DEPARTMENT OF THE NAVY
OFFICE OF COUNSEL
NAVAL UNDERSEA WARFARE CENTER DIVISION
1176 HOWELL STREET
NEWPORT RI 02841-1708

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PATENT COUNSEL
NAVAL UNDERSEA WARFARE CENTER
1176 HOWELL ST.
CODE 00OC, BLDG. 112T
NEWPORT, RI 02841

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Inventor Thomas J. Gieseke

If you have any questions please contact James M. Kasischke, Acting Deputy Counsel, at 401-832-4736.

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Attorney Docket Number 82855

ELASTOMERIC LAUNCH ASSEMBLY AND METHOD OF LAUNCH

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT THOMAS J. GIESEKE, employee of the United States Government, citizen of the United States of America and resident of Newport, County of Newport, State of Rhode Island has invented a certain new and useful improvements entitled as set forth above of which the following is a specification:

JAMES M. KASISCHKE, ESQ.
Reg. No. 36562
Naval Undersea Warfare Center
Division, Newport
Newport, Rhode Island 02841-1708
TEL: (401) 832-4736
FAX: (401) 832-1231

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ELASTOMERIC LAUNCH ASSEMBLY AND METHOD OF LAUNCH

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for Governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

(1) Field of Invention

The present invention relates to an elastomeric launch assembly for expelling a device from a vehicle, and more particularly to an elastomeric launch assembly which is operationally insensitive to ambient pressure and which can launch the device, such as a counter measure, defensive weapon, or an offensive weapon with variable energy.

(2) Description of the Prior Art

It is well known that submarines must be capable of delivering countermeasures, defensive weapons, offensive weapons, and other devices from externally stowed modules or tubes, in order to defend themselves against attacking torpedoes and other threats. Conventional launch assemblies utilize

chemical gas generators in order to force the devices from their launch tubes. Because conventional launch assemblies rely upon pressure developed at the base of the devices inside of the launch tubes, they are sensitive to ambient pressure. At depths of greater than about several hundred feet the ambient pressure can often prevent the launched devices from achieving acceptable launch velocities.

In addition to being sensitive to ambient pressures, current gas generator based systems are not operated over a range of energy levels. Instead, these generators are ignited and burn at a predetermined rate, thus forcing the device from its launch tube at a fixed velocity. When stealth operation is a priority, conventional launch assemblies cannot be adjusted to provide a low impulse, or "quiet" launch.

Another issue associated with conventional launch assemblies is that the handling of their combustible or explosive gas generators represents a significant cost. To safely handle the combustible or explosive gas generators requires an investment in time, money and training.

Accordingly, there is needed in the art a launch assembly which is capable of performing at various ambient pressures, which preferably can be operated in a range of launch energy modes, and which is safe and reliable during operation.

SUMMARY OF THE INVENTION

The present invention is directed to a launch assembly having an elastomeric tube designed to at least partially receive the body of the device to be launched. Before launch, the tube is secured to a support housing having an inboard end and an outboard end. To launch the device, an outboard end of the elastomeric tube is movable outwardly along the length of the housing by an extending device. In one embodiment, the extending device includes a ring attached to both the outboard end of the tube and to at least a pair of rails which run along the length of the housing, from the inboard end to the outboard end. The rails may preferably be threaded, and the ring may be attached thereto by nuts and linear bearings, which are preferably disposed around the periphery of the ring and matingly engage the threaded rails in one embodiment. A motor may be provided to turn the screws which, when turned, operate to force the nuts attached to the outboard end of the ring to move the ring toward the outboard end of the support housing.

As the attached ring and outboard end of the elastomeric tube moves, the inboard end of the tube is restrained by a release mechanism and remains stationary. Thus, as the outboard end moves outwardly and the inboard end remains stationary, the elastomeric tube becomes elongated. The tube may be elongated a predetermined amount, at which time the inboard end of the

elastomeric tube is released from the base assembly by the release mechanism. In one embodiment, the release mechanism includes a hook releasably engaged with a plate supported on the inboard end of the tube. To release the inboard end of the tube, the hook is rotated from engagement with the plate. Releasing the inboard end allows it to travel toward the now stationary outboard end with a sufficient velocity to launch the device housed within the tube. As will be appreciated, the amount of elongation of the tube is related to the amount of possible launch energy. Thus, greater elongation of the tube provides a greater launch velocity, while shorter elongation provides a reduced launch velocity, as desired.

