(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 571 207 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **93303918.2**

(22) Date of filing : **20.05.93**

(51) Int. Cl.^{5} : **B66D 1/39**

(30) Priority : **20.05.92 GB 9210713**
18.12.92 GB 9226444
26.03.93 GB 9306298

(43) Date of publication of application :
24.11.93 Bulletin 93/47

(84) Designated Contracting States :
DE GB

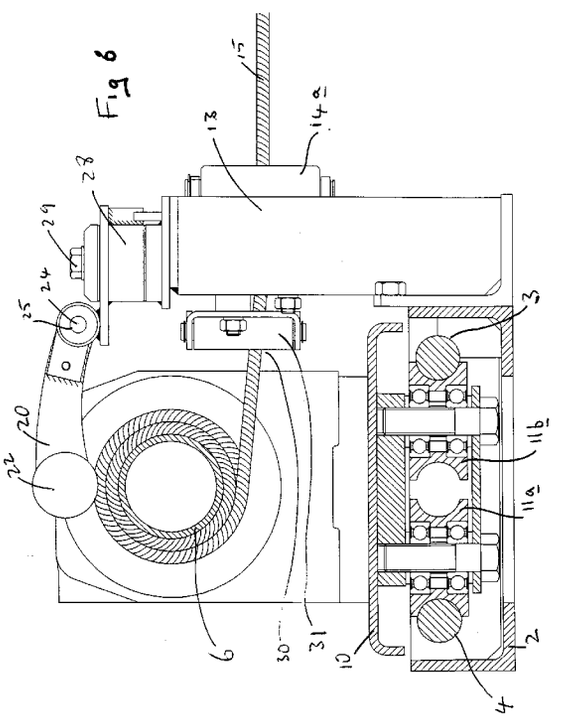
(71) Applicant : **SUPERWINCH LIMITED**
Abbey Rise, Whitchurch Road
Tavistock, Devon PL19 9DA (GB)

(72) Inventor : **Dray, Timothy**
West Cliffe Cottage, Hartcliffe Road, Beelsby
South Humberside DN37 0TJ (GB)

(74) Representative : **Cline, Roger Ledlie**
EDWARD EVANS & CO. Chancery House 53-64
Chancery Lane
London WC2A 1SD (GB)

(54) Winch assembly.

(57) When a rope (15) is wound upon a drum (6) at a large angle of approach relative to the normal to the drum shaft, there is a tendency for the rope (15) to bunch up at one region of the drum. To overcome this problem, the drum (6) is mounted for axial movement, e.g. along rails (3,4) or along splines (42), as well as rotary movement on its axis. A fairlead (13) may be provided to reduce the angle of approach of the rope (15).



EP 0 571 207 A1

This invention relates to a winch assembly, particularly but not exclusively to a winch assembly adapted to be mounted upon a vehicle.

In a conventional winch, a winch drum is arranged to be driven by a transmission or gearbox which is, in turn, powered by some motive force, e.g. an electric, hydraulic, or pneumatic motor or, alternatively, by a driveshaft coupled to a parent engine in the case of mechanical drum winches. The term 'fleet angle' as used throughout this specification means the included angle between the rope, in its position of greatest travel across the drum, and a line drawn normal to the drum shaft, passing through the centreline of a head sheave or that point where the rope's hook or other means of attachment is fastened to the object being moved. It has been found that when the fleet angle is small there is no problem with successive turns of the rope laying up snugly against each other as the rope is wound onto the drum. There is however a problem when the fleet angle is larger, since in this case successive turns of the rope have a tendency to bunch up at one region of the drum.

Attempts have been made to combat this problem by arranging that the rope pass through a fairlead and by arranging that the fairlead reciprocate back and forth along the drum thereby to spread successive turns of the rope more or less uniformly along the drum. The disadvantage of such an approach however is that the fairlead must be driven in its back and forth movement. The amount of power required to move the fairlead against the direction of pull of the rope can be almost as much as that required to rotate the drum itself. This therefore requires that larger and hence more expensive motive units be provided than would otherwise be necessary.

It has also been proposed, in Canadian Patent No. 655052, to mount the winch drum on a fixed pivot to permit limited angular movement of the drum axis substantially in the plane of that axis and a fixed fairlead associated therewith. The extent of the pivotal angular movement of the drum is defined by stops located at the limits of arcuate travel of the drum. Means may be provided for biassing the drum to a central position. This proposal is unsatisfactory in situations where the tension in the rope may vary considerably. A further disadvantage of this approach is that the pivotal angular movement of the drum invariably reaches its maximum arc of travel regardless of amount of change in the fleet angle, rendering the even paying on or off the rope unsatisfactory when the fleet angle has changed only slightly.

Canadian Patent No. 1111829 relates to a towing system for use on a vessel for towing an underwater body, e.g. a SONAR body, behind the vessel. As shown in Figs. 4 and 5 of that patent, a hoist assembly is provided with a wheeled base for linear translation of the entire hoist to control fleet angle of the rope as it is wound on and off the drum. A translating device and drive for the hoist base is provided, which may be, for example, a hydraulic cylinder or a screw. The additional power required for this arrangement, together with its increased mechanical complexity renders it a less than wholly satisfactory system.

According to a first aspect of the present invention there is provided a winch assembly, which assembly comprises a winch mounting plate or base with fairlead attached thereto, said fairlead incorporating means for exerting a force upon a cable or rope, a winch drum for receiving a cable or rope, winch driving means for driving the winch drum in rotation about the axis of the winch drum, and movement means being provided whereby the winch drum is free to move in translation in the axial direction of the winch drum and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to reduce the fleet angle of said cable or rope.

According to a further aspect of the present invention there is provided a winch assembly including a winch drum for receiving cable or rope, in which assembly, in use, the winch drum is acted upon by the cable or rope to move the winch drum in translation in the axial direction of the winch drum, thereby to reduce the fleet angle of said cable or rope.

Our invention recognises the desirability of moving the winch drum in translation to reduce the fleet angle, provided that the rope is made to pass through a fairlead, e.g. a set of rollers or a hawse, said fairlead to be mounted on the winch carriage close to the drum, which fairlead reduces the fleet angle, as measured between the winch drum and said fairlead, to nearly zero.

The winch drum may be arranged for movement in translation by any suitable means or method.

In one embodiment of the present invention, the winch drum is mounted upon a winch carriage which is free to move in translation in the axial direction of the winch drum and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to reduce the fleet angle of the said cable or rope.

