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

(11) EP 0 929 494 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
04.12.2002 Bulletin 2002/49

(21) Application number: **97943248.1**

(22) Date of filing: **09.09.1997**

(51) Int Cl.[7]: **B66B 9/02**, B66B 11/04

(86) International application number:
PCT/SE97/01514

(87) International publication number:
WO 98/014394 (09.04.1998 Gazette 1998/14)

(54) **A MECHANICAL CONTROL FOR A LIFT DRIVEN BY AN INTERNAL COMBUSTION ENGINE**

MECHANISCHE STEUERUNG FÜR EINEN VERBRENNUNGSMOTORGETRIEBENEN AUFZUG

COMMANDE MECANIQUE POUR ASCENSEUR M PAR UN MOTEUR A COMBUSTION INTERNE

(84) Designated Contracting States:
AT CH DE DK ES FI FR GB IT LI NL

(30) Priority: **30.09.1996 SE 9603568**

(43) Date of publication of application:
21.07.1999 Bulletin 1999/29

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EP 0 929 494 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to a mechanical control device for a lift powered by a combustion engine, more precisely, according to the preamble of claim 1, a control device for a lift having a lift cage carrying driving means, which comprise a clutch connected to the engine, the clutch being engageable in response to the speed of the combustion engine, and a brake which is released when the driving torque of the engine is transmitted to the driving means of the lift cage. The closest prior art is seen in US-A-3,804,208.

[0002] The lift is in particular intended to be used when inspecting and maintaining high (in the order of 100 m) transmission poles and the like, in order to transport service personnel along the pole. In this connection, one and the same lift cage is intended to be used for a group of poles and be transported between the poles to be mounted and demounted between the occasions when the lift cage is employed at each individual pole, each pole having a permanently mounted drive track (for instance a pin rack or a gear rack) with control means with which the driving means and the guide elements, respectively, of the lift cage engage.

[0003] The lift must have its own energy supply for its operation, since the normal electricity supply network is not available at the sites where the lift is to be utilized. Suitable motors for this purpose are combustion engines complete with a fuel tank (petrol tank). As is well known a great disadvantage of such motors as opposed to electric motors is that they are capable of producing only a small torque at low speeds. Therefore, measures have to be taken in order to prevent the combustion engine from connecting to the drive chain before a high enough speed and torque have been achieved. A solution of this problem is to utilize a clutch which is dependent upon speed and which engages the engine to the drive chain at a predetermined speed, at which the torque of the engine is high enough to run the lift cage along the drive track. Such a speed dependent clutch may for instance be constituted by a centrifugal clutch, which is a relatively inexpensive and reliable mechanical component for this purpose.

[0004] In addition to necessary gears and forward-backwards changeover switches there is also a brake connected to the drive chain which keeps the lift cage in a stop position between the movements along the drive track. In an inoperative state the brake is applied, whereas it is released by means of a brake control device when the lift is to be run along the drive track. This causes problems of the movements of the lift cage when starting the lift, since the braking and the increase in speed are effected by separate control devices and the release of the brake should take place synchronously with the actuation of the centrifugal clutch. Otherwise the start-up movement will be jerky. It is however difficult to manually achieve this synchronization of the movements of the throttle and the brake control device, and for this reason the starting-up tends to be uneven and uncontrolled.

[0005] The object of the invention is to provide a mechanical control device in a lift of the above mentioned kind, which eliminates the above mentioned problems and which therefore produces a gentle and controlled start-up of the lift movement.

[0006] This object is obtained by a control device according to the preamble of claim 1 having the features stated in the characterizing portion of claim 1.

[0007] By the fact that the fuel control means is interconnected to the operating means of the brake, in the manner stated, it is achieved that the brake always will be released at or somewhat over the engaging speed of the clutch. Consequently, every start-up interval will be even and gentle.

[0008] The fuel control means is suitably connected to a link which affects the fuel supply of the engine and has a cam which operates the brake control means to release the brake at a certain speed.

