Fig.17b



INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2017/050224

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01K27/00

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 833 249 A (IVOR CORNMAN) 6 May 1958 (1958-05-06)	1-7, 9-16, 18-21, 28-35,38
A	the whole document	17
X	US 3 910 234 A (HENSON EDWARD V) 7 October 1975 (1975-10-07) cited in the application	1-7, 9-13,18, 19, 22-26, 28-31, 34-37
	the whole document	
X	FR 399 057 A (ARTHUR CONTZEN [BE]) 21 June 1909 (1909-06-21)	1-7,22, 23,28, 29,34-37
	the whole document	
	-/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

28 March 2017

Date of mailing of the international search report

07/04/2017

Name and mailing address of the ISA/

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Authorized officer

Batres Arnal, Lucía

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2017/050224

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/312252 A1 (LIPKE STEPHEN A [US]) 13 December 2012 (2012-12-13) the whole document	1,3, 6-10,18, 19,27, 30,34
A	----- EP 0 167 063 A1 (LOCKWOOD PRODUCTS [US]) 8 January 1986 (1986-01-08) cited in the application figures	11-13
A	----- US 548 062 A (JOYNER, I. [US]) 15 October 1895 (1895-10-15) the whole document -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2017/050224

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2833249	A	06-05-1958	NONE
US 3910234	A	07-10-1975	NONE
FR 399057	A	21-06-1909	NONE
US 2012312252	A1	13-12-2012	NONE
EP 0167063	A1	08-01-1986	DE 8418855 U1 06-12-1984 EP 0167063 A1 08-01-1986
US 548062	A	15-10-1895	NONE