The movement means of the winch assembly of the present invention may comprise bearing means. Such bearing means may comprise a plurality of rollers secured to a carriage for the winch drum and one or more rails secured to the base of the winch assembly, the rollers riding along the rail or rails to permit the movement in translation of the winch drum relative to the base. It will of course be understood that the rail or rails may instead be provided on the carriage for the winch drum and the rollers provided on the base of the winch assembly. In other embodiments, means other than rollers may be employed, e.g. flanged wheels or grooved pulleys and means other than round rails may be utilised, e.g. tracks or channels.

Alternatively, the winch drum of our Application

No. 9210713.5 may be mounted on a carriage adapted for sliding translational movement relative to the base, e.g. by lubricated shoes or sliders sliding within tracks or grooves provided respectively on the carriage and the base or vice versa. It is desirable that whatever bearing means be employed be sufficiently robust to resist torsional or twisting forces imparted to the winch drum by the cable or rope.

In other embodiments of the winch assembly of the present invention the winch drum is mounted for axial sliding movement along or upon a support therefor, e.g. a shaft located internally of the winch drum and extending co-axially of the winch drum.

For example, in a preferred embodiment the winch drum is coaxially mounted about a drive shaft of the winch driving means and operatively connected thereto so that the winch driving means can drive the winch drum in rotation about the axis of the winch drum. At the same time however, the winch drum is so mounted about the drive shaft as to be free to move axially thereof. Such an arrangement may be achieved e.g. by forming the drive shaft with one or more axially extending splines on its surface and keying the winch drum to the drive shaft for rotary movement by means of elements coacting with the spline or splines, e.g. sliding elements, ball bearings or roller bearings. Alternatively, the winch drum may be mounted for translational sliding movement upon a shaft provided for that purpose, in which case the winch driving means may comprise, for example, a longitudinally extending toothed pinion arranged externally of the winch drum, parallel to the axis of the winch drum and co-operating with one or more toothed flanges provided at one or both ends of the winch drum. It is also envisaged that for example the winch driving means and the winch drum may together comprise an electric motor of such a kind that the winch drum is capable of moving axially of the winch driving means but can still be driven in rotation thereby. Thus, for example, the winch driving means may comprise the stator of an electric motor and the winch drum comprise a corresponding rotor of the electric motor. It is envisaged, for example, that the winch driving means comprise a longitudinally extending stator provided along its length with a plurality of circumferentially arranged coils adapted in use to produce a rotating magnetic field and that the interior of the winch drum be formed as a squirrel cage motor. Such an arrangement will permit the winch drum to be driven in rotation about the stator and will allow the winch drum to move axially of the stator.

When the winch assembly of this invention is winding on the cable or rope, each successive turn of the cable or rope on the winch drum will bear against the previous turn and will exert a lateral force thereagainst. The effect of this force is to move the winch drum in translation by that amount required to allow the next turn of the cable or rope to lie snugly against the preceding turn.

When the winch assembly of this invention is paying off cable or rope from the winch drum there will be a vector force produced as the fleet angle increases. This vector will move the winch drum in translation thereby to result in a subsequent decrease in the fleet angle.

In general the winch assembly of this invention will include a fairlead, fixed relative to the base and located in close proximity to the drum. In a preferred embodiment, the fairlead of the winch assembly includes one or more pinch rollers to act upon the cable or rope passing therethrough and to maintain tension thereupon. In a preferred arrangement, the cable or rope is arranged to pass between a pair of rollers located in the fairlead and resiliently biassed towards each other so as to act upon the cable or rope and to maintain the tension thereupon. It is preferable that a first pair of such resiliently biassed rollers be located in the fairlead with their axes generally parallel and in a first orientation, and that a second pair of rollers be located in the fairlead with their axes generally parallel to each other but substantially at right angles to the axes of the first pair of rollers. Said second pair of rollers may also be resiliently biassed towards each other.

It is preferred that cable or rope tensioning means be provided to maintain tension at all times on the cable or rope remaining on the drum, thus to prevent 'bird-nesting' of the cable or rope about the winch drum. Such tensioning means may be provided by arranging that the winch drum driving means exert a tension against the stored cable or rope as it is paid off from the winch drum and to prevent the turns of cable or rope becoming slack during paying onto the winch drum of the cable or rope.

As is discussed in our co-pending Patent Application No. 9226444.9 it has been found in practice that the winch assembly of the present Patent Application works well in most situations and under most conditions of operation. However, as described in Patent Application No. 9226444.9 it has been found that in certain situations the winch carriage and winch drum can move under the influence of gravity to one or other of their extreme positions of travel. These problem situations tend to arise particularly when the following combination of circumstances exists:

i) when there is little or no tension on the cable or rope;

ii) when the winch assembly is mounted upon a vehicle; and

iii) when the vehicle is parked on a camber of, say, approximately 4 or 5 degrees or more.

The invention of our co-pending Patent Application No. 9226444.9 provides a winch assembly, which assembly comprises a winch mounting plate base with or without a fairlead attached thereto, said fairlead incorporating means for exerting a force upon a

cable or rope, a winch carriage movably mounted on the winch mounting base or plate, a winch drum mounted on the winch carriage for receiving a cable or rope, winch driving means for driving the winch drum in rotation about the axis of the winch drum, and bearing means being provided whereby the winch carriage is free to move in translation in the axial direction of the winch drum relative to the winch mounting base or plate and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to alter the fleet angle of said cable or rope, and which winch assembly further comprises cable- or rope-locating means for locating the path of the cable or rope at a position adjacent the cable drum, said locating means being arranged to constrain lateral movement of the cable or rope relative to the winch drum and thus, in use, to control translational movement of the winch drum in the axial direction of the winch drum.

It is stated in our co-pending Patent Application No. 9226444.9 that, very preferably, said cable- or rope-locating means is adapted at least partially to track the cable or rope as there occurs relative axial movement between the cable or rope and the winch drum, thereby to present the cable or rope to the winch drum at approximately a desired angle to the axis of the winch drum.

It is also stated in our co-pending Patent Application No. 9226444.9 that the locating means of that invention preferably comprises a pulley or roller adapted to co-operate with the cable or rope and biased to exert a locating force upon the cable or rope, so that the position of the path of the cable or rope adjacent the winch drum is constrained (if not actually fixed), even in the event of the cable or rope becoming slack and the winch carriage and drum being laterally influenced by gravity. The effect of constraining the path of the cable or rope adjacent the winch drum is said in that Application to increase the translational force applied to the winch carriage and drum as the cable or rope is taken up by the winch drum or is paid off therefrom, thereby to reduce the tendency of the winch carriage and drum to remain at an extreme position of travel. Furthermore it is indicated that the locating means of that Application does not have to employ a pulley or roller, a pulley or roller being preferred simply so as to reduce friction. In certain circumstances it is suggested that it may be adequate simply to have a static cable- or rope-locating device such as a groove, tube or slot suitably positioned in the locating means.