BRIEF DESCRIPTION OF THE DRAWINGS

It should be understood that the drawings are provided for the purpose of illustration only and are not intended to define the limits of the invention. The foregoing and other objects and advantages of the embodiments described herein will become apparent with reference to the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of the elastomeric launch assembly according to the present invention;

FIG. 2 is an enlarged perspective view of the inboard end of the elastomeric launch assembly of FIG. 1;

FIG. 3 is a top, schematic view of the elastomeric launch assembly of FIG. 1 in an initial, or non-engaged position;

FIG. 4 is a top, schematic view of the elastomeric launch assembly of FIG. 1 during engagement;

FIG. 5 is a top, schematic view of the elastomeric launch assembly of FIG. 1 during release of the elastomeric tube; and

FIG. 6 is a top, schematic view of the elastomeric launch assembly of FIG. 1 launching a countermeasure or other device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the FIGS., launch assembly **10** includes an elastomeric tube **12** which is movable along a length of a launch housing **14** in order to launch a device **16** underwater. Launch housing **14** is fixed to the hull of the launching vehicle. The launch housing preferably includes at least a pair of rails **26** supported at either end by an outboard ring **17** and an inboard ring **38**. The elastomeric tube **12** is positioned around at least one end of the device **16** to be launched, is stretchable in at least a longitudinal direction along a length, "l", of the housing, and acts as an energy storage device. The tube **12** is preferably of a size and shape sufficient to receive at least a portion of the one end of the device **16** to be launched, which

may have any of a variety of sizes in terms of both length and diameter, as desired. The tube may be made of any suitable elastomeric material, for example natural or artificial rubber, and preferably includes an open, outboard end **18**, a closed, inboard end **20**, and is supported by the launch housing **14**. In the present embodiment, the outboard end **18** of the elastomeric tube **12** is movable along the length of the launch housing **14** by an extending device **22**. The extending device **22** may include a movable ring **24** operatively connected to both the outboard end **18** of the tube **12** and to at least the pair of rails **26**. Preferably, the rails **26** are threaded, with the ring **24** being operatively engaged therewith by at least a pair of corresponding threaded nuts **28** and linear bearings (not shown), which may be spaced around the periphery of the ring **24** and which matingly engage the threaded rails **26** in the present embodiment. The movable ring **24** may be attached to the elastomeric tube in any manner suitable to withstand the operating forces and undersea operation, for example, by clamping, surface bonding, or another manner as would be known to those of skill in the art. Likewise, the ring **24** is preferably made of a material sufficient to withstand the operating forces during the launch mode, and may be coated for underwater operation. Any of a number of suitable metals, or other materials, may be utilized as would be known to those of

skill in the art. The extending device can also include other components, and may not include a ring, provided that the outboard end receives the device to be launched, and remains movable along a length of the housing.

The inboard end **20** of the elastomeric tube **12** is preferably closed so as to provide an attachment point for the tube release mechanism **30**. As best shown in FIGS. 3-6, the tube may be closed by a plate **32** which provides support for the release mechanism **30**. During use, one end of the device **16** to be launched may also rest on the interior surface of the plate **32**. The plate **32** may be attached to the inboard end **20** of the elastomeric tube in any manner suitable to withstand the operating forces and undersea operation, for example, by clamping, surface bonding, or another manner as would be known to those of skill in the art. The release mechanism preferably includes a hook **34** which is releasably connected to a coupling or link **36**. In the present embodiment, the link **36** may be supported on an outer surface of plate **32**, while the hook may be supported by the inboard ring **38**. The hook is preferably pivotally supported and includes a first end which is releasably engagable with the link **36**, and a second end which is operatively connected to a driver, such as piston **40**. In use, the piston **40** operates to move the hook from an engaged, or locked position, to a non-engaged, or release position, as

described in greater detail below. Alternate release mechanism may also be utilized, or the exemplary release mechanism may be modified, for example the hook may be positioned on the plate **32**, and the link **36** on the inboard ring **38**, as would be known to those of skill in the art. In any case, the release mechanism should provide sufficient strength and durability to restrain the inboard end of the tube in order to prevent the tube **12** from contracting as the outboard end **18** of the tube is elongated, prior to launch.