[0009] Preferably the fuel control means comprises a Bowden cable and, furthermore, in a suitable embodiment the above mentioned link is designed as a pivotable disc cam, which is pivoted by the fuel control means and connected to the fuel control means of the engine via a wire and comprises a cam surface on a side edge for controlling a cam follower connected to the brake.

[0010] An embodiment of the invention will be described in more detail with reference to the accompanying drawings, in which

[0011] Fig. 1 generally shows a side view of a lift cage with driving means, in which the invention is implemented,

[0012] Fig. 2 shows a front view of the carrier of the lift cage with driving means and associated guide elements and safety components,

[0013] Fig. 3 shows a front view of the control system for controlling the movement of the lift cage shown in Figs. 1 and 2 in a desired manner along the drive track, and

[0014] Fig. 4 shows on a large scale a detail of the control system shown in Fig. 3.

[0015] In Fig. 1 there is shown a type of lift cage 1 intended to be used when inspecting high transmission poles. The lift cage 1 is associated with a group of poles and is moved between the latter and comprises driving means of its own which in this case include a petrol-powered combustion engine complete with a petrol tank. The engine with its associated transmission chain are accumulated in protecting casings and are therefore not visible in this Figure. In the lift there are the usual guide means and safety devices, of which a catcher 3 can be seen in Fig. 1.

[0016] The lift is operated by a pin rack and a portion 5 of the pin rack is enclosed with the lift cage to be mounted together with the latter in a space arranged in a bottom section of each pole, in which a pin rack or gear rack track is mounted. This arrangement however

does not constitute any part of the present invention and therefore it will not be described in more detail, but is the subject of a separate application.

[0017] The design and arrangement of the driving means of the lift are evident from the front view according to Fig. 2, in which the lift cage has been removed. The lift cage 1 and the engine with transmissions are both arranged on a carrier frame 7, which carries guide means, such as guide rollers 9, 10, 11, 12, and safety devices, such as a catcher 3 and a centrifugal brake 13. These last mentioned components are of prior art design and therefore they will not be described in any further detail.

[0018] As a first stage in the drive assemblage there is a petrol driven combustion engine 15 with a fuel control 16 (see below) and a suitable gear reduction, a centrifugal clutch 17 connected to the engine 15, and a forward-backward switch 19 connected to an output clutch member of the centrifugal clutch 17. From said first stage follows a cardan shaft 21 with cardan joints 23 and 25, respectively, in both ends, an angular gear 27 and a worm gear 29 which drives the output gear 31 of the lift cage 1, which in operation engages the pin rack or gear rack of the pole in question. A brake 33, which normally is applied and which is connected to the input shaft of the angular gear 27, is released when the lift cage moves upwards and downwards the pole.

[0019] Let us now turn to Figs. 3 and 4 showing the control device of the lift in more detail, for controlling the movement of the lift cage along the drive track and constituting the part which is addressed by the present invention. A mono-lever 35 for determining both the driving direction and the speed is interposed in the lift cage and may suitably be constituted by the type frequently used for outboard motorboats for the determination of speed and forward-backward direction, for instance model A20 from IMO Morse Controls Ltd. It is provided with a manual operating lever, which is rotatable within a limited angular range and which in a vertical position has an idle position, which in Fig. 3 is denoted "N" while the upward direction is indicatd by "U" and the downward direction with "D". A counter clockwise turning of the operating lever affects a Bowden cable 41 to switch over the forward-backward switch 19 for moving the lift cage upwards at the same time as a second outgoing Bowden cable 39 connected to the fuel control 16 of the engine is influenced to increase the speed. When the operating lever 37 is turned clockwise from the idle position "N" the switch 19 is adjusted in a position in which the lift cage moves downwards and further turning of the lever 37 results in an increase in the speed of the engine 15. When the engine has achieved a certain speed, the engagement speed, the centrifugal clutch 17 is engaged, whereby the engine is connected to the drive chain.