In a preferred embodiment of the invention of our co-pending Patent Application No. 9226444.9, a resiliently biassed arm is mounted on the fairlead assembly, bearing a roller or pulley at its distal end and is adapted to exert a locating force upon the cable or rope at a position adjacent the winch drum. It is said that the roller or pulley preferably includes means which define a path in the roller or pulley for the cable or rope, and that in a preferred embodiment said means comprise flanges provided on the roller or pulley.

It is also indicated in Patent Application No. 922644.9 that the locating means is preferably arranged at least partially to track the path of the cable or rope onto the winch drum, and that this may be achieved by arranging for the locating means to be moveable within defined limits in translation axially of the winch drum. The tensioning means of that Application may be pivotally mounted, e.g. on the fairlead or on a superstructure associated with the fairlead, so as to swing over a defined arc to track the cable or rope as the angle of the cable or rope relative to the winch drum surface alters.

It is also indicated that the cable- or rope-locating means of the invention of Application no. 9226444.9 need not be mounted upon the fairlead, but that it can be mounted upon any suitable portion of the winch assembly so as to apply the desired locating/constraining force to the cable or rope.

In a preferred embodiment of the invention of Application No. 9226444.9 the cable- or rope-locating means is pivotally mounted on the fairlead and a third pair of rollers is mounted on the fairlead, with their axes parallel and generally upright, to apply guidance to the cable or rope at approximately the point where the cable or rope exits the fairlead between the fairlead and the winch drum. This third pair of rollers may, if desired, be arranged to exert a light gripping force upon the cable or rope.

The invention of our co-pending Patent Application No. 9226444.9 is applicable to the present invention. The advantages that it affords are provided also to the present invention. It may be however that the need for the invention of our Application No. 9226444.9 may not be as great for those embodiments of the present invention which do not employ a winch carriage to support the winch drum, because the embodiments of the present invention that employ an internal support for the winch drum offer a much lighter winch drum assembly than those that include a winch carriage, and thus a winch drum assembly which is less liable to sit at one extreme of its travel under the influence of gravity.

An embodiment of the winch assembly of the present invention will now be described, by way of example only, by reference to Figs 4 to 7 of the accompanying drawings and will be better understood in conjunction with the following description of an embodiment of the invention of our Application 9210713.5. In the accompanying drawings,

Fig. 1 is a diagrammatic view from beneath of an embodiment of a winch assembly according to our Application No. 9210713.5, mounted in the front bumper of a 'Land Rover Defender' motor vehicle;

Fig. 2 is a front elevation of the winch assembly of Fig. 1;

Fig. 3 is a diagrammatic side elevation of the winch assembly of Figs 1 and 2;

Fig. 4 is a diagrammatic side elevation of an embodiment of the winch assembly of the present invention incorporating the cable- or rope-locating means of the present invention;

Fig. 5 is a plan view on an enlarged scale of a part of the assembly of Fig. 4;

Fig. 6 is a side elevation in partial section of an embodiment of the locating means of the present invention; and

Fig. 7 is a plan view of the locating means of Fig. 6.

Fig. 8 is a side elevation in partial section of an embodiment of the locating means of the present invention; and

Fig. 9 is a plan view of the locating means of Fig. 8.

Referring firstly to Figs. 1 to 3 of the accompanying drawings, there is shown an embodiment of a winch assembly according to our co-pending Application No. 9210713.5. The winch assembly 1 includes a base 2. Base 2 includes two sturdy, parallel, circular-cross section rails or bars 3, 4 and is secured to a front bumper 5 of a 'Land Rover Defender' motor vehicle (not shown).

A winch drum 6 is supported in bearings 7, 8 and is provided with motive force, e.g. motor 9 for driving a gearbox or transmission to drive the winch drum 6 in rotation. The motor 9, the gearbox or transmission, and the bearings 7, 8 are themselves secured to a carriage 10. Carriage 10 is mounted upon pairs of pulley wheels or rollers 11a, 11b and 12a, 12b. As shown in Figs. 2 and 3, rollers 11a, 11b, 12a and 12b co-operate with rails 3 and 4 respectively to allow the carriage 10 to move freely in translation relative to the base 2. The direction of this translation movement is left-to-right and right-to-left as shown in Fig 2.

A fairlead 13 is affixed to base 2, spaced from winch drum 6 and located generally in line with a central position of carriage 10. Fairlead 13 includes a first pair of pinch rollers 14a, 14b biassed together by spring means (not shown) to urge the pinch rollers 14a, 14b into gripping contact with a cable or rope (shown diagrammatically at 15 in Fig. 2) to be paid onto or off the winch drum 6. The pinch rollers 14a, 14b are arranged with their axes generally parallel and generally vertical. In practice, roller 14b is fixed and roller 14a is biassed theretowards by tension springs (not shown). A second pair of pinch rollers 16a, 16b which are also biassed together by spring means (not shown) is also located on fairlead 13 and is arranged substantially at right angles to the first pair of pinch rollers 14a, 14b. These arrangements of pinch rollers in fairlead 13 ensure gripping contact between the fairlead and the cable or rope 15 irrespective of the horizontal or vertical angle made between the cable or rope and the fairlead, externally of winch assembly 1.

It will be seen from Fig. 3 of the drawings that the spacing between a pair of pulley wheels or rollers 11a, 11b or 12a, 12b is such as to permit a third rail or bar to be provided on base 2. Such an additional rail or bar may be desirable when the size of the winch assembly 1 is increased, or if the winch assembly is to be subject to large magnitude forces.

It will be seen from Fig. 1 and Fig. 2 that the distance between the respective pairs 11a, 11b and 12a, 12b of the pulley wheels or rollers of the carriage 10 and their respective locations on carriage 10 is such as to cause the winch drum 6 to lie substantially within the rectangle defined by the positions of the pulley wheels or rollers, i.e. to lie inboard thereof. This arrangement greatly adds to the stability of the winch assembly of the present invention.

Furthermore, it will be seen from Figures 1 and 2 that both rails are located outboard of the pulley wheels or rollers. In other embodiments, both rails may be located inboard of the rollers or, alternatively, one rail may be located outboard of the rollers and the other inboard of the rollers and, in all cases, the option of a third rail may be employed in either the inboard or outboard position. The placement and number of rails will be determined by the forces to be translated and the direction of such forces, i.e. the rails will be placed in one configuration if the winch will do all its paying on from the front direction and the rails will be placed in a different configuration if the paying on will be done from both the front and rear directions.