In order to rotate the rails **26** and move the outboard end of the elastomeric tube **12**, a drive assembly **42** is also preferably provided. The drive assembly **42** may include a motor **44** which is operatively connected to the rails **26** in order to rotate the rails, as described below. The motor **44** may be of any design and speed. However, since the rate at which the motor **44** is capable of rotating the rails **26** to elongate the elastomeric tube **12** will effect the launch rate of the device, the motor **44** should provide sufficient power for the given device and operating conditions. The drive assembly **42** also preferably includes a drive belt or chain **46** (FIGS. 1 and 2) which is operatively connected to both the motor **44** and the rails **26**, such that as the motor runs the belt or chain is moved which, in turn, rotates the rails **26**. In the present embodiment, a chain and sprocket assembly is preferably

provided, although alternate devices may be utilized, as would be known to those of skill in the art.

Use of the launch assembly **10** will now be described with reference to FIGS. 3-6.

In an initial, or non-engaged position (FIG. 3), a first end of the device **16** to be launched is supported within the elastomeric tube **12**. In the initial position, the tube is at rest, i.e., is not elongated, such that no energy is stored within the tube in this position. The motor **44**, rails **26** and ring **24** remain stationary in the non-engaged position. As the command is received to prepare for launch, the launch assembly moves into the engaged position (FIG. 4), wherein the motor begins to operate to turn a shaft **47** (arrow "A") which is operatively connected to the drive chain **46**, the chain being operatively connected to the rails **26**. As the rails **26** begin to rotate in the direction of arrow A, they matingly engage the nuts **28** attached to ring **24** such that the ring begins to move outwardly toward the outboard end of the assembly, as shown by arrow "B". As the ring **24** moves, the elastomeric tube **12** which is restrained at its inboard end **20** begins to elongate, or extend at the outboard end **18**, along the length of the housing, thereby storing potential energy. Once the outboard end of the tube **12** is moved a distance determined to be sufficient to provide the requisite energy to launch the device at a desired

speed or distance, as determined by the particular device to be launched and launch conditions, rotation of the rails is stopped. The outboard end **18** of the tube is now stationary, and the inboard end **20** of the tube is then released, as shown in FIG. 5. In the present embodiment, to release the inboard end the piston **40** moves in the direction of arrow "C" to rotate the hook **34** from engagement with the link **36** supported on the inboard end of the tube. Once the inboard end **20** is released, the tube contracts, i.e., the inboard end moves within the housing **14** in the direction of arrow "D", toward the outboard end of the assembly. This causes the device within the tube to accelerate until it is fired from the launch assembly (FIG. 6). As will be appreciated, the launch assembly of the present invention is capable of performing at various ambient pressures, can be operated in a range of launch energy modes by varying the elongation of the tube, and is safe and reliable during operation since no combustible components are utilized.

It will be understood that many additional changes in the details, materials, steps and arrangement of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

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ELASTOMERIC LAUNCH ASSEMBLY AND METHOD OF LAUNCH

ABSTRACT OF THE DISCLOSURE

A launch assembly having an elastomeric tube for launching a device is disclosed. To launch the device an outboard end of the tube is movable outwardly along the length of a housing by an extending device, while the inboard end of the tube is restrained by a release mechanism and remains stationary. Thus, as the outboard end moves and the inboard end remains stationary, the elastomeric tube elongates. The tube may be elongated a predetermined amount, at which time the inboard end of the tube is released by the release mechanism. Releasing the inboard end allows it to travel toward the now stationary outboard end with a sufficient velocity to launch the device. The amount of elongation of the tube is related to the amount of possible launch energy. Thus, greater elongation of the tube provides a greater launch velocity, while shorter elongation provides a reduced launch velocity, as desired.

