

March 14, 1944.

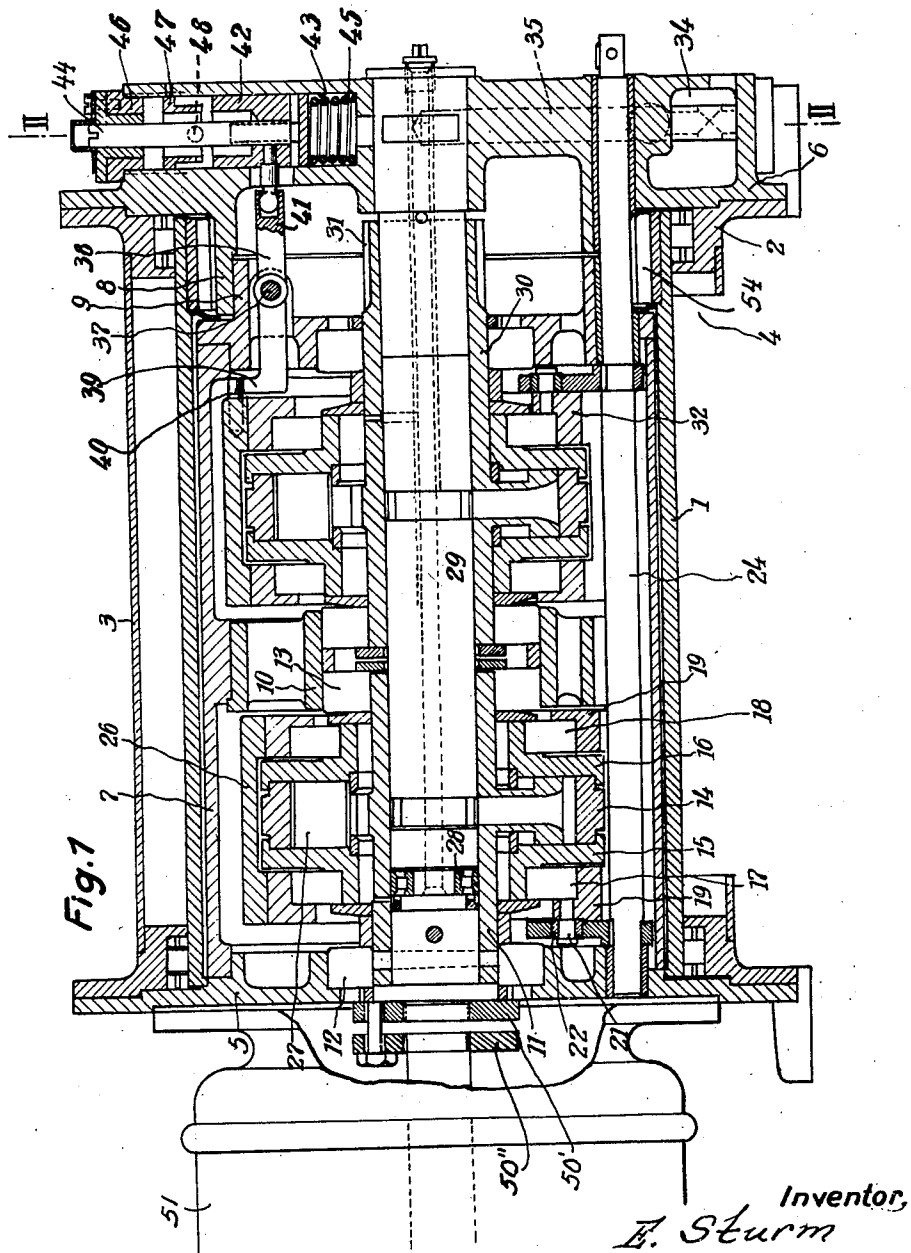
E. STURM

2,344,115

ROPE DRUM WITH REGULABLE HYDRAULIC DRIVE ESPECIALLY FOR LIFTS

Filed Nov. 16, 1939

2 Sheets-Sheet 1



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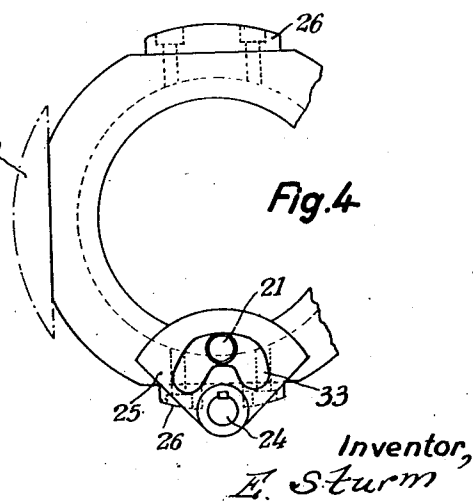
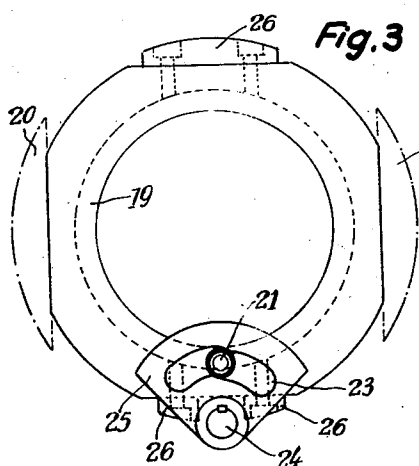
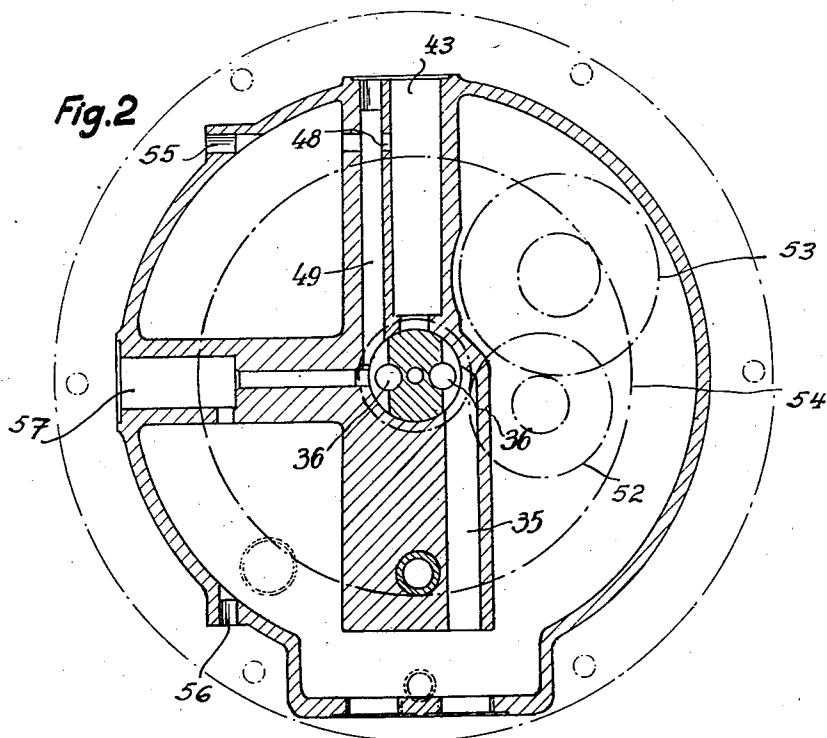
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ROPE DRUM WITH REGULABLE HYDRAULIC DRIVE ESPECIALLY FOR LIFTS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,344,115

ROPE DRUM WITH REGULABLE HYDRAULIC
DRIVE, ESPECIALLY FOR LIFTSErwin Sturm, Boll, near Goppingen, Germany;
vested in the Alien Property CustodianApplication November 16, 1939, Serial No. 304,820
In Germany November 17, 1938

6 Claims. (Cl. 254—173)

This invention relates to a rope drum, especially for lifts having a regulable hydraulic drive. Regulable drives require in general additional implements to be attached especially outside of the rope drum. These arrangements necessitate, therefore, a comparatively large space for housing them and cannot, in consequence thereof, be employed in cases in which only a small place is available.

The present invention is based on the discovery that hydraulic drives comprising, with consideration to their comparatively easy regulation, a pump and a motor are particularly suited to be placed into the interior of the rope drum in that this affords the possibility to arrange also the regulating device within said drum.

Besides this characteristic feature of the invention, another characteristic feature consists therein that the regulating device located within the rope drum is provided with a control shaft extending parallel to the axle of the driving gear, this shaft being coupled with the motor or with the pump or with both these parts by the intermediary of suitable control members, for instance cam disks or the like. Arranging the gearing, including the control device, within the rope drum, renders it possible to attain certain further important advantages, as will appear from the detailed description of certain particular constructional forms dealt with hereinafter.

The invention comprises, however, also a particular design of the regulating device itself, in that in this device the maximum speed accommodates itself automatically to the load at the time being. For this purpose, the regulating device is, according to this invention, provided with either only one abutment member or with a plurality of such members, said member or members projecting in the path, which is traversed by the control shaft or by the fluid motor during regulation, and so limiting the extent of its displacement and therefore of the velocity of the gear, depending upon the weight of the load at the time being.

The invention is illustrated diagrammatically and by way of example in the accompanying drawings in which Figure 1 shows a longitudinal section through a rope drum designed according to this invention. Figure 2 shows a transverse section in the plane II—II of Fig. 1, a few parts being omitted in this figure. Figure 3 is a plan of the control part of the pump, and Fig. 4 is a plan of the control part of the motor.