[0020] To enable the lift cage 1 to move, however, the brake 33 must be released. This operation could be carried out by means of a control device specifically connected to the brake. However, it has been proven that the start-up often will be jerky, when the brake is released at the wrong moment. This is so because in order to achieve an even and gentle start-up it is required that the operation of the brake is carefully synchronized with the actuation of the centrifugal clutch, which is a delicate task difficult to carry out.

[0021] In accordance with the invention a control device therefore has been developed by means of which the release of the clutch 33 takes place in step with the actuation of the centrifugal clutch 17. Reference is now made to Fig. 4 which on a large scale shows the detail encircled in Fig. 3 but turned 90° relative to Fig. 3. A disc cam 47 is pivotable around a joint 59, which is carried by a holder having a substantially U-shaped cross section and which is fixed to the angular gear or any other detail on or in the carrier. On one side of the disc cam 47 in relation to the joint 59, one end of the Bowden cable for the speed control is hinged to an attachment point 55. At the other side of the joint 59 there is a wire 43, which is connected at its end, not shown, to the fuel control means 16 of the engine and which is attached to an attachment point 61.

[0022] Accordingly, when the disc cam 47 is brought to turn clockwise by operating the operating lever 37 in the speed increase direction, the gas wire 43 will be pulled out and in its turn operate the fuel control means 16 of the engine 15 to increase the speed.

[0023] The opposite side of the disc cam 47 is provided with a cam surface, against which a cam follower 49 with a cam roller 51 abuts. The cam follower 55 influences the operating means of the brake 33 to release the brake when the disc plate 47 is turned clockwise. At the same time the cam follower 49 is pressed by the brake, which strives to return to the position in which the brake is applied, against a cam curve 53 of the disc cam 47.

[0024] The cam curve 51 is adapted to the speed control of the engine 15 such that when the disc plate 47 starts to turn clockwise the brake 33 is gradually released, while the speed of the engine successively increases. When the disc cam 47 has been turned so far that the engine has reached the engagement speed of the centrifugal clutch 17 or a speed just exceeding that, the cam curve 51 is designed to have a maximum, so that the brake 33 is completely released in this position. By this synchronization with the centrifugal clutch 17, a controlled and gentle start-up phase is achieved without the lift cage 1 jerking. The reference numerals 64 and 66 in Fig. 3 show the positions of the operating lever 37 in which the engagement speed of the centrifugal clutch 17 is achieved and consequently, as is evident from the above mentioned, when the cam surface 51 of the disc cam 47 has lifted the cam follower 49 maximally, so that the brake 33 is completely released and the lift cage 1 starts to move upwards and downwards, respectively.

[0025] The movement of the lift is of course interrupted in the reverse order by putting the operating lever

back to the idle position.

[0026] Even if the exemplified embodiment shows a mono-lever operation of the lift movement and it is convenient to have such an operation, it is of course self-evident that a separate control device may be provided for choosing the direction of movement. Furthermore, it is possible to have other types of transmission mechanisms from the manual switch lever to the controlled elements than Bowden cables and wires. In such a case, a variety of link mechanism are conceivable. Even if a centrifugal clutch as mentioned above offers a simple and inexpensive solution to the problem of coupling the engine at a certain point of time, it is of course conceivable to use other designs of speed responsive clutches.

Claims

1. A mechanical control device for a lift powered by a combustion engine, with a lift cage (1) carrying control means (35, 37, 39, 41) and driving means for the movement of the lift cage, the mechanical control device comprising a fuel control means (16, 41, 43), a clutch (17) connected to the engine (15) and engageable with the engine in response to the speed of the latter, and a brake (33) with an operating means, the brake being applied in an inoperative state preventing movement of the lift cage (1), but being released during movement of the lift cage (1) to allow transmission of the torque of the engine to the drive means (31) of the lift cage, **characterized in that** the fuel control means is connected to a movable link (47) with an activation element (53) connected to the operating means of the brake (33) and designed such that when moving the fuel control means to a position substantially corresponding to the speed of the engine (15) which causes engagement of the clutch (17), the fuel control means influences the operating means of the brake (33) to release the brake (33), so that the lift cage starts to move.