At the limits of travel of the carriage 10 relative to base 2, dampers or shock-absorbers (not shown) may be provided to cushion any tendency of the carriage 10 to collide abruptly with the base at its limits of movement.

Means may also be provided, e.g. in the form of a peg or pin (not shown) to lock in position the carriage 10 relative to the base 2, so that, when the winch assembly is not in use and, say, a vehicle upon which it is mounted is being driven, the carriage 10 does not slide uncontrollably back and forth.

Referring now to Figs 4 to 5 of the accompanying drawings, there is shown a second embodiment of a winch assembly according to the present. Like parts to those of the winch assembly of Figs 1 to 3 of the accompanying bear like numerals.

The winch assembly 1 includes a base 2. Base 2 in this embodiment may be a simple plate-like member as shown, for secural to motor vehicle or, alternatively, may be a part of a motor vehicle itself, e.g. the front bumper of a 'Land Rover Defender' vehicle.

A winch drum 6 is provided and is arranged to be driven in rotation by a gearbox or transmission 40, which is itself driven by a motor 9 which may be elec-

tric, hydraulic, pneumatic or mechanical in nature. The gearbox 40 is operatively connected to a shaft 41 so as to drive the shaft 41 in rotation.

The shaft 41 is provided with one or more splines 42 and the winch drum 6 is keyed to the splines 42 by means of one or more linear motion bearings (not shown). The operative interconnection of winch drum 6 and splines 42/shaft 41 is such that the winch drum 6 is driven in rotation by the shaft 41 but is nonetheless capable of axial movement along shaft 41. Any suitable linear motion bearing(s) may be employed to key the winch drum 6 to the splined shaft 41; one such suitable bearing is a recirculating ball bearing in which balls are held within a cage and traverse a closed path between a loaded and an unloaded state.

It will be appreciated that the linear motion bearing(s) may be provided on shaft 41 and that the splines, or an equivalent thereto, be arranged on an internal surface of the winch drum 6, so as to achieve the purpose of rotational locking and axial slideability.

It will also be appreciated that the shaft 41 and/or splines 42 on the shaft 41 should be of a sufficient length to permit the winch drum 6 to move axially over a distance corresponding at least approximately to the axial length of the cable- or rope- receiving drum surface.

The distal end of shaft 41 is supported for rotation in a pedestal-type bearing housing 43.

Shaft 41 may be arranged to be hollow for receiving components of gearbox or transmissions 40 or to receive a further gearbox (not shown) to assist in the transmission of drive torque to the shaft 41 from gearbox or transmission 40.

A fairlead (not shown) will generally be mounted upon the winch assembly 1 to determine a feed-in/feed-out position for the cable or rope. Furthermore, a cable- or rope-locating means such as is described hereinafter may also be incorporated into the winch assembly of this embodiment.

This embodiment of the winch assembly of the present invention provides a winch assembly having an axially movable winch drum which is operationally less heavy than the embodiments of Fig 1 to 4 and which therefore facilitates the smooth and regular laying up or paying off of cable or rope onto or from the winch drum.

Referring now to Figs 6 to 9 of the accompanying drawings, there is shown an embodiment of a winch assembly according to the present invention, incorporating an embodiment of a cable- or rope-locating means according to the present invention. A cable- or rope- locating arm 20 bears at a distal end 21 thereof a flanged pulley wheel 22 arranged to be freely rotatable about a horizontal axis 23, the flanged pulley wheel 22 being located adjacent the winch drum 6. The arm 20 is mounted for rotation in a vertical plane about a horizontal pivot axis 24 constituted by a pivot bar 25. The arm 20 is biassed downwardly as shown in Fig. 4 by springs 26, 27. The pivot bar 25 is supported by a pivot structure 28 adapted to pivot in a horizontal plane about a vertical pivot pin 29, thus to permit horizontal pivotal movement of the arm 20 between limits defined by stop pegs (not shown). The pivot pin 29 is mounted atop the fairlead 13 and so located that the locating arm 20 is positioned directly above a rear outlet 30 in the fairlead 13 for the cable or rope 15. As may be seen in Fig. 6, the outlet 30 of the fairlead 13 is bracketed by a third pair of rollers 31, arranged with their axes parallel and in a vertical plane. The function of this third pair of rollers 31 is to provide guidance of the cable or rope 15 at the rear of the fairlead 13.

The skilled reader will realise that the locating arm 20 does not necessarily have to be biassed downwardly, but that, for example, with the winch assembly in another orientation, the locating arm 20 could be arranged to exert a lateral locating force or an upward locating force. Likewise the skilled reader will realise that the locating arm 20 could exert a 'pulling' force rather than a 'pushing' force. Furthermore, the skilled reader will recognise that the locating arm 20 does not have to be biassed by one or more external springs but that, for example, the locating arm 20 itself could be made of a resilient material such as spring steel, and be so located as to exert the necessary locating/positioning force upon the cable or rope 15.

The arrangement of the elements shown in Figs 4 to 7 is such that the locating arm 20, biassed generally downwardly by springs 26, 27, exerts a locating force upon the cable or rope 15 *via* the flanged pulley 22. As the cable or rope 15 is laid up onto the winch drum 6 or is paid off therefrom the locating arm 20 maintains the path of cable or rope 15 at approximately a fixed position. The effect of this is to increase the lateral translational force applied to the winch carriage 10 and winch drum 6 by the cable or rope 15, thus to reduce the likelihood of the winch carriage 10 and winch drum 6 being influenced by gravity to travel to and remain at one of their extreme positions of translational travel. The locating arm 20 also pivots in a generally horizontal plane about pivot pin 29 so that the locating arm 20 does not interfere with the angle at which the cable or rope 15 is laid up onto or paid off from the winch drum 6.

The arrangement shown in Figs 6 to 9 significantly improves the winch assembly of this invention, particularly those embodiments that incorporate a movable winch carriage, serves to alleviate the problems to which those embodiments of winch assembly can be prone in certain 'slack rope' conditions.

The winch assembly of the present invention has wide applicability. It may be used as a vehicle-mounted winch, e.g. on a break-down truck, recovery vehicle, or fire engine, or on the front or rear of an all-terrain vehicle such as a Jeep or Land Rover.

The winch assembly of this invention may also be useful in other situations for example as a winch for ship-board use. Examples of such use could be as an anchor winch, a net winch, a windlass, a sail-raising winch etc.

The winch assembly of the present invention provides an effective and cost-efficient way of overcoming or alleviating the problems of prior-art winches.

The present invention may be performed otherwise than as has been particularly described. The invention includes within its scope all modifications and improvements which would be apparent to one skilled in the art.

