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(54) LIFTING UNIT

(71) We, MIFAGO AKTIENGESELLSCHAFT, of Josef Rheinberger Strasse 6, Vaduz/Liechtenstein, Federal Republic of Germany, a Body Corporate organised under the laws of the Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a lifting unit which consists of a pulley block inserted into a cylinder-like casing and composed of two sets of rope wheels which are adjustable relative to one another and are joined together by a load rope, one of these sets of rope wheels being disposed in a fixed position in the casing while the other is mounted in a piston-like component which is adapted to be displaced in the casing in relation to the said fixed set of rope wheels by a pressure medium.

Lifting units of this kind which are operated by compressed air are well known and have given good results. The component carrying the adjustable set of rope wheels, the piston adapted to be operated by compressed air, and also the piston rods rigidly connecting them together are however made in one piece as a casting in the known arrangement. The piston rods must consequently be guided laterally past an intermediate member, so that sealing between the latter and the casing of the component carrying the adjustable set of rope wheels, and also between it and the cylinder, cannot be achieved. Since lifting units of this kind are used particularly in wet places, such as for example in motor car washing installations, moisture and dirt penetrate into the interior of the lifting unit on both sides of the intermediate member.

The guides of the moving parts are thus subjected to considerable wear and rapidly corrode, so that breakdowns are almost inevitable after only a short period of operation and considerable servicing work entailing heavy cost is unavoidable. In addition, this known construction of lifting unit is very large, since the cylinder together with the piston is disposed at the side of the pulley block.

The invention accordingly aims at providing a lifting unit of the foregoing kind which does not have these disadvantages. Above all the invention aims at a construction which ensures that moisture and dirt cannot penetrate into the interior of the lifting unit even under extreme operating conditions, so that the lifting unit is completely closed and therefore not liable to breakdown or require servicing. In addition, expense for construction should be kept low, so that economical manufacture is possible, while in addition an extremely short overall length should be achieved.

With the foregoing objects in view, the present invention consists in a lifting unit, comprising a pulley block inserted into a cylinder-like casing and consisting of two rope wheel sets which are adjustable relative to one another and connected together by a load rope, one of these rope wheel sets being mounted in a spatially fixed position and the other being installed in a piston-like component which is adapted to be displaced by a pressure medium in relation to the fixed rope wheel set, characterised in that the two rope wheel sets are contained in a closed casing which consists of a pressure cylinder with a pressure-tight lead-in for the load rope, and that the component carry the displaceable rope wheel set is in the form of a piston adapted to be acted on by pressure medium on one or both sides and pressure-tightly guided in the pressure cylinder.

Advantageously, the fixed set of rope wheels is mounted in a flange formed as a cover for the pressure cylinder. The two covers or flanges closing the pressure cylinder are preferably joined fast together by means of tie rods guided along the outside of the cylinder.

Spacer pins may be provided on one or both of the components carrying the two sets of rope wheels in order to limit the distance between these sets of wheels.

A lifting unit constructed in accordance with the invention not only affords the ad-

vantages of the known pneumatically operated arrangement of comparable type, namely almost silent operation, the absence of sparking, continuously variable adjustability of the rate of raising and lowering the load, and low energy consumption, but in addition it is ensured by the constructional design that no moisture or dirt can penetrate into the interior of the lifting unit. If in fact the two sets of rope wheels are contained in a closed casing consisting of a pressure cylinder and if the component carrying the adjustable set of rope wheels is in the form of a piston, a self-contained unit is obtained which is completely watertight, while in addition operating noises are also damped.

Breakdowns caused by the penetration of foreign bodies are thus eliminated, and in fact the lifting unit requires no maintenance because lubricants for the moving parts applied on assembly remain in the unit and are not flushed out. Because of the design the cost of construction and assembly is also considerably reduced, since there are no guide rods and the intermediate member necessary in the known arrangement is also not required. Furthermore, the dimensions of the individual parts do not have to be accurately adjusted to one another, so that simple, inexpensive manufacture is possible. Since moreover no oil drips out, the lifting unit of the invention can be used to advantage almost anywhere, particularly for medical purposes and also in the foodstuff and chemical industries, and optionally even independently of a supply system.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate, diagrammatically and by way of example, one embodiment thereof and in which:—

Figure 1 is an axial section of the lifting unit; and

Figure 2 is a section along the line II—II of Figure 1.

The lifting unit illustrated in Figure 1 and designated 1, which is intended for raising or lowering a load 3 suspended on a load rope 2, consists essentially of a pulley block 10 consisting of two sets of rope wheels 21 and 31, the load rope 2 being guided over the rope rollers 23 and 33 of these sets. The two rope wheel sets 21 and 31 forming the pulley block are disposed in a closed casing which consists of a pressure cylinder 11 and two flanges 12 and 13 closing the cylinder. The flanges 12 and 13 are joined fast to one another by means of tie rods 14 guided along the outside of the cylinder 11.

