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(54) Title: DESCENT DEVICE

(57) Abstract: A descent device for lowering an individual includes a housing and a spool rotatably carried by the housing. The spool includes a barrel defining an interior volume and is adapted to receive a length of high tensile strength line. A centrifugal brake is carried within the barrel and a gear assembly couples the spool to the centrifugal brake for rotation of the centrifugal brake with the spool.

DESCENT DEVICE

TECHNICAL FIELD

This invention relates to devices for facilitating lowering individuals from elevated positions.

More particularly, the present invention relates to devices for safety or evacuating structures.

In a further and more specific aspect, the instant invention concerns devices for escaping elevated locations.

BACKGROUND ART

Providing exits from buildings and other structures is a major concern during planning and construction, particularly in multi-story buildings. Typically, elevators and stairways are employed. For added safety during crisis, shorter multi-story buildings employs fire escapes which are essentially stairways erected on the outside of a building. Escaping buildings has always been a concern during crisis. Elevators are often disabled, and stairways can be blocked, crowded or otherwise made impassable. Fire escapes are very expensive, and typically cannot be used on very tall buildings.

Many diverse device have been developed for evacuating buildings, such as ladders, foldable ladders, escape tubes, climbing ropes, etc, but each has the drawback of being expensive, difficult to use, and un-usable on buildings having great height. Often, evacuation devices require physical strength and specialized skills for use or an individual who is physically fit and skilled to assist. These requirements are often difficult to meet quickly in a crisis situation. On very tall buildings, often referred to as sky scrapers, inner stairways, or aerial evacuation from the roof are the only options.

The fall protection industry has made tremendous advances in the last 10 to 15 years to ensure workers at heights will be safely protected if they experience a fall. Though safety measures are moving in the right direction, more than 200,000 workers are injured each year due to falls. It is the second most cited OSHA violation on construction sites.

It is not practical to rely on emergency responders, such as firefighters, to provide rescue services in all instances. Many times the construction or maintenance is occurring in remote locations where it may take the emergency responders a long time to arrive at the accident location or they may not be trained to rescue on certain types of structures. It is the responsibility of the employer to ensure that a safe rescue can take place from any location the worker may be required to work. OSHA 1926.502(d)(20) states the employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.

If a person experiences a fall in an electrical environment, OSHA requires CPR be administered within 4 minutes of exposure. This requires getting the victim to a safe location to begin CPR as soon as possible. In most fall situations, the victim remains suspended making it impractical to hoist them up to a higher level where the fall occurred to administer CPR or other medical attention, especially on steel beams, steel lattice communication and power transmission line towers, oil rigs, wood pole distribution poles, wind generators, bridges, pitched rooftops, bucket trucks, grain elevators, and factory and warehouse environments. Therefore the victim must be lowered using a rescue descent device to safely bring them to the ground for medical attention.

Another important reason to rescue as quickly as possible after a fall is that the person can experience suspension trauma (orthostatic hypertension), which can be

fatal. Suspension trauma can occur when a person is suspended in a harness for an extended amount of time. The blood pools in the lower part of the body because the individual is in an upright position with limited movement. When this happens there is less blood circulating in the rest of the body, which causes the heart to speed up increasing the risk of a heart attack. Also the pooling in the veins reduces the blood's oxygen content and can cause fainting making the rescue more difficult and raises the seriousness of the situation because if the blood is not equalized in the body after passing out, the victim's position may be fatal.

When a worker is suspended in the air, rescue personnel need to have the proper training and equipment on hand to react quickly. A rescue plan should be in place addressing how to safely bring a fallen person to the ground. It is important that the proper rescue equipment be on site and ready for use. Currently, many rescue devices are very heavy and complex to properly rig. Therefore, what normally happens is that the rescue gear remains in the shop or in a truck near the site. The time it takes to set up rescue equipment puts the fallen worker at risk of further injury.

It would be highly advantageous, therefore, to remedy the foregoing and other deficiencies inherent in the prior art.

Accordingly, it is an object of the present invention to provide a new and improved descent device.

Still another object of the present invention is to provide an evacuation device which is compact and lightweight, making it easy to store, carry and use.

Yet another object of the invention is to provide an evacuation device which can be operated by a single individual and which does not require physical strength and no specialized skills.

