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"APPARATUS FOR RAISING AND LOWERING
A RAMP ON A FLOATING BRIDGE"

The invention relates to an apparatus for raising and lowering ramps on floating bridges and also parts of floating bridges. The use of the this apparatus is particularly intended for floating bridges which do not have their own power supplies for operating such an apparatus.

A known apparatus of this type essentially has a manually operated hydraulic piston pump which is connected without bursting protection to a unpressurised hydraulic tank or reservoir of open construction. The piston in the hydraulic cylinder has unequal piston areas. Flexible tubes or hoses are provided for connecting the hydraulic piston pump to the reservoir.

An apparatus of this type appears to be readily usable in the low-pressure and medium-pressure range between 0 and 80 bars. In this case the ramp is raised via the hand pump actuated by means of a hand lever.

However, if the ramp is subjected to a live load,

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for example upon being traversed by a tank, when this latter travels over the coupling point between bridge section and ramp section a high pressure of about 500 bars is created. This high pressure is transmitted via the hydraulic hoses as far as the piston pump. During movement and loading of the hydraulic cylinder, unequal quantities of the hydraulic fluid flow from the hydraulic cylinder to the hydraulic reservoir and vice versa. This means that, in the event of the leakages inevitably occurring under such high pressures, hydraulic oil enters the water supporting and surrounding the floating bridge and thus pollutes it.

Furthermore, it is necessary for the oil reservoir of the ramp to be sealed by means of sealing screws for road transport. If these sealing screws on the hydraulic-oil reservoir are not released before actuation of the apparatus and use of the ramp, this operating error results in bursting of the hydraulic-oil reservoir and in correspondingly massive environmental pollution. Moreover, further operating errors are possible as a result of the unprotected switch positions of the hand pump.

Accordingly, the invention is based on the object of so developing an apparatus of this type for raising and lowering ramps on floating bridges that the above-mentioned disadvantages of the known apparatus are obviated; i.e. above all no environmental pollution occurs in the event of possible leakages which are unavoidable in the

long run. Furthermore, quite generally it is intended to make the apparatus more reliable and simpler to operate.

The invention achieves the object set, starting from the apparatus described above, with an apparatus of this type in which the hydraulic cylinder is designed as a balanced cylinder with a piston having equal surface areas, a non-return valve and a pressure-limiting valve both being arranged directly on the hydraulic cylinder on its high-pressure side, and the hydraulic-oil reservoir being designed as a closed pressure tank or vessel with pressure-connection valves.

If two identical apparatuses are provided for operating the ramp, compensating ducts are advantageously arranged between them.

As a result of the piston design chosen, equal amounts of hydraulic fluid enter and leave when a load is applied on either side of the hydraulic cylinder. Because of the valves provided, the high pressure occurring when a vehicle travels over the coupling point is not transmitted via the connecting hoses as far as the pump. One cause for the formation of leakages is above all eliminated thereby. Nevertheless, if such leakages do occur, the outflow of hydraulic fluid is minimal in relation to the connecting hoses acted upon with high pressures. Since no variations in volume occur in the hydraulic reservoir because of the balanced cylinder, it is possible for the reservoir to be designed as closed.

vessel. Therefore, the possibility of operating errors is eliminated, such as those described above with respect to the known state of prior art. The design as a pressure tank is effected so as to protect against possible
5 differences in volume caused by corresponding temperature differences and the like.

The preferably provided compensating ducts, in the case of two identical apparatuses, make it possible to compensate for different outputs of the two manually
10 operated pumps.

The following is a description of one embodiment of the subject-matter of the invention illustrate purely diagrammatically, is made by way of example and with reference 1 to the accompanying drawings; of which:

15 Figure 1 is a side view of the region of a ramp in which the apparatus according to the invention is disposed, the lateral ramp covering being cutaway in the region of the apparatus; and

Figure 2 represents the circuit diagram of the
20 entire apparatus with two parallel-connected individual apparatuses.

A ramp 2 is articulated to a floating body 1, for example the end pontoon of a floating bridge consisting of floating pontoons. The ramp can be pivoted about
25 the articulation point or the pivot axis 3 so that it can compensate for the respective differences in height between the deck 4 of the floating body 1 and the adjacent

bank. For raising and lowering this ramp 2 there is provided a manually operated apparatus which essentially comprises a hydraulic piston pump 5, which can be actuated by an operator via a lever system 6, and a hydraulic
 5 cylinder 8 which can be acted upon by the pump 5.

The hydraulic cylinder 8 is designed as a double-acting working cylinder. The cylinder is articulated, on the one hand, at 9 to the ramp and the piston, on the other hand, is articulated at 10 to the floating body 1.

10 The hydraulic circuit is illustrated in Figure 2, in which case the preferred embodiment is represented having two identical apparatus which are correspondingly interconnected.

The hand pump 5 is protected on each side with
 15 non-return valves 11 and 12. Furthermore, an excess-pressure valve 13 acting as a pressure-limited valve is provided. The hand pump 5 is in communication with an oil reservoir 14 and with a multi-way valve 15 with four valve positions I, II, III and IV. In position II the
 20 ramp is lowered, and in position III the ramp is raised. Position I is provided for transport and crossing. In position IV it is possible for the ramp to be rapidly lowered. In the intake duct of the hand pump 5 a suction filter 16 is provided in the oil reservoir 14. Moreover,
 25 the oil reservoir 14 is provided with a ventilation valve 17 and a pressure-limiting valve 18. A measuring connection 19 is provided in the line between the hand

pump 5 and the multi-way valve 15.

A duct leads from the multi-way valve 15 to one side of the double -acting working cylinder 8 and a further duct leads to the other side thereof. This hydraulic cylinder 8 is likewise provided with an excess-pressure valve 20 acting as pressure-limited valve, with a check or stop valve 21 and with a measuring connection 22, which latter at the same time serves as a venting valve.

The hydraulic cylinder 8 is designed as a balanced cylinder with a piston 23 with equal surface areas. The hydraulic-oil reservoir 14 is designed as a closed pressure tank.

The illustrated completely identical apparatuses are interconnected via connecting ducts: a connecting duct 24 with couplings 25 and serving as compensating duct is provided between the two hydraulic-oil reservoirs, and a connecting duct 26 with couplings 27 and serving as compensating duct is provided between the two bottom ends of the two hydraulic cylinders 8.

CLAIMS



1. Apparatus for raising and lowering a ramp on a floating bridge or a part of a floating bridge which does not have its own power supply for actuating such an apparatus, with a manually operated hydraulic piston pump, a hydraulic-oil reservoir and a hydraulic cylinder, wherein the hydraulic cylinder is designed as a balanced cylinder with a piston with equal surface areas, a non-return valve acting as a check valve and an excess-pressure valve acting as a pressure-limiting valve both being arranged directly on the hydraulic cylinder on its high-pressure side, and the hydraulic-oil reservoir being designed as a closed pressure tank or vessel with pressure-connection valves.

2. Two apparatuses each as claimed in Claim 1, wherein connecting ducts are provided between them as compensating ducts.

3. Apparatus substantially as herein described with reference to and as shown in the accompanying drawings.