Claims

1. A winch assembly comprising a winch mounting plate or base with fairlead attached thereto, said fairlead incorporating means for exerting a force upon a cable or rope, a winch drum for receiving a cable or rope, winch driving means for driving the winch drum in rotation about the axis of the winch drum, and movement means being provided whereby the winch drum is free to move in translation in the axial direction of the winch drum and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to reduce the fleet angle of said cable or rope.

2. A winch assembly including a winch drum for receiving cable or rope movement means for supporting the winch drum for rotation about its axis and for translation along its axis, so that, in use, the winch drum is acted upon by the cable or rope to move the winch drum in translation in the axial direction of the winch drum, thereby to reduce the fleet angle of said cable or rope.

3. An assembly as claimed in claim 1 or claim 2 wherein the movement means comprises a winch carriage on which the winch drum is mounted which carriage is free to move in translation in the axial direction of the winch drum and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to reduce the fleet angle of the said cable or rope.

4. An assembly as claimed in claim 3 when dependent on claim 2 comprising a fairlead through which the rope may be made to pass, said fairlead being mounted on the winch carriage close to the drum.

5. An assembly as claimed in any one of claims 1 to 4 wherein the supporting means comprises bearing means.

6. An assembly as claimed in claim 5 wherein the bearing means comprises a plurality of rollers on one body and one or more rails secured to the other body, the rollers riding along the rail or rails to permit the movement in translation of the winch drum relative to the base, the two bodies being the carriage and the base of the winch.

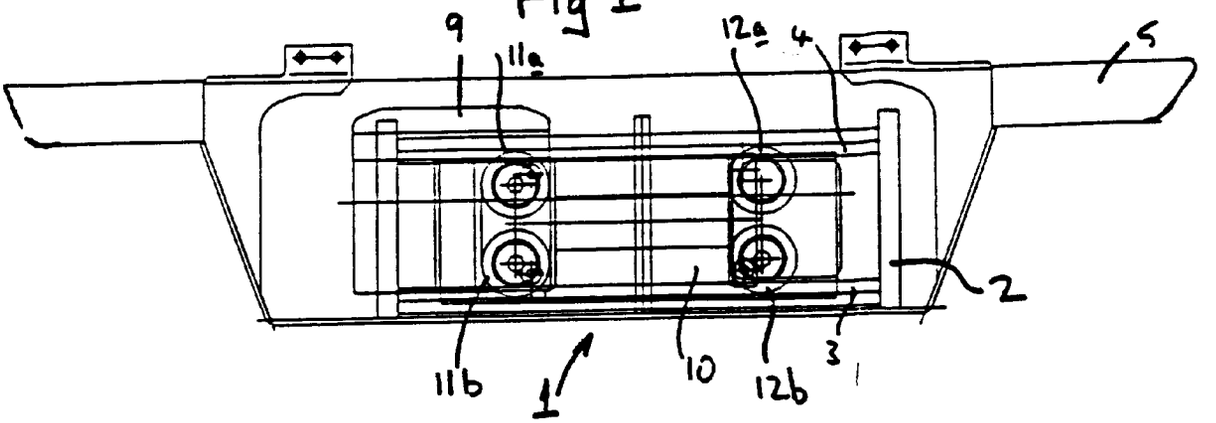
7. A winch assembly, which assembly comprises a winch mounting plate base with a fairlead attached thereto, said fairlead incorporating means for exerting a force upon a cable or rope, a winch carriage movably mounted on the winch mounting base or plate, a winch drum mounted on the winch carriage for receiving a cable or rope, winch driving means for driving the winch drum in rotation about the axis of the winch drum, and bearing means being provided whereby the winch carriage is free to move in translation in the axial direction of the winch drum relative to the winch mounting base or plate and within predetermined limits, as cable or rope is paid onto or paid off from the winch drum, thereby to alter the fleet angle of said cable or rope, and which winch assembly further comprises cable- or rope-locating means for locating the path of the cable or rope at a position adjacent the cable drum, said locating means being arranged to constrain lateral movement of the cable or rope relative to the winch drum and thus, in use, to control translational movement of the winch drum in the axial direction of the winch drum.

8. A winch assembly as claimed in claim 7 wherein a resiliently biased arm is mounted on the fairlead assembly, bearing a roller or pulley at its distal end and adapted to exert a locating force upon the cable or rope at a position adjacent the winch drum.

9. An assembly as claimed in claim 7 or claim 8 wherein the tensioning means is pivotally mounted so as to swing over a defined arc to track the cable or rope as the angle of the cable or rope relative to the winch drum surface alters.

10. An assembly as claimed in any one of claims 7 to 9 comprising a third pair of rollers mounted on the fairlead with their axes parallel and generally upright to apply guidance to the cable or rope at approximately the point where the cable or rope exits the fairlead between the fairlead and the winch drum.