DISCLOSURE OF THE INVENTION

Briefly, to achieve the desired objects of the instant invention in accordance with a preferred embodiment thereof, provided is a descent device for lowering an individual. The descent device includes a housing and a spool rotatably carried by the housing. The spool includes a barrel defining an interior volume and is adapted to receive a length of high tensile strength line. A centrifugal brake is carried within the barrel and a gear assembly couples the spool to the centrifugal brake for rotation of the centrifugal brake with the spool. In a particular aspect, the compact nature of the device permits a smaller overall size with the descent device having a width of less than seven inches, a height less than twelve inches and a thickness of less than three inches.

In a specific aspect, the gear assembly includes a spool gear carried by the spool for rotation therewith, an intermediate gear meshing with the spool gear and rotated thereby, and a brake gear meshing with the intermediate gear and rotated thereby and coupled to the centrifugal brake.

In yet a more specific aspect a brake mechanism is carried by the housing. The brake mechanism is moveable between a braking position wherein the brake mechanism stops unspooling of the line and a release position permitting unspooling of the line.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and further and more specific objects and advantages of the instant invention will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment thereof taken in conjunction with the drawings, in which:

FIG. 1 is a front elevation view of a descent device according to the present invention;

FIG. 2 is an side elevation of the descent device;

FIG. 3 is a top elevation of the descent device;

FIG. 4 a partially schematic vertical front sectional view of the descent device;

FIG. 5 is a partially schematic vertical side sectional view of the descent device;

FIG. 6 is a partial view illustrating the removal of a fastening member from the outlet of the descent device;

FIG. 7 is a perspective view of a centrifugal brake assembly according to the present invention; and

FIG. 8 is an exploded view of the centrifugal brake assembly of FIG. 7.

BEST MODES FOR CARRYING OUT THE INVENTION

Turning now to the drawings in which like reference characters indicate corresponding elements throughout the several views, attention is first directed to FIGS. 1-3 which illustrate a descent device generally designated 10. Descent device 10 is a compact device for storing and unspooling a high tensile strength line in a controlled manner. Device 10 can be attached to substantially any arrangement secured to an individual such as a harness, belt, vest and the like. Descent device 10 is a compact device permitting easy storage, and thus ready accessibility when needed. Device 10 has been designed to meet the needs of rescue personnel trapped or unable to reach victims by traditional methods. Firefighters, police and military personnel are usually required to carry already heavy loads therefore this device was built to be exceptionally lightweight yet sturdy enough to withstand harsh use and heat. As illustrated, device 10 has a width of less than seven inches (6.6 inches), a height less than twelve inches (11.6 inches) and a thickness of less than 3 inches (2.6 inches). The compact size is achieved through the arrangement of elements as described herein.

Referring now to FIGS. 4 and 5, descent device 10 includes a housing 12 enclosing a spool 14 and a brake mechanism 15. Spool 14 holds a length of high tensile strength line 17, such as fishing line, in a manner similar to a fishing reel. Spool 14 is rotatably mounted in housing 12 with line 17 exiting through and guided by an outlet 18 at a top end of housing 12. Outlet 18 can be elongated from housing 12 as illustrated in FIGS 1-5, providing space for a fastening member and a brake mechanism, each of which will be described presently. Spool 14 includes a barrel 20 and end flanges 22. Barrel 20 receives and rotates on a spindle 25. Spindle 25 defines an interior volume 26. Spool 14 carries line 17 with an outer surface 23 of barrel 20 underlying the spooled line.

The rotation of spool 14 is controlled by a centrifugal brake mechanism 30 carried within barrel 20 and spindle 25. With additional reference to FIGS. 7 and 8, centrifugal brake mechanism 30 is illustrated. In a preferred embodiment centrifugal brake mechanism 30 includes a centrifugal clutch 32, such as that sold commercially by SUCO Inc. or a similar structure. Centrifugal clutch 32 includes flyweights 33 positioned to overcome adjustable return springs when sufficient rotary speed (centrifugal force) is reached. Outward pressure of flyweights 33 press brake elements 35 outwardly to engage a drum or spindle 25. A range of engagement speeds can be achieved through adjustments of the return springs. Because centrifugal clutches of the type described can be purchased commercially, further description of the inner construction will not be provided.

A driving shaft or axle 37 is coupled to centrifugal brake mechanism 30 so as to rotate with the inner components of centrifugal clutch 32. A gear assembly 40 couples spool 14 to centrifugal brake mechanism 30 for rotation of centrifugal brake mechanism 30 with spool 14.