2. A mechanical control device according to claim 1, **characterized in that** the movable link is constituted by a pivotable disc cam (47) comprising a cam surface (51) influencing a cam follower (49), which in its turn influences the operating means of the brake (33), and that the disc cam (47) is connected to a throttle (16) of the engine (15) by means of a coupling link (43), which influences said engine throttle (16) when the disc cam (47) is turned.

3. A mechanical control device according to claim 2, **characterized in that** the coupling link is a wire (43).

4. A mechanical control device according to claim 1, 2 or 3, **characterized in that** the speed responsive clutch is a centrifugal clutch (17).

5. A mechanical control device according to any of claims 1-4, **characterized in that** the movements of the lift cage are controlled by a mono-lever operation member with two outputs, one output of which (41) is connected to a forward-backward switch of the driving means and the other output of which is a part of the fuel control means (39).

6. A mechanical control device according to claim 5, **characterized in that** the outputs from the mono-lever operation member (35) are constituted by Bowden cables (39, 41).

Patentansprüche

1. Mechanische Steuervorrichtung für einen durch einen Verbrennungsmotor angetriebenen Aufzug mit einer Aufzugskabine (1), die Steuermittel (35, 37, 39, 41) und Antriebsmittel für die Bewegung der Aufzugskabine trägt, wobei die mechanische Steuervorrichtung aufweist:

   ein Brennstoffsteuermittel (16, 41, 43),
   eine mit dem Motor (15) verbundene und mit dem Motor in Reaktion auf dessen Drehzahl einkuppelbare, Kupplung (17) und
   eine Bremse (33) mit einem Betätigungsmittel, wobei die Bremse in einen Nichtbetrieb-Zustand versetzt ist, wobei die Bewegung der Aufzugskabine (1) verhindert ist, jedoch während der Bewegung der Aufzugskabine (1) gelöst ist, um die Übertragung des Drehmoments vom Motor zum Antriebsmittel (31) der Aufzugskabine zu ermöglichen,

   dadurch gekennzeichnet, dass das Brennstoffsteuermittel verbunden ist mit einem bewegbaren Verbindungsteil (47) mit einem Aktivierungs-Element (53), das mit dem Betätigungsmittel der Bremse (33) verbunden ist und derart gestaltet ist, dass, wenn das Brennstoffsteuermittel in eine Position bewegt ist, die im Wesentlichen jener Drehzahl des Motors (15) entspricht, die das Eingreifen der Kupplung (17) verursacht, das Brennstoffsteuermittel das Betätigungsmittel der Bremse (33) beeinflusst, um die Bremse (33) zu lösen, so dass die Aufzugskabine beginnt sich zu bewegen.

2. Mechanische Steuervorrichtung gemäß Anspruch 1,

   dadurch gekennzeichnet, dass das bewegbare Verbindungsteil von einer drehbaren Nockenscheibe (47) gebildet wird, die eine Nockenfläche (51) aufweist, die ein Nockenmitnahmeteil (49) beeinflusst, welches seinerseits das Betätigungsmit-

tel der Bremse (33) beeinflusst, und dass die Nokkenscheibe (47) mittels eines Kopplungsteils (43) mit einer Drossel (16) des Motors (15) gekoppelt ist, welches die Motordrossel (16) beeinflusst, wenn die Nockenscheibe (47) gedreht wird.

3. Mechanische Steuervorrichtung gemäß Anspruch 2,
dadurch gekennzeichnet, dass das Kopplungsteil ein Draht (43) ist.

4. Mechanische Steuervorrichtung gemäß einem der Ansprüche 1, 2 oder 3,
dadurch gekennzeichnet, dass die drehzahlansprechende Kupplung eine Zentrifugalkupplung (17) ist.