Fig 1



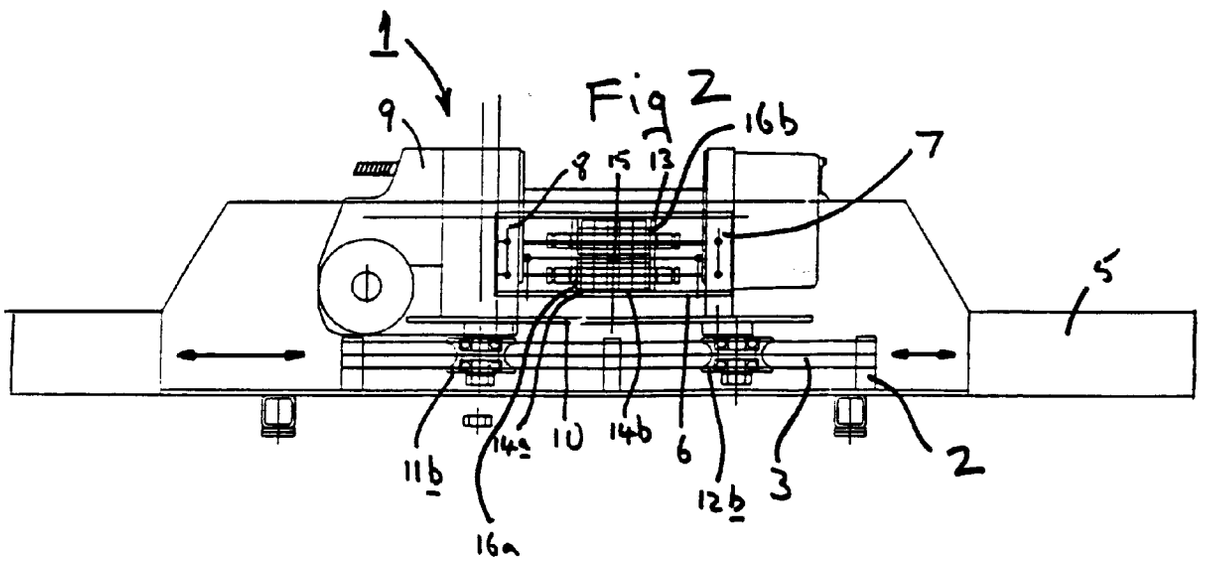


Fig 2

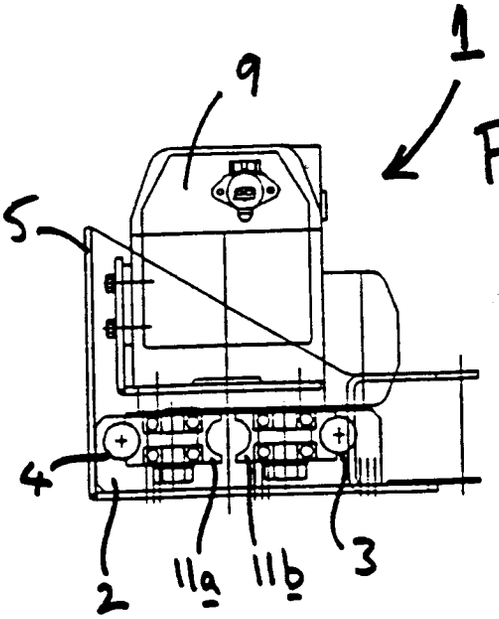


Fig 3

Fig 4