Gear assembly 40 includes a spool gear 42 carried by spool 14 for rotation therewith, an intermediate gear 43 meshing with spool gear 42 and rotated thereby, and a brake gear 45 meshing with intermediate gear 43 and rotated thereby and coupled to axle 37. Spool gear 42 includes a plurality of teeth 47 extending from barrel 20 radially inwardly into interior volume 26. Intermediate gear 43 is fixed in position within interior volume 26 for common rotary motion. Thus, rotation of spool 14 provides a corresponding rotation of spool gear 42, which in turn causes rotation of intermediate gear 43. Rotation of intermediate gear 43 causes rotation of brake gear 45 coupled to axle 37 and generally concentric with spool gear. In this manner, rotation of spool 14 is transferred to rotation of centrifugal brake mechanism 30. When a pre-determined revolution rate is reached, centrifugal brake mechanism prevents a greater rate, by preventing faster rotation of brake gear 45 and subsequently intermediate gear 43, spool gear 42 and ultimately spool 14. Unspooling of line 17 is thereby limited, controlling the rate of descent of an individual. Thus, the person using descent device 10 does not have to control the descent.

Still referring to FIGS. 4 and 5, a brake mechanism 50 is carried by housing 12. Brake mechanism 50 is moveable between a braking position wherein brake mechanism 50 stops unspooling of line 17 and a release position permitting unspooling of line 17. The provision of brake mechanism 50 permits an individual to control or stop their descent if desired. Thus a rescue worker can descend to a lower window, stop and enter. Brake mechanism 50, in this embodiment, includes a pair of releasing handles 52 positioned on opposing sides of housing 12 so as to selectively provide movement of brake mechanism 50 into one of the braking position and the release position. Brake mechanism further includes cam

members 53 positioned within outlet 18 to either side of line 17. Handles 52 are each coupled by elongate elements 55 to one of cam members 53 for rotation thereof between a disengaged position and an engaged position. In the engaged position, cam members contact and bind line 17 therebetween preventing unspooling thereof. It will be understood by those skilled in the art that a single control such as a single handle or lever can be employed to actuate brake mechanism 50 and other varieties of brake mechanisms can be employed.

Turning now to FIG. 6, it can be seen that line 17 ends in a fastening member 60. Fastening member 60 is used to anchor line 17 to an anchor point or structure during descent, and in this embodiment is a carabineer which can be fastened to a structure directly, or wrapped about a structure and hooked to line 17. Fastening member 60 is carried within outlet 18 prior to use. A cap 62 can be employed to close outlet 18 and prevent access until use is desired. Cap 62 is removed and fastening member 60 extracted for use. Referring back to FIGS. 4 and 6, a ring 63 is coupled to housing 12 opposite outlet 18, for attachment to an individual such as by being secured to a harness, belt, vest and the like.

Unlike the other devices in this category, device 10 can be used as a self-rescue device or used in an assisted rescue operation. Device 10 has a manual braking mechanism to ensure total control during a rescue and can also be set to allow an automatic descent safely to the ground. This lightweight, easy to use, rescue descend device is adaptable to all industries and high angle rescues.

Various changes and modifications to the embodiments herein chosen for purposes of illustration will readily occur to those skilled in the art. To the extent that such modifications and variations do not depart from the spirit of the invention, they are intended to be included

within the scope thereof which is assessed only by a fair interpretation of the following claims.

Having fully described the invention in such clear and concise terms as to enable those skilled in the art to understand and practice the same, the invention claimed is:

CLAIMS

1. A descent device for lowering an individual comprising:

a housing;

a spool rotatably carried by the housing, the spool including a barrel defining an interior volume, the spool adapted to receive a length of high tensile strength line;

a centrifugal brake carried within the barrel; and

a gear assembly coupling the spool to the centrifugal brake for rotation of the centrifugal brake with the spool.

2. A descent device as claimed in claim 1 wherein the gear assembly includes a spool gear carried by the spool for rotation therewith, an intermediate gear meshing with the spool gear and rotated thereby, and a brake gear meshing with the intermediate gear and rotated thereby and coupled to the centrifugal brake.

3. A descent device as claimed in claim 2 wherein the spool gear includes a plurality of teeth extending from the barrel radially inwardly into the interior volume.