The rope wheel set 21 is rotatably mounted but spatially fixed position in a recess 22 in the flange 12. The individual rope rollers 23 over which the rope 2 is guided are mounted for rotation on an axle 24, which is inserted into a hole 25 in the flange 12 and held by a threaded pin 26. A component 15 of piston-like construction is provided to hold the adjustable rope wheel set 31, and is likewise provided with a recess 32 to receive the rope rollers 33 mounted on an axle 34 inserted into a hole 35.

The piston 15 is guided in the cylinder 11 and, since a seal 36 carried by piston 15 lies sealingly against the inner wall of the cylinder 11, separates the cylinder into the two pressure chambers 29 and 38, to which pressure medium can be alternately supplied through the connections 16 and 17 respectively. The cylinder 11 is also sealed by means of seals 28 and 37 in relation to the flanges 12 and 13 respectively and the lead-in 18 through which the load rope 2 passes through the flange 13 is also sealed. This lifting unit 1 thus forms a closed unit, which with the aid of holding means adapted to be screwed into threaded holes 19 can be fastened on a rail or the like bearing against surfaces 20.

When pressure medium is supplied to the pressure chamber 29 through the connection 16, pressure builds up in this chamber and the piston 15 together with the rope wheel set 31 fastened to it is moved to the right. At the same time the pressure chamber is vented by way of the connection 17. By virtue of this displacement of the piston 15 the load suspended on the rope 2 is thus raised. The load 3 can be lowered through its own weight and through the venting of the pressure chamber 29, but it is also possible to supply pressure medium to the pressure chamber 38. In order to prevent the rope rollers 23 and 33 from bearing against one another when the piston 15 is moved back, spacer pins 27 bearing against the abutting surface 39 of the piston 15 are provided in the flange 12.

The lifting unit is thus a closed unit which requires no maintenance and into which moisture and dirt cannot penetrate and which can be used in a variety of ways, particularly as continuously variable regulation of the speed at which the load is raised and lowered can easily be achieved and as no noise occurs in operation, there is no sparking, and energy consumption is low.

WHAT WE CLAIM IS:—

1. A lifting unit, comprising a pulley block inserted into a cylinder-like casing and consisting of two rope wheel sets which are adjustable relative to one another and connected together by a load rope, one of these rope wheel sets being mounted in a spatially fixed position and the other being installed in a piston-like component which is adapted to be displaced by a pressure

medium in relation to the fixed rope wheel set, characterised in that the two rope wheel sets are contained in a closed casing which consists of a pressure cylinder with a pressure-tight lead-in for the load rope, and that the component carrying the displaceable rope wheel set is in the form of a piston adapted to be acted on by pressure medium on one or both sides and pressure-tightly guided in the pressure cylinder.

2. A lifting unit as claimed in claim 1, wherein the fixed rope wheel set is inserted into a flange in the form of a cover for the pressure cylinder.

3. A lifting unit as claimed in claim 2, wherein two covers or flanges closing the pressure cylinder are joined fast to one another by means of tie rods guided externally along said cylinder.

4. A lifting unit as claimed in any of claims 1 to 3, wherein in order to limit the distance between the two rope wheel sets spacer pins or the like are mounted in one or both components carrying said wheel sets.

5. A lifting unit substantially as herein described with reference to and as shown in the accompanying drawings.

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1563976 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1

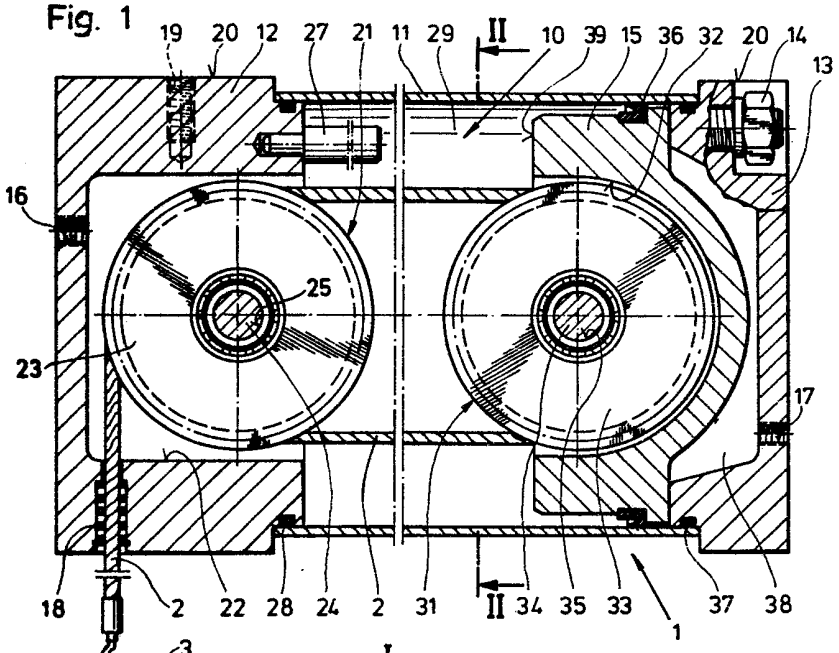

Fig. 2