In the drawings, 1 (Fig. 1) denotes the rope drum which is supported in the usual manner

in a casing 2, the shell 3 of which is provided with a longitudinal slot 4 for the passage of the rope. The casing 2 is closed at its frontal ends by means of flanged covers 5 and 6. The cover 5 constitutes a rigid bearing for the casing 7 of the hydraulic gearing, and the cover 6 is provided with a cylindrical collar 8 forming a bearing for a cylindrical extension 9 of the casing 7 and permitting an axial displacement of said extension. The casing 7 embraces with its middle portion an annular member 10 which may be integral with said casing. Said member 10 divides the casing into two parts, of which that on the left side serves for the reception of the pump and that on the right side serves for the reception of the motor.

The blade drum 11 of the pump is mounted in a race bearing 13 abutting on the annular member 10. The hub part of the blade drum 11 carries a clutch member 50' which is taken along by the clutch member 50'' which is mounted on the shaft of an electric motor provided on the flange cover 5. The blade drum 11 is enclosed by a casing that is adjustable eccentrically with respect to the drum and consists of a ring 14 provided with lateral covers 15 and 16. These covers have rim flanges and abut on the supporting frame 19 by the intermediary of race bearings 17 and 18, which are displaceable radially with respect to the gearing axle in guides 20 (Fig. 3).

The supporting frame 19 shown in the left-hand half of Fig. 1 is provided with a pivot 21 engaging a curved slot 23 across a race socket 22 provided in a disk piece 25 keyed to the control shaft 24. The control shaft is supported in the covers 5 and 6 and can be adjusted by means of a hand wheel (not shown). The extent of the displacement of the supporting frames 19, which are rigidly connected with one another by webs 26, upon turning of the control shaft, is determined by the shape of the curved slots 23.

With the chamber formed by the casing surrounding the drum are arranged in known manner the blade pistons 27, of which one is visible in Fig. 1. Within the drum 11 is provided a guide axle 29 that abuts on a roller bearing and is rigidly supported at one of its ends in the flange 6.

The hydraulic motor shown in the right-hand half of Fig. 1 is designed similar to the pump so that no detailed description of its construction is necessary, but I mention, anyhow, separately that the projecting end of the drum 30 is provided with a toothing 31 meshing with gear wheels arranged in a chamber provided in the flange

6. The toothing 31 engages in the large wheel of a pair of toothed wheels 52, the small wheel thereof taking along by means of a further pair of toothed wheels 53 the spur ring 54 connected to the rope drum. The control means for the supporting frame 32 correspond, as regards their construction, substantially with those provided for the supporting frame 19, there existing only that one difference that the shape of the curved slot 33 (Fig. 4) is accommodated to the motor. The control slots 23 and 33 are so designed that the control of the pump and of the motor can be effected with the aid of only one control shaft. With such a one-lever control, the conditions are preferably such that in the idle running position of the control lever, in which the delivery of the pump is the smallest and also the adjusted eccentricity of the pump is the smallest, the absorption capacity and also the adjusted eccentricity of the fluid motor has attained its maximum value. If the gearing is set in motion from the idle running position, the eccentricity of the pump is first increased by the control and only after the delivery of the pump is adequately increased, the eccentricity of the motor will then be decreased during the further operation of the control shaft. This order of the regulation is attainable without difficulty by a suitable shape or form of the control slots 23, 33.

In order to obtain space for housing the requisite amount of the driving agent, the chamber 34 provided in the flanged cover 6 and containing the gear wheels is made use of for said purpose. This chamber communicates with the working spaces of the pump and the motor through vertical bore 35, as well as through bores 36 extending axially through the guide axle 29, on the suction side and on the pressure side respectively.

In the gear casing is provided a journal 37 for a two-armed lever 38, the end 39 of which cooperates with an abutment member 40 secured to the supporting frame of the hydraulic motor, whereby the extent of the eccentric adjustment of the motor is determined. The other end (41) of said lever 38 engages across a ball clutch a piston 42 supported radially shiftable with respect to the gear axle in a bore 45 of the cover 6. The piston 42 abuts across a screw-threaded pin 44 that is adjustable from the outside on a compressive spring 45. The bore containing the piston 42 is closed by means of a screw-threaded cover 46. An externally screw-threaded sleeve 47 which can be fixed in its normal position serves as an end abutment for the piston 42. The space above this piston communicates through a hole 48 and a conduit 49 (Fig. 2) with that passage of the two conduits 36 at left, which serves as pressure passage, while the passage at right is the suction passage. The end of conduit 49 as well as the bores 55, 56 are closed by plugs. 57 is a hole, which receives a safety valve, which is not substantial with regard to the invention and therefore not shown.

The manner of operation of the device is as described hereinafter, but I abstain from describing also the manner of operation of the gearing as this is known and does not form a part of the present invention.