4. A descent device as claimed in claim 1 further including a line carried by the spool and a brake mechanism carried by the housing, the brake mechanism being moveable between a braking position wherein the brake mechanism stops unspooling of the line and a release position permitting unspooling of the line.

5. A descent device as claimed in claim 4 wherein the brake mechanism includes a pair of releasing handles positioned on opposing sides of the housing so as to

selectively provide movement of the brake mechanism into one of the braking position and the release position.

6. A descent device as claimed in claim 1 wherein the centrifugal brake includes a centrifugal clutch constructed to maintain rotation of the spool at a predetermined rate.

7. A descent device as claimed in claim 1 having a width of less than seven inches, a height less than twelve inches and a thickness of less than three inches.

8. A descent device for lowering an individual comprising:

a housing;

a spool rotatably carried by the housing, the spool including a barrel defining an interior volume, the spool adapted to receive a length of high tensile strength line;

a centrifugal brake carried within the barrel; and

a gear assembly coupling the spool to the centrifugal brake for rotation of the centrifugal brake with the spool, the gear assembly including a spool gear carried by the spool for rotation therewith, an intermediate gear meshing with the spool gear and rotated thereby, and a brake gear meshing with the intermediate gear and rotated thereby and coupled to the centrifugal brake.

9. A descent device as claimed in claim 8 wherein the spool gear includes a plurality of teeth extending from the barrel radially inwardly into the interior volume.

10. A descent device as claimed in claim 8 further including a line carried by the spool and a brake mechanism carried by the housing, the brake mechanism being moveable between a braking position wherein the

brake mechanism stops unspooling of the line and a release position permitting unspooling of the line.

11. A descent device as claimed in claim 10 wherein the brake mechanism includes a pair of releasing handles positioned on opposing sides of the housing so as to selectively provide movement of the brake mechanism into one of the braking position and the release position.

12. A descent device as claimed in claim 8 wherein the centrifugal brake includes a centrifugal clutch constructed to maintain rotation of the spool at a predetermined rate.

13. A descent device as claimed in claim 8 having a width of less than seven inches, a height less than twelve inches and a thickness of less than three inches.

14. A descent device for lowering an individual comprising:

a housing;

a spool rotatably carried by the housing, the spool including a barrel defining an interior volume, the spool carrying a length of high tensile strength line;

a centrifugal brake carried within the barrel;

a gear assembly coupling the spool to the centrifugal brake for rotation of the centrifugal brake with the spool; and

a brake mechanism carried by the housing, the brake mechanism being moveable between a braking position wherein the brake mechanism stops unspooling of the line and a release position permitting unspooling of the line.

15. A descent device as claimed in claim 14 wherein the gear assembly includes a spool gear carried by the spool for rotation therewith, an intermediate gear meshing

with the spool gear and rotated thereby, and a brake gear meshing with the intermediate gear and rotated thereby and coupled to the centrifugal brake.

16. A descent device as claimed in claim 15 wherein the spool gear includes a plurality of teeth extending from the barrel radially inwardly into the interior volume.

17. A descent device as claimed in claim 14 wherein the centrifugal brake includes a centrifugal clutch constructed to maintain rotation of the spool at a predetermined rate.

18. A descent device as claimed in claim 14 having a width of less than seven inches, a height less than twelve inches and a thickness of less than three inches.