5. Mechanische Steuervorrichtung gemäß einem der Ansprüche 1 bis 4,
dadurch gekennzeichnet, dass die Bewegungen der Aufzugskabine über ein Mono-Hebel-Bedienelement mit zwei Ausgängen gesteuert werden, wobei einer dieser Ausgänge (41) an einen Vorwärts-Rückwärtsschalter des Antriebsmittels gekuppelt ist und der andere dieser Ausgänge ein Teil des Brennstoffsteuermittels (39) ist.

6. Mechanische Steuervorrichtung gemäß Anspruch 5,
dadurch gekennzeichnet, dass die Ausgänge des Mono-Hebel-Bedienelements (35) von Bowdenzügen (39, 41) gebildet sind.

Revendications

1. Dispositif de commande mécanique pour un ascenseur entraîné par un moteur à combustion, comportant une cage d'ascenseur (1) portant des moyens de commande (35, 37, 39, 41) et des moyens d'entraînement pour le mouvement de déplacement de la cage d'ascenseur, le dispositif de commande mécanique comprenant des moyens de commande de combustible (16, 41, 43), un embrayage (17) relié au moteur (15) et qui est susceptible d'être enclenché avec le moteur en réponse à la vitesse de ce dernier, et un frein (33) comportant un moyen d'actionnement, le frein étant appliqué dans un état de non fonctionnement empêchant le mouvement de déplacement de la cage d'ascenseur (1), mais étant libéré pendant le mouvement de déplacement de la cage d'ascenseur (1) de façon à permettre la transmission du couple du moteur aux moyens d'entraînement (31) de la cage d'ascenseur, **caractérisé en ce que** les moyens de commande de combustible sont reliés à une liaison mobile (47) via un élément de déclenchement (53) relié au moyen d'actionnement du frein (33) et conçu de telle sorte que lorsque les moyens de commande de combustible sont déplacés vers une position correspondant sensiblement à la vitesse du moteur (15) qui provoque l'enclenchement de l'embrayage (17), les moyens de commande de combustible agissent sur le moyen d'actionnement du frein (33) de façon à libérer le frein (33), de sorte que la cage d'ascenseur commence à se déplacer.

2. Dispositif de commande mécanique selon la revendication 1, **caractérisé en ce que** la liaison mobile est constituée par une came en forme de disque pivotant (47) comprenant une surface de came (51) agissant sur un suiveur de came (49), qui à son tour agit sur le moyen d'actionnement du frein (33), et **en ce que** la came en forme de disque (47) est reliée à un obturateur (16) du moteur (15) au moyen d'une liaison de couplage (43), qui agit sur ledit obturateur (16) du moteur lorsque la came en forme de disque (47) est entraînée en rotation.

3. Dispositif de commande mécanique selon la revendication 2, **caractérisé en ce que** ladite liaison de couplage est un câble (43).

4. Dispositif de commande mécanique selon la revendication 1, 2 ou 3, **caractérisé en ce que** l'embrayage sensible à la vitesse est un embrayage centrifuge (17).

5. Dispositif de commande mécanique selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** les mouvements de déplacement de la cage d'ascenseur sont commandés par un organe d'actionnement à levier unique comportant deux sorties, dont une sortie (41) est reliée à un commutateur marche avant/marche arrière du moyen d'entraînement et dont l'autre sortie constitue une partie des moyens de commande de combustible (39).

6. Dispositif de commande mécanique selon la revendication 5, **caractérisé en ce que** les sorties de l'organe d'actionnement à levier unique (35) sont constituées par des câbles Bowden (39, 41).