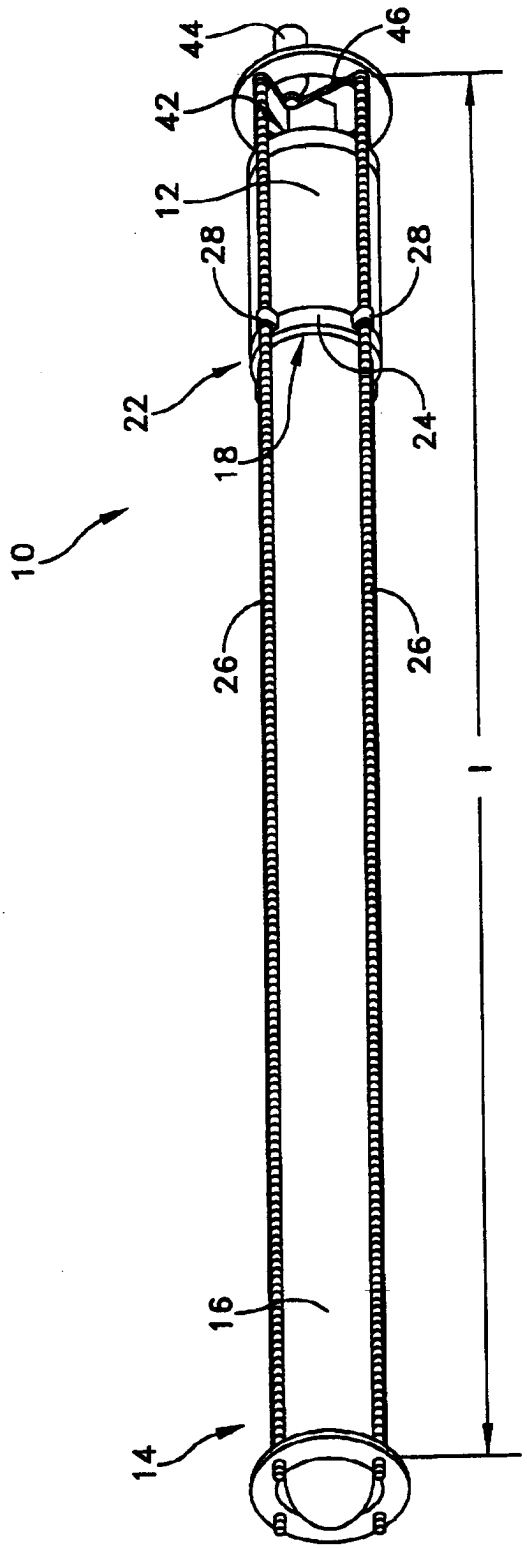

FIG. 1

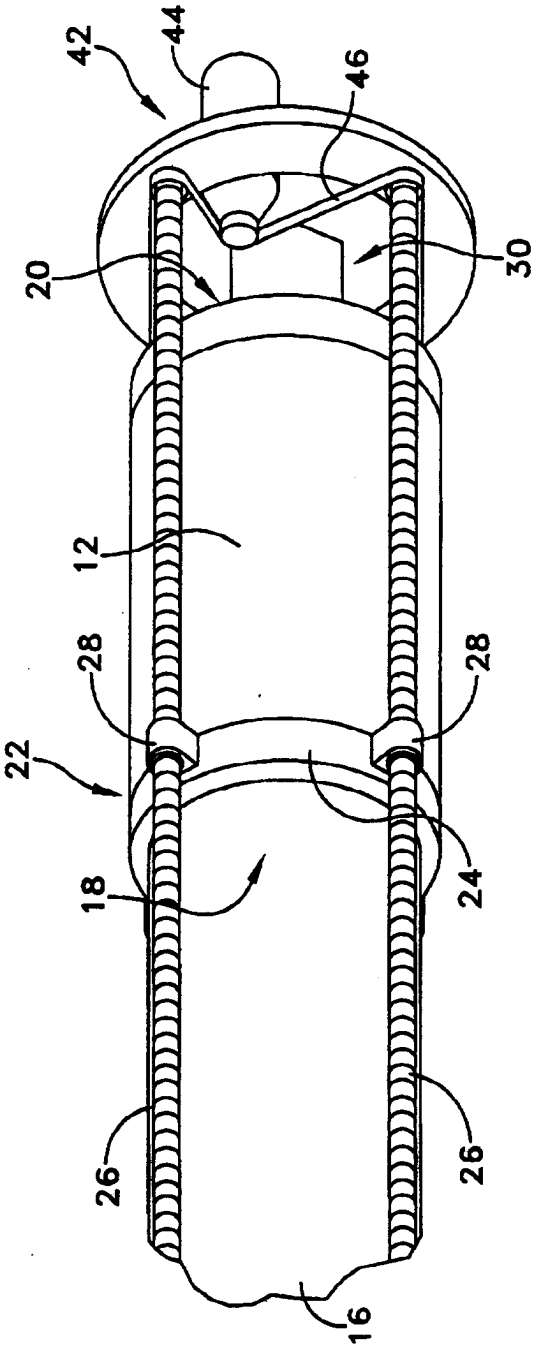

FIG. 2

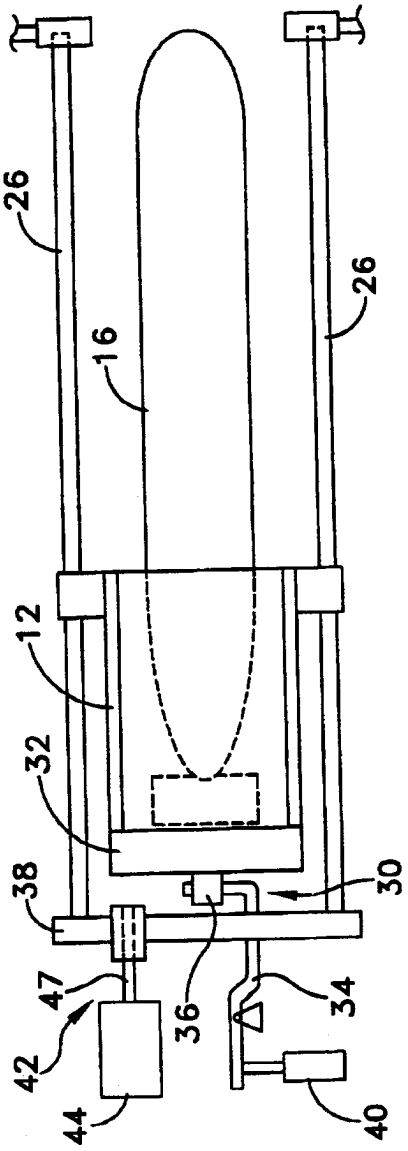