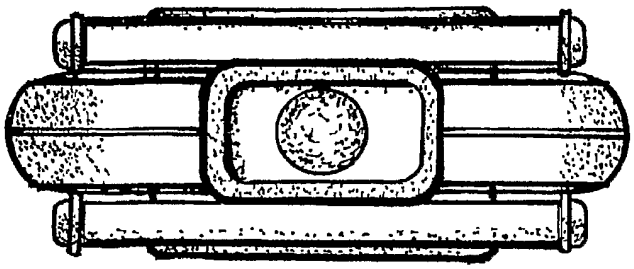

FIGURE 3

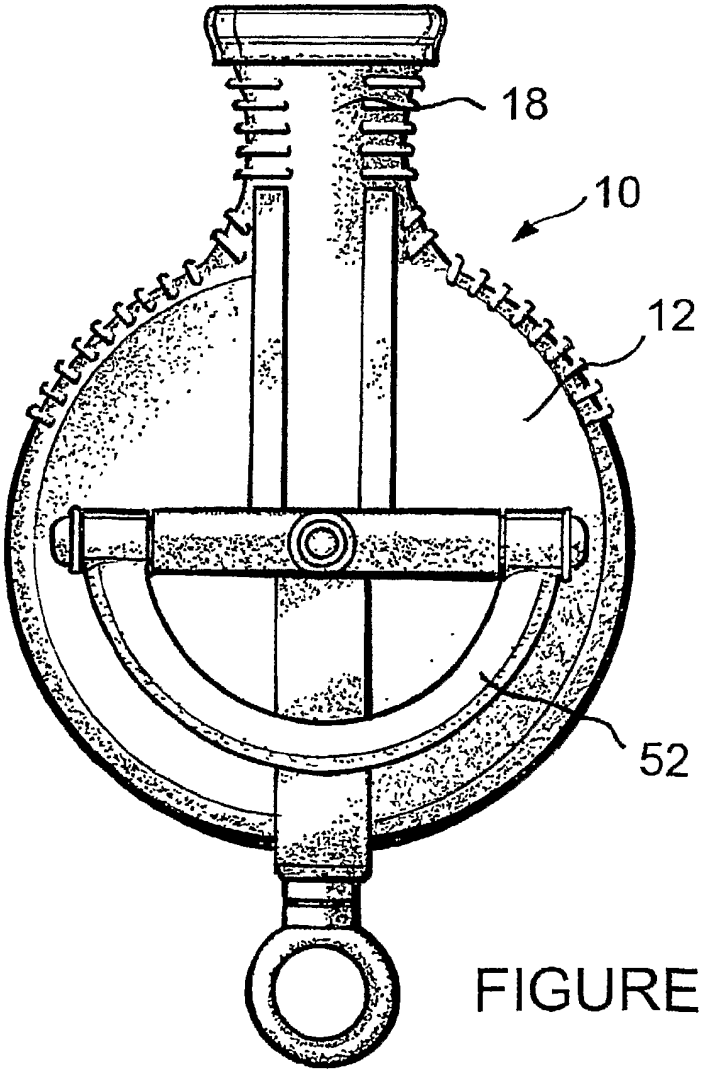

FIGURE 1

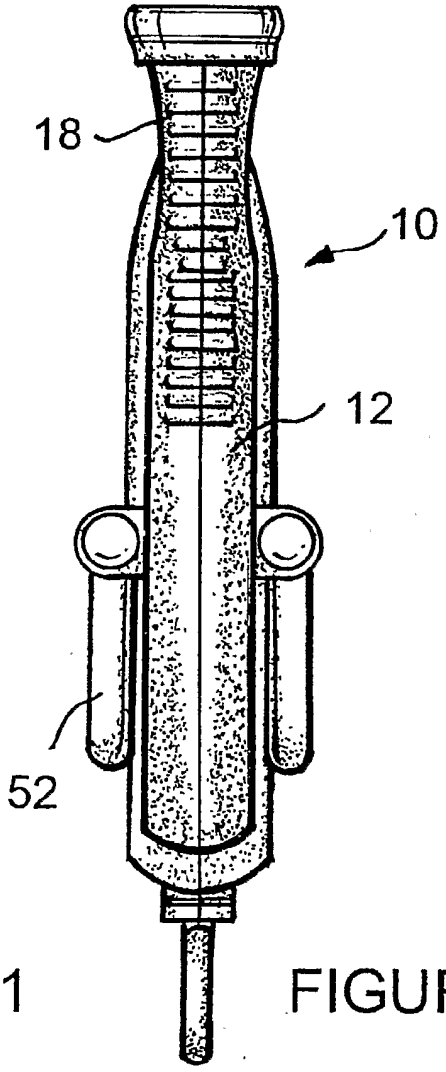