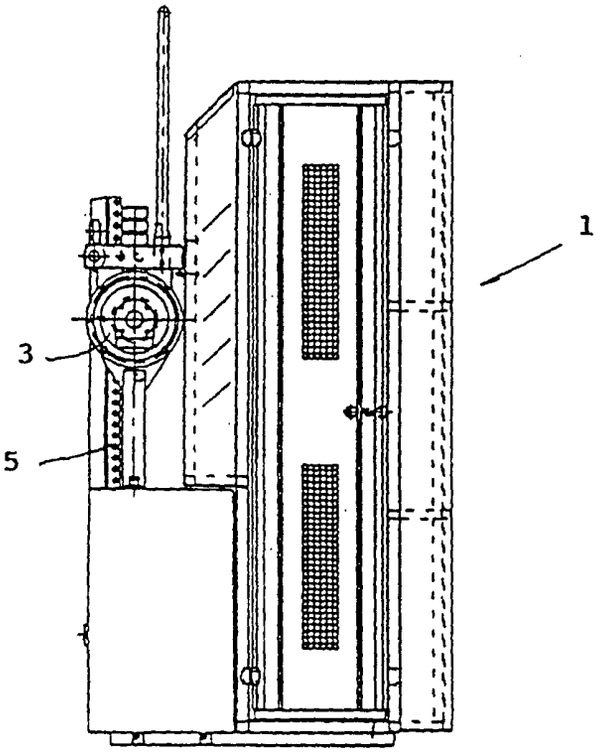

FIG. 1

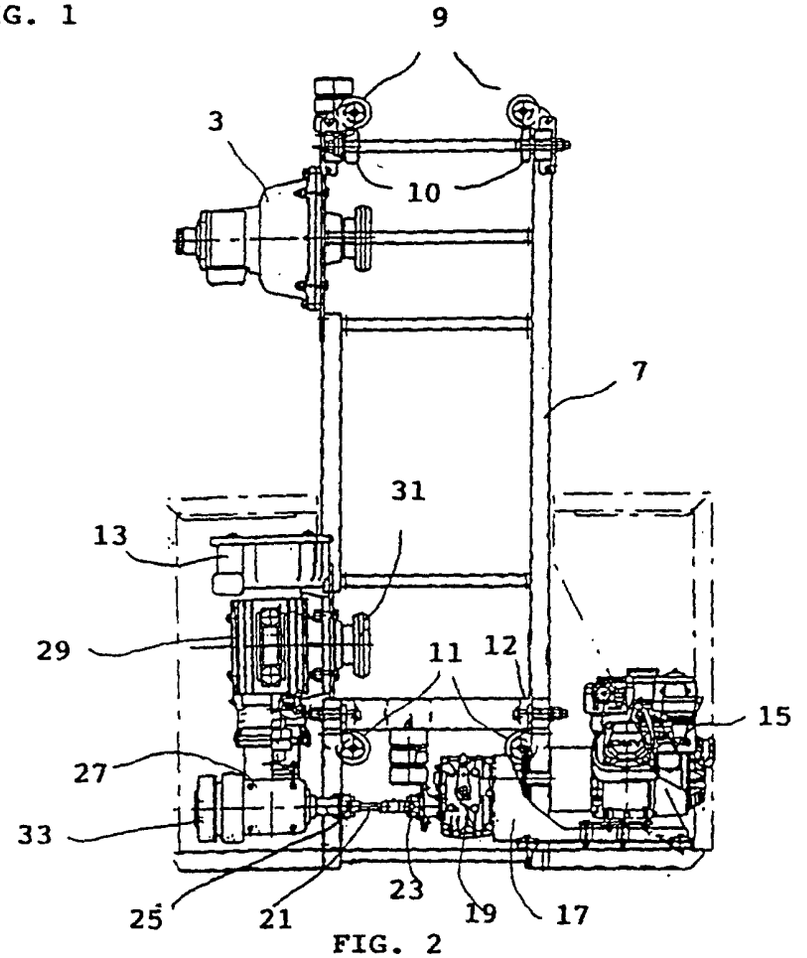

FIG. 2

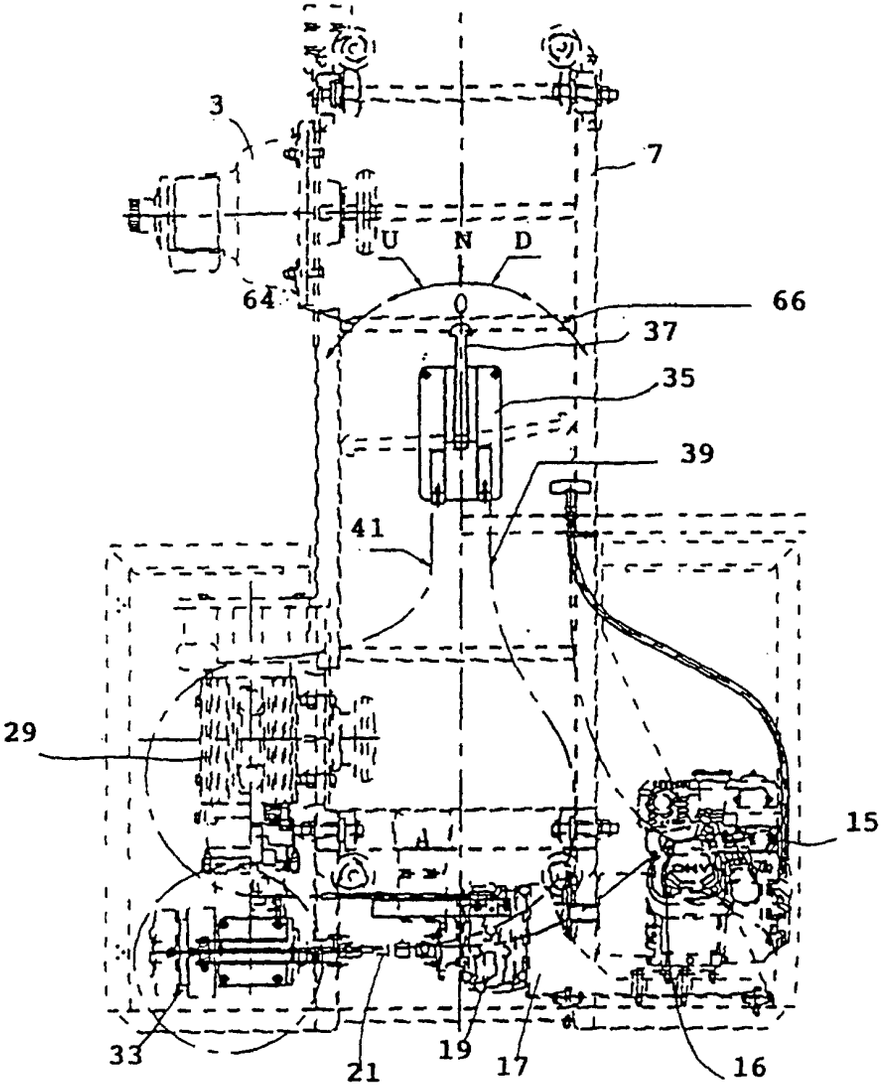