26
16
26
12
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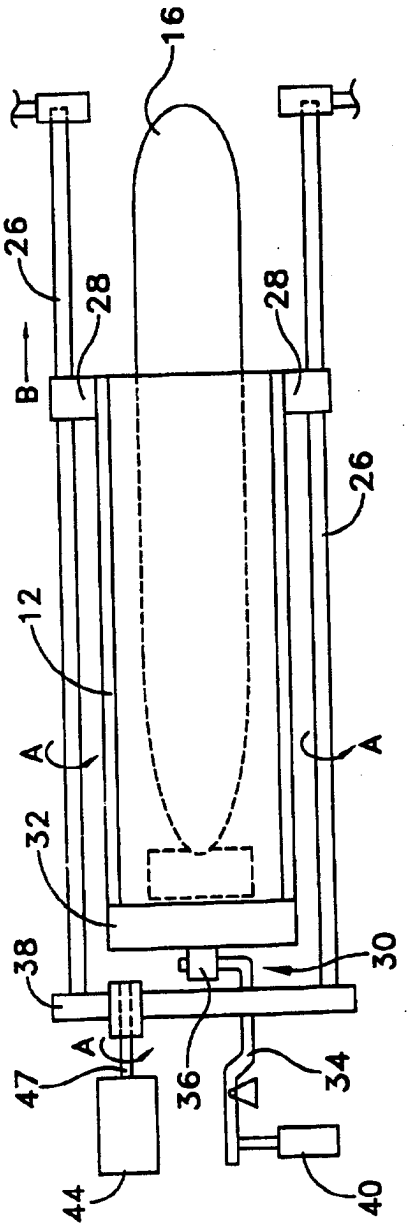
FIG. 3