FIGURE 2

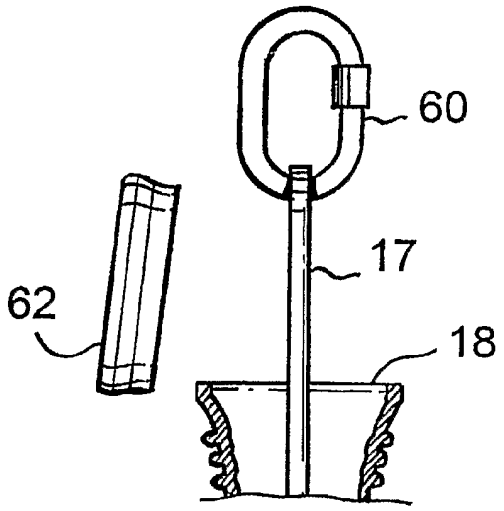

FIGURE 6

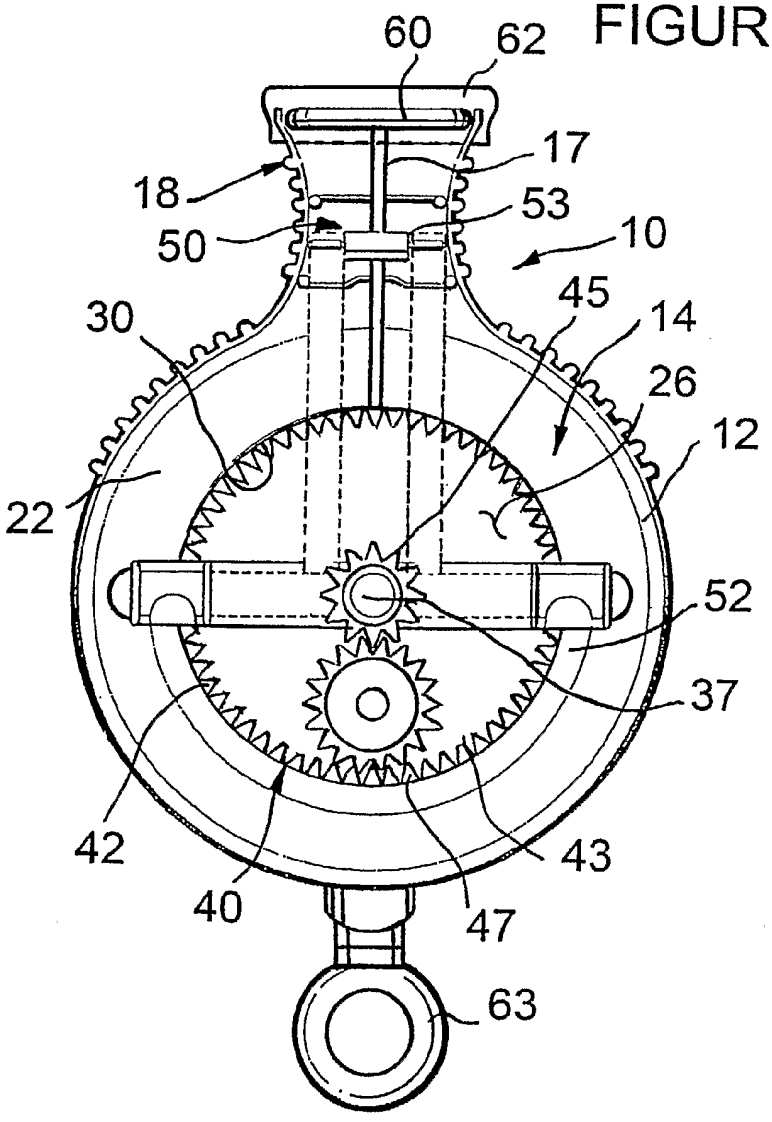

FIGURE 4

