

Device for clamping hydraulic-cylinder rod from spontaneous sinking

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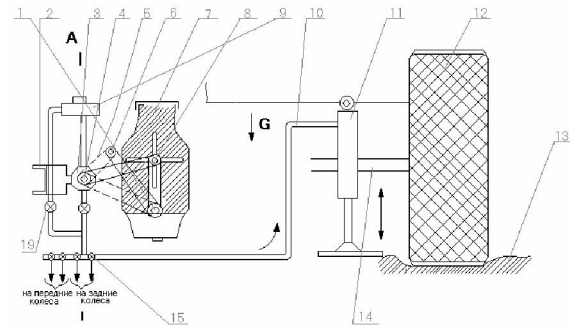
Abstract. The article discusses a device by means of which there is a fixation of a hydraulic cylinder rod after hanging wheeled vehicle's axis to perform maintenance or getting out the axis from the track in rainy weather. This device prevents spontaneous lowering of the hydraulic cylinder rod while hanging the machine axis, and also can be used in hoisting mechanism of car bodies and dump trailers, excluding injury of the wheeled vehicle operator at a sudden lowering of the hydraulic cylinder rod. The use of the device - clamp allowed to increase efficiency of wheeled vehicles use for 7-9% and for 100% avoid spontaneous lowering of hydraulic cylinder rod.

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Keywords: wheeled vehicle, hydraulic cylinder, hydraulic-cylinder rod, clamp, injury risk, machine centerlines, maintenance and repair of the machine.

Introduction

When operating wheeled vehicle of agriculture purposes, on the field and dirt roads in the rainy weather, car wheels often fall into a track pit. Steering and drive axles «bump» into the ground, and the movement becomes impossible. It takes a long time to get out of this pit, wasting a lot of efforts and energy. Sometimes, in the absence of materials on hand, drive out of a car from the rut is only possible with the help of another vehicle (tractor, hauler, etc.). Existing electronic systems in this case cannot overcome these difficult conditions [1, 2]. Sometimes operator of a mobile wheeled machine has to overcome 15...20 miles foot distance to find the right hauler. It takes a lot of time. Besides the operation of «pulling out» the machine using a hauler and wire rope is a certain risk injury, especially when the cable is broken. Displaying wheels with the help of jacks in order to place materials on hand under the wheels (twigs, branches, tree trunks, rocks, etc.) is very difficult and dangerous. The danger is that the ground, on which the jack is installed, basically has a big settlement, and because of this, the machine can break away from the latter and injure the operator or other person involved in this operation. In addition, the driver while being under the car experience great discomfort due to the dirt, water, winds and low temperature in the cold season. The solution to this problem is partially solved by scientists from Chelyabinsk State Agro engineering Academy. They offer simple device for displaying wheels of the stuck car [3, 4] (Figure 1).

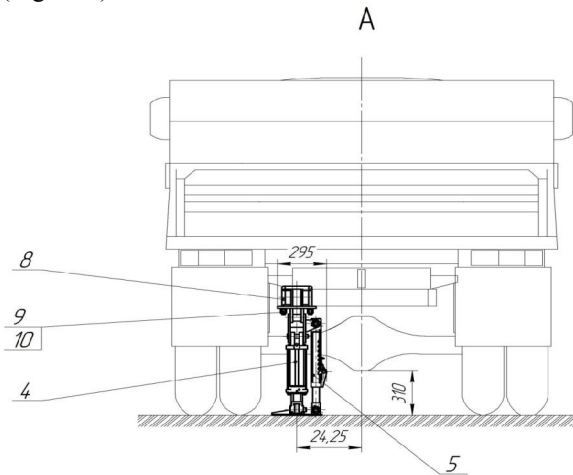


1 - crank pulley, 2 - car frame, 3 - oil pump gear, 4 - pressure oil pump gear pulley, 5 - drive belt of pulley pump gear, alternator pulley 6 - alternator pulley, 7 - engine, 8 - pump drive pulley of fan blading, 9 - oil box, 10 - oil lead, 11 - actuator, 12 - traction wheel, 13 - ground, 14 - drive axles, 15 - oil cock (spools), 16 - car body, 19 - solenoid-operated valve.