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FIG. 3

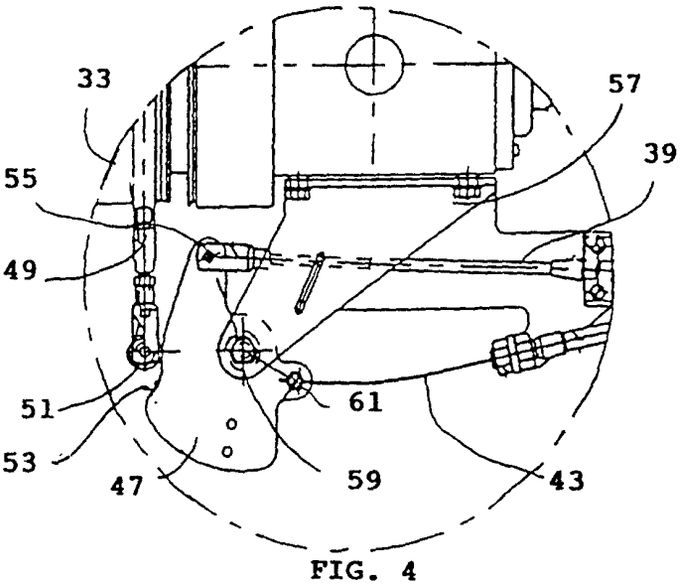
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FIG. 4