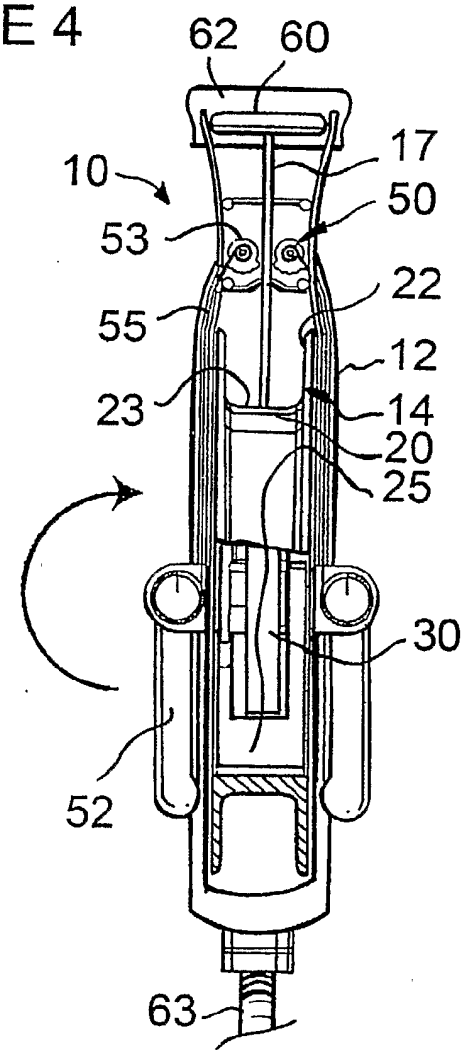

FIGURE 5

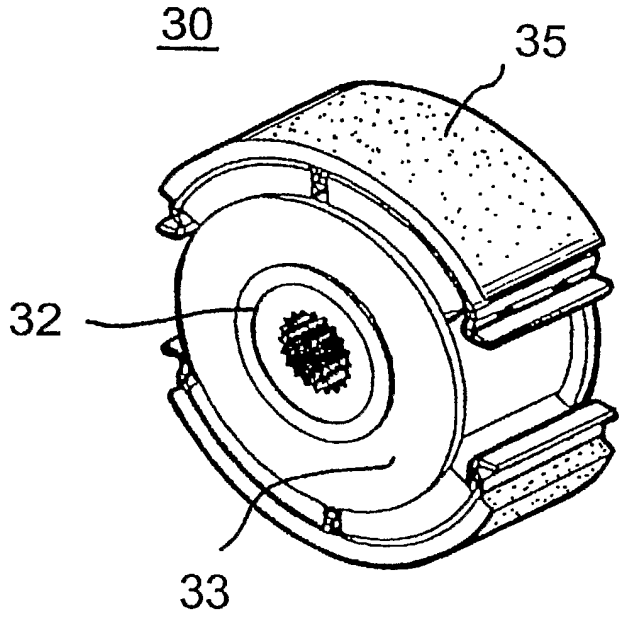

FIGURE 7

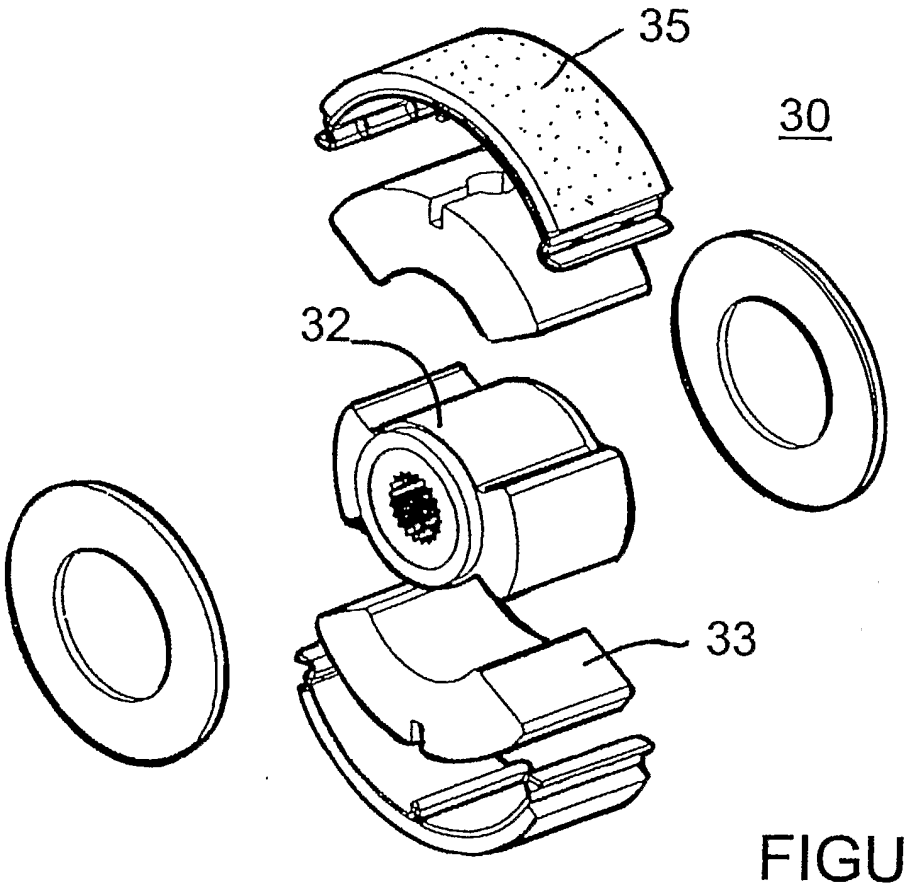

FIGURE 8