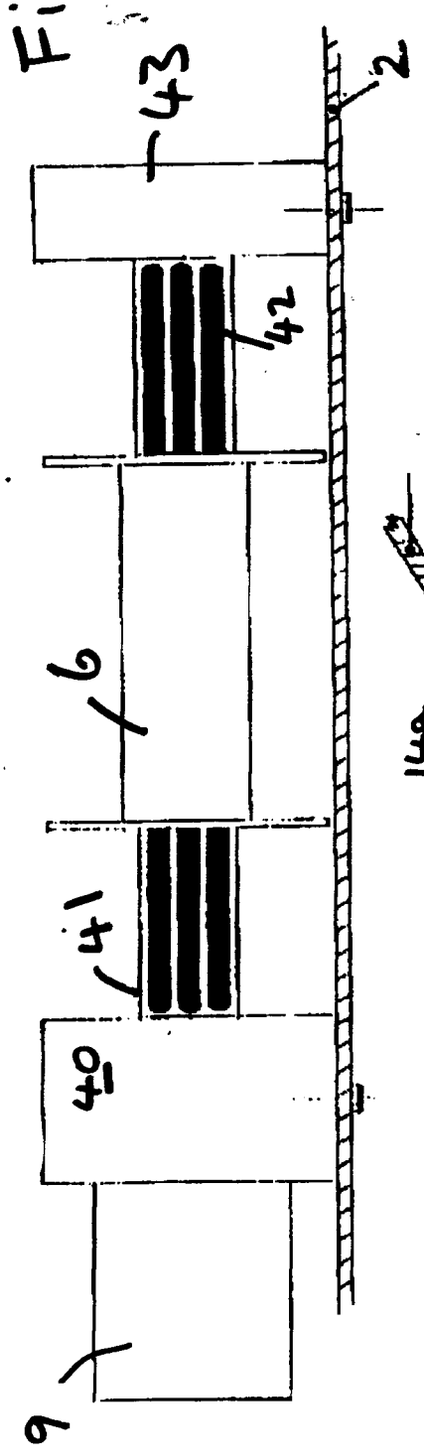


Fig 5

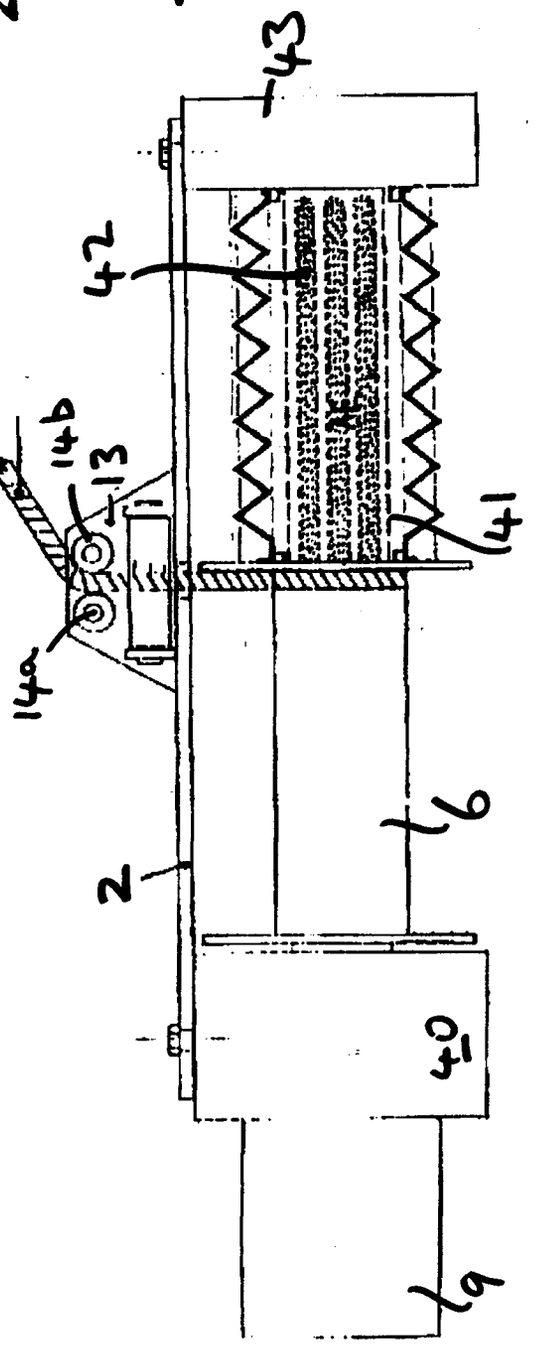
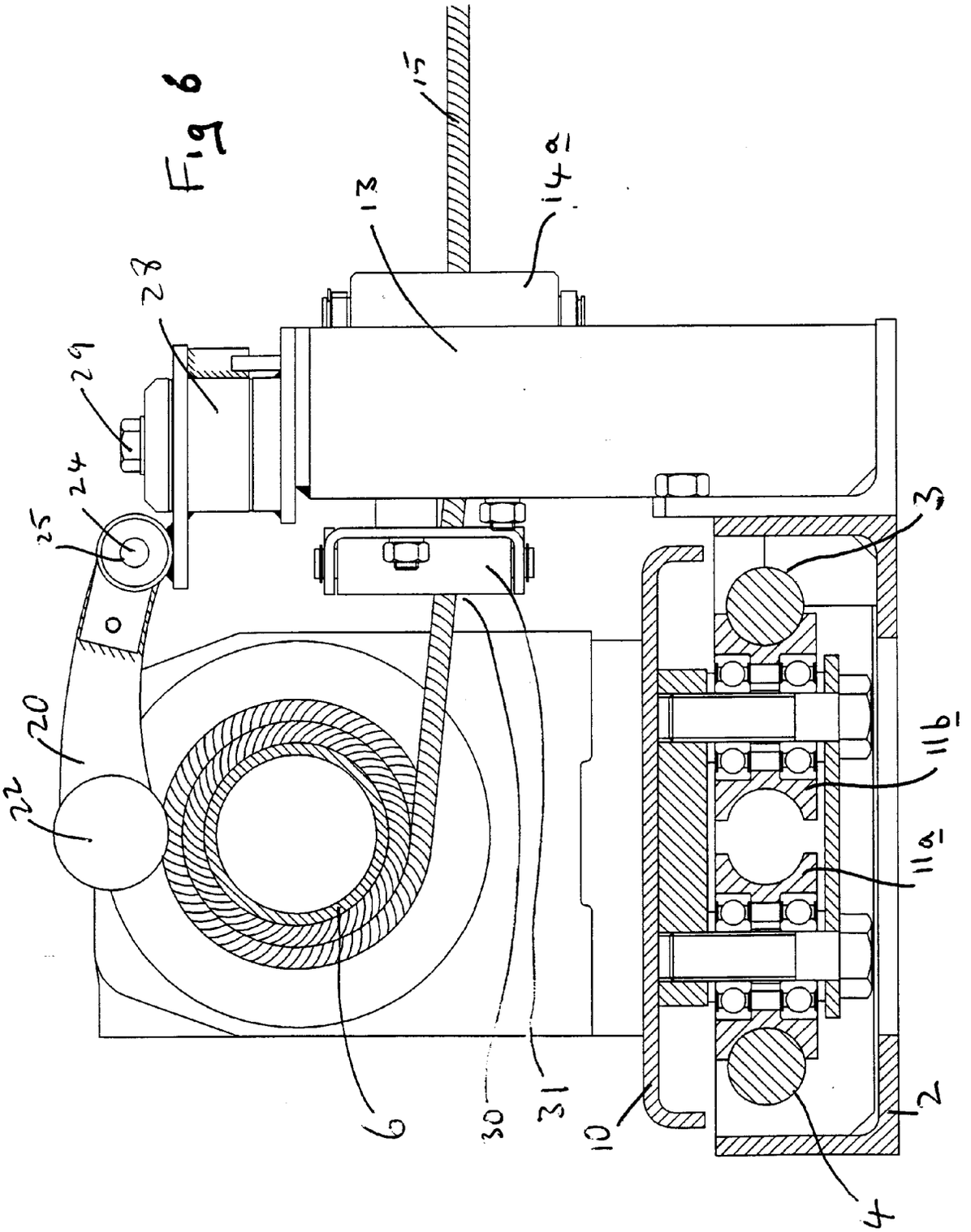