By turning the control shaft 24 first the pump is caused to supply the driving agent to the motor so as to start same, but owing to the weight of the load to be lifted the driving agent is subjected to a pressure which is higher than the pressure existing at idle running. The thus increased

pressure of the driving agent acts upon the piston 42 by which the two-armed lever 38 and, thus, also the limiting abutment members 39 are adjusted counter to the action of the spring 45, the adjustment corresponding with the weight of the load existing at the time being. When now the control shaft is further turned, first the pump is adjusted to its maximum eccentricity and thereafter the eccentricity of the motor is decreased as far as the limiting abutment member allows depending upon the weight of the load at the time being.

From Fig. 2 it will be apparent that the channel 48 communicates with the pressure pipe 36 so that the pressure of the driving fluid acts through the channel 48 on the upper side of the regulating piston 42. According to the prevailing fluid pressure, which depends on the load of the rope drum, the piston 42 will be displaced against the spring 45 and thereby rock more or less the two-armed lever 38. The end 39 of this lever, which acts as an abutment, will therefore limit the displacement of the adjustable part of the fluid motor so that the adjustable minimum value of the eccentricity of the fluid motor is higher (and the adjustable maximum velocity is lower) the greater the present load of the rope drum.

I claim:

1. A rope drum in combination with a hydraulic gear, said gear comprising a rotary pump driven by a machine arranged outside the drum, a rotary fluid motor connected to the pump and driving said drum, said pump and said motor being arranged in axial coincidence within the drum and each of them provided with radial guides so as to be regulated by radial displacement, said hydraulic gear being housed in a cylindrical casing, which is fixedly arranged within said drum, a control shaft, for regulating said pump and said motor by radial displacement, said control shaft arranged parallel to the axis of the drum within said cylindrical casing of said gear.

2. A rope drum in combination with a hydraulic gear, said drum arranged in a casing, which comprises an outer shell provided with frontal covers, said gear comprising a rotary pump driven by a machine arranged outside the drum, a rotary fluid motor connected to the pump and driving said drum, said pump and said motor being arranged in axial coincidence within the drum and each of them provided with radial guides so as to be regulated by radial displacement, said hydraulic gear being housed in a cylindrical casing, which is fixedly arranged within said drum, a control shaft for regulating said pump and said motor by radial displacement, said control shaft arranged parallel to the axis of the drum within said cylindrical casing of said gear, and rotatably supported in said frontal covers of said outer shell.

3. A rope drum in combination with a hydraulic gear, said drum arranged in a casing, which comprises an outer shell provided with frontal covers, said gear comprising a rotary pump driven by a machine arranged outside the drum, a rotary fluid motor connected to the pump and driving said drum, said pump and said motor being arranged in axial coincidence within the drum and each of them provided with radial guides so as to be regulated by radial displacement, said hydraulic gear being housed in a cylindrical casing, which is fixedly arranged within said drum, intermediate gear wheels transmitting the rotation of said fluid motor to an inner spur ring connected to said drum, one of said

frontal covers forming an inner chamber surrounding said gear wheels and containing in its lower part the driving fluid, a control shaft for regulating said pump and said motor by radial displacement, said control shaft arranged parallel to the axis of the drum within said cylindrical casing of said gear, and rotatably supported in said frontal covers of said outer shell.

4. A rope drum in combination with a hydraulic gear, said drum arranged in a casing, which comprises an outer shell provided with frontal covers, said gear comprising a rotary pump driven by a machine arranged outside the drum, a rotary fluid motor connected to the pump and driving said drum, said pump and said motor being arranged in axial coincidence within the drum and each of them provided with radial guides so as to be regulated by radial displacement, said hydraulic gear being housed in a cylindrical casing, which is fixedly arranged within said drum, intermediate gear wheels transmitting the rotation of said fluid motor to an inner spur ring connected to said drum, one of said frontal covers forming an inner chamber surrounding said gear wheels and containing in its

lower part the driving fluid, a control shaft for regulating said pump and said motor by radial displacement, said control shaft arranged parallel to the axis of the drum within said cylindrical casing of said gear, and rotatably supported in said frontal covers of said outer shell, one of said covers supporting a central journal, said journal traversing the rotating parts of said pump and said fluid motor and provided with axial passages communicating said pump and said fluid motor with said chamber.

5. A rope drum as claimed in claim 1, a cam-disk piece or a plurality of such pieces keyed to said shaft, and a pivot or pivots engaging said piece or pieces and projecting from the supporting frame of the pump or the motor.

6. A rope drum as claimed in claim 1, comprising a device, which is controlled by the pressure of the driving fluid and provided with an abutment member, said member projecting in the displacing path of said fluid motor so as to limit during regulation the extent of its displacement and therefore the velocity of said gear depending upon the weight of the load at the time being.

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