16
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B
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A
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A
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36
34
44
40

FIG. 4

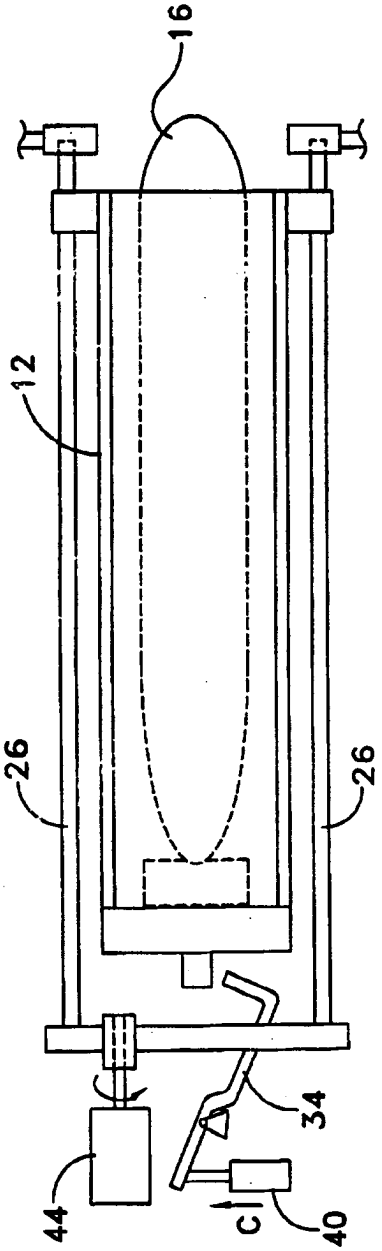

FIG. 5

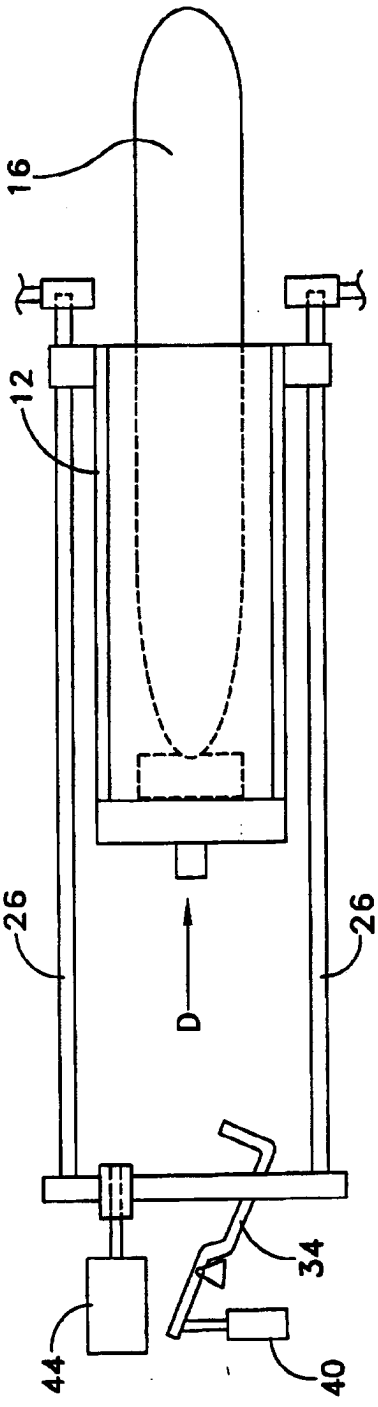

FIG. 6