Fig 6



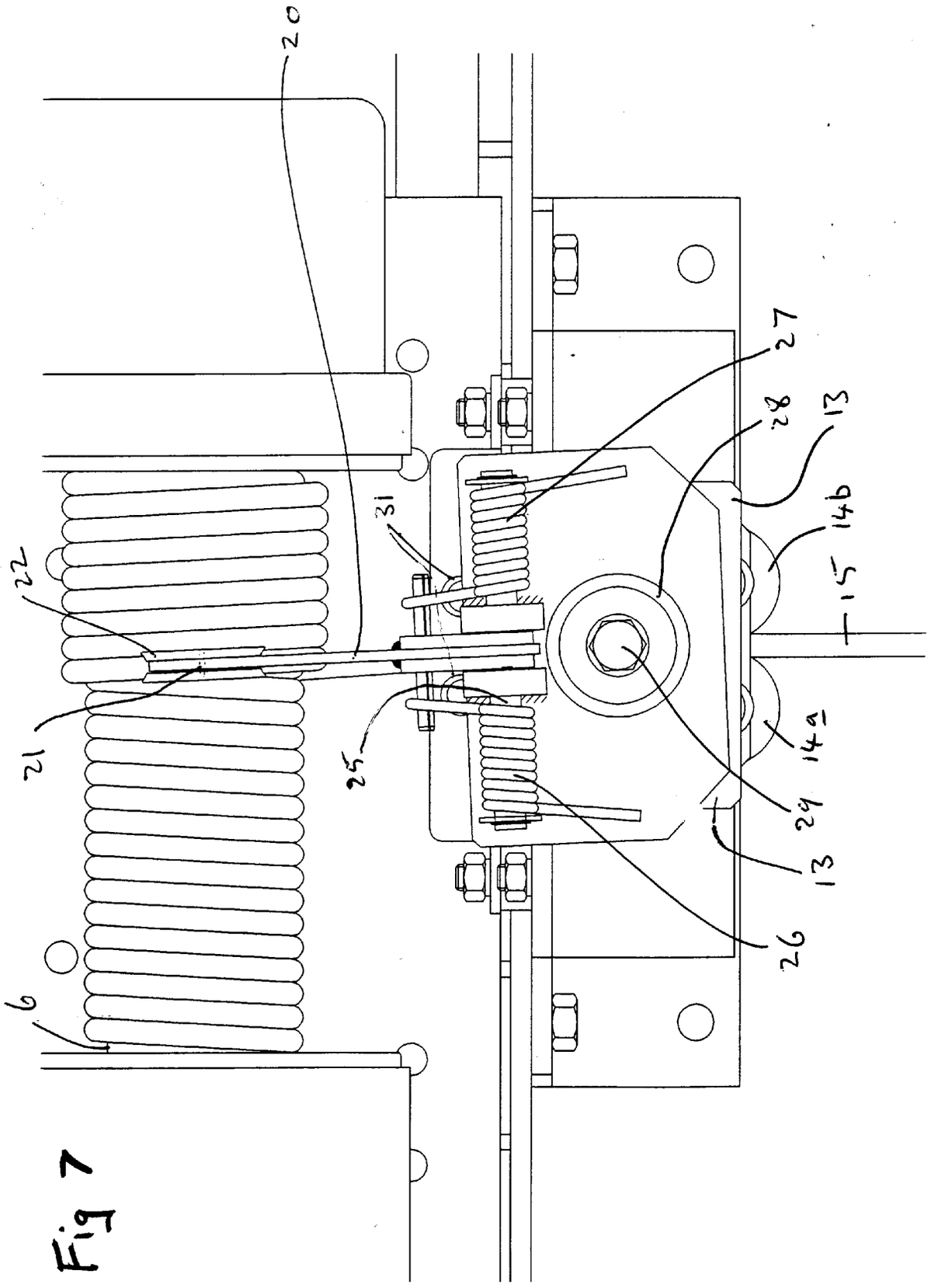


Fig 7

Fig 9

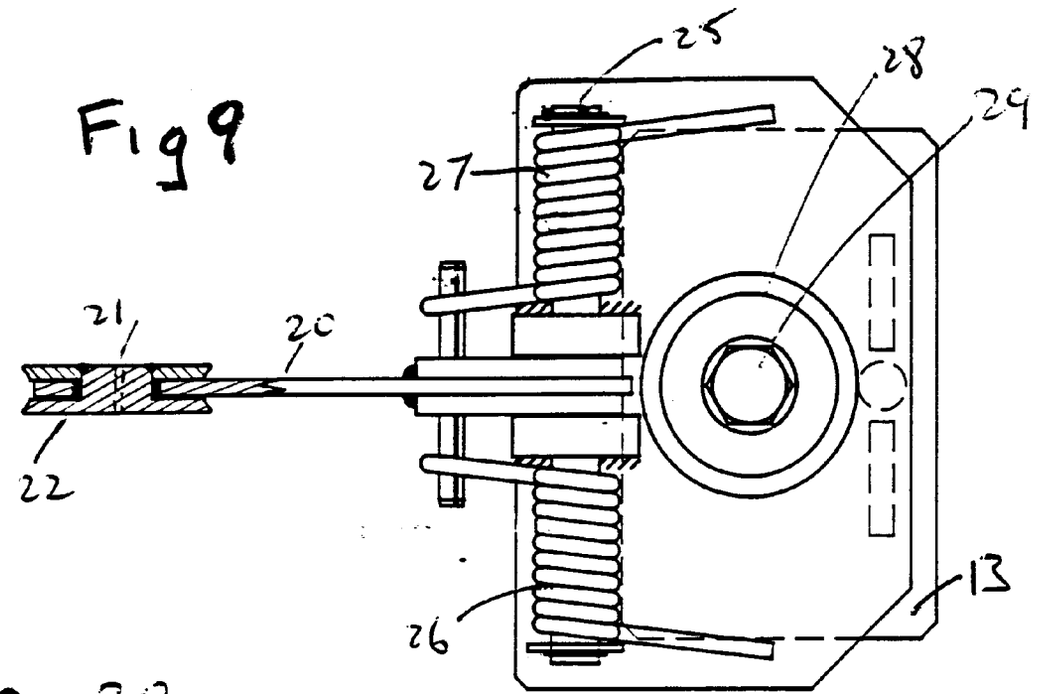
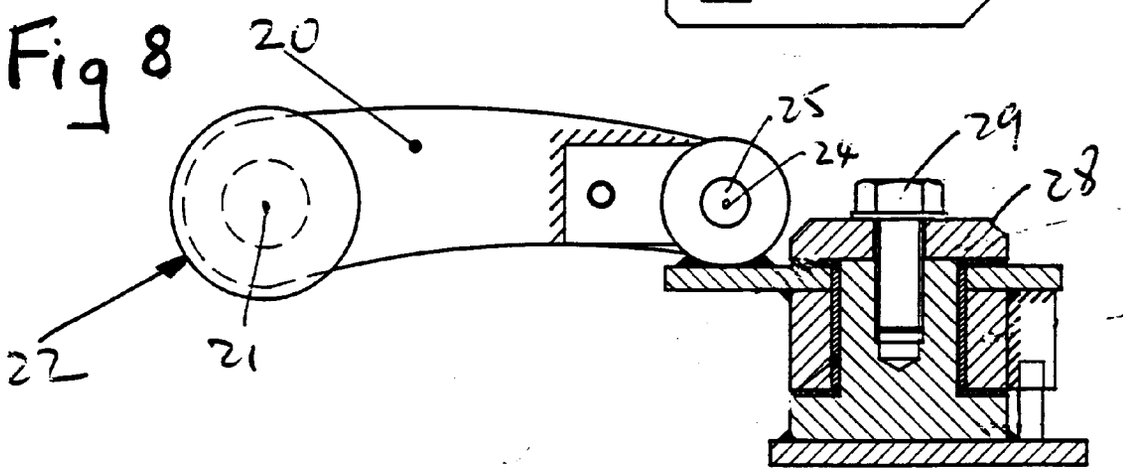


Fig 8



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 3918
Page 1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-B-1 192 381 (GENERAL MILLS INC.) * column 3, line 47 - column 4, line 12 * * figures 4-7 *	2,5	B66D1/39
Y A	DE-A-2 138 971 (POTAIN S.A.) * page 4, last paragraph * * page 5, paragraph 1 * * page 5, paragraph 3 * * page 5, last paragraph * * page 6, line 1 - line 3 * * figures 2-6,9 *	1,3,5,7 6	
Y	SOVIET PATENTS ABSTRACTS Section PQ, Week 9150, 5 February 1992 Derwent Publications Ltd., London, GB; Class Q38, AN 91-367508/50 & SU-A-1 622 285 (BUILDING CONS RES) 23 January 1991	1,3,5,7	
A	* abstract * * figure *	6,8	
P,A	FR-A-2 676 217 (PRUDHOMME) * page 5, line 1 - page 6, line 5 * * figures *	1,3,5-7	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B66D B65H
Y	US-A-4 087 060 (LAKY ET AL.) * figure 3 * * column 2, line 22 - line 32 * * column 3, line I - line 20 *	2	
Y	SOVIET INVENTIONS ILLUSTRATED Section PQ, Week E34, 6 October 1982 Derwent Publications Ltd., London, GB; Class Q38, AN L3186 E/34 & SU-A-874 593 (AVILOV V YA) 28 October 1981	2	
A	* abstract * * figure *	5	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 AUGUST 1993	GUTHMULLER J.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 3918
Page 2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	FR-A-2 262 641 (GOTLIBOWICZ) * page 3, line 36 - page 4, line 21 * * page 4, line 33 - line 40 * * figure 1 * ---	1,7,8	
A	DE-C-413 673 (GESELLSCHAFT FÜR FÖRDERANLAGEN E.HECKEL M.B.H.) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 AUGUST 1993	GUTHMULLER J.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)