Figure 1 - Ladder diagram of the device for displaying wheels of the stuck car

However, for long term use of this device it may get out of order as a result of hermeticity failure of hose groups, gasket or other elements of the hydraulic system [5, 6]. This fact may lead to a fluent or abrupt lowering of the hydraulic cylinder rod and to the injure of the wheeled vehicles operator or to the accident at the moment of placing the material at hand under the traction wheels or while performing servicing, repair while arising machine centerline. This issue also can be solved by preventing this failure by using appropriate electronic systems [7, 8, 9]. But in our case to solve this problem, it is offered to use the device - clamp 5 for clamping the hydraulic cylinder rod, with which there is no danger

of spontaneous lowering of the hydraulic cylinder rod (Figure 2).

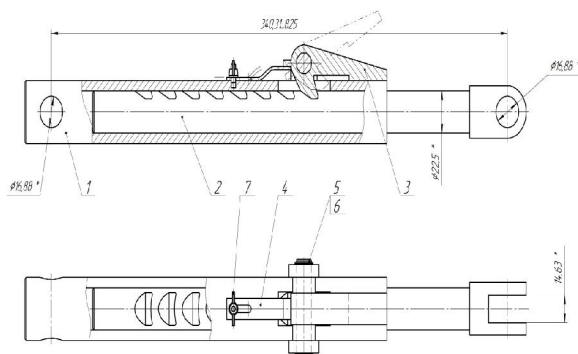


4 - hydraulic cylinder, 5 - clumper, 8 - car frame, 9,10, - attachment brackets of hydraulic cylinder.

Figure 2 - Ladder diagram of the device for displaying wheels of the car with the clumper

Clumper connects close to the main hydraulic cylinder 4 on the frame or axle, depending on the design features of wheeled vehicles.

The device - clumper is a cylinder 1 (Figure 3) inside of which rod with teeth and a solid neck is placed 2. Fixture 4, on which the ratchet wheel 3 bears against is connected with the clumper's bulk. The ratchet wheel is connected on the centerline 5. Rod's teeth 2 are located opposite to each other. Analogously on this rod from the other side of the teeth there are necks which have a greater depth of 5 mm than the teeth depth. In the bulk - of the cylinder there is an oval hole through which the ratchet wheel leads against the rod's teeth. The ratchet wheel itself is sprung in the upward direction.



1 - Cylinder of the clumper, 2 - Rod with teeth and solid neck, 3 - The ratchet wheel, 4 - Fixture of the ratchet wheel, 5 - Centerline of the ratchet wheel.

Figure 3. The device - clumper

The device - clumper works in the following way. When moving the hydraulic cylinder's rod down (arising of the wheeled vehicle's axle), it pulls over the rod from the cylinder's bulk. The clumper's - rod devices, while moving down constantly hitting the ratchet wheel with their teeth, puts it down. Once the rod stops, the ratchet wheel rising upward by spring force comes into catching with the rod and blocks it out. While the gradual or sudden lowering of the hydraulic cylinder's rod, the ratchet wheel mechanism will prevent downfall of the centerline or axle WV. In this case the load will be transmitted through a wooden leg, clumper's rod, ratchet wheel, ratchet wheel's centerline, and the device - clumper's bulk on the centerline or wheeled vehicle's frame, excluding the effect of hydraulic adaptation for displaying wheel or machine's axle [10].

To lower the WV into the transport position, it is necessary to turn the clumper's rod to 90 degrees. In this case, the ratchet wheel will be not in the tooth cavity, but in the cavity of the solid neck, excluding the catching, ensuring unhampered return of the hydraulic cylinder's rod to its original position. After returning wheeled vehicles into the transport position, it is necessary once again to turn the clumper's rod to 90 degrees with the teeth to the ratchet wheel.

By using this device - clumper it allows to ensure the clamp of the hydraulic cylinder's rod when centerline or axle of wheeled vehicles are lift, as well as in the arising position and thus safely perform various types of work related to maintenance and repair [11].

Besides the above the device - clumper can be used in tilting mechanisms on hydraulic cylinders, in mobile vehicles for agricultural purposes GAZ, ZIL, KAMAZ and trailers with hydraulic lifting body.

Preliminary testing of the offered device - clumper gives the opportunity to improve efficiency of using wheeled vehicles by 7-9% and to avoid spontaneous sinking of the hydraulic cylinder's rod by 100%.

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