

DRIVING SHEAVE FOR LIFT

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This invention relates to a driving sheave for a lift. The sheave serves to drive a cage of the lift so as to move it vertically.

One type of driving sheave for a lift is disclosed in e.g. Japanese Patent Laid-Open No. 89181 of 1980. In this driving sheave a plurality of parallel grooves are formed on the outer circumferential surface of a rim formed of cast iron and supported on a rotary shaft in order to avoid slippage between the driving sheave and the rope and the generation of noise; lining members formed of a resilient organic material, such as polyurethane rubber, of high friction coefficient are fitted in the grooves; and slots are formed in the lining members for guiding a rope.

Owing to the fact that the rim is formed of cast iron, it is difficult to fit the lining member into each groove on the rim.

It is a requirement that the rope for hanging the suspended cage should consist of more than three cables. This makes it necessary to provide more than three grooves and lining members,. Because of this, the machining of the rim to form the grooves,

the fitting of the lining member into each groove and the replacing of worn lining members are time-consuming and labour-wasting.

5 To obviate this problem. it has been proposed to fabricate a driving sheave by forming the same number of rings as there are cables of the rope. The rings are each formed with a groove which has a lining member fitted in it, the lining member having a slot for guiding the cables of the rope. The
10 rings are then mounted on the outer circumferential surface of the rim, and the rings are fastened together by the use of nuts and bolts extending through side plates attached to axially opposite ends of the rim.

15 Such a driving sheave has some disadvantages. Machining the rings is troublesome because each ring has to be machined to form a groove in it. Moreover, since there is more than one ring, mounting and dismounting the rings onto and off from
20 the rim is troublesome.

This invention seeks to obviate this problem of the prior art sheave.

Accordingly the invention provides a driving sheave for a lift comprising a rim supported on a
25 rotary shaft, a ring member located on an outer

circumferential surface of said rim and formed with a plurality of grooves, and a lining member fitted in the grooves of the ring member, said lining member being formed of a resilient organic material of high friction coefficient, said ring member being in the form of a corrugated ring member substantially in the form of waves in cross section formed of a steel sheet separate from the rim and provided with a plurality of grooves, said corrugated ring member being removably mounted on the outer circumferential surface of the rim.

The corrugated ring member is formed from steel sheet, so that the lining member can be easily fitted to the rim. The plurality of grooves are preferably formed by use of a press.

Accordingly, some embodiments of the invention may provide a driving sheave for a lift which will allow easy mounting and dismounting of the lining member.

Some embodiments may provide a driving sheave for a lift in which the lining member can be easily fitted to the rim and bonded to it securely.

Furthermore, some embodiments may provide a driving sheave for a lift in which the grooves can be formed easily.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

5 Fig. 1 is a schematic view of a lift showing the position in which a driving sheave according to the present invention is used;

10 Fig. 2 is a fragmentary vertical sectional perspective view of the corrugated ring member having the lining member fitted thereto which is used with a driving sheave according to the invention;

Fig. 3 is a fragmentary vertical sectional side view of a first embodiment of a driving sheave according to the present invention;

15 Fig. 4 is a fragmentary vertical sectional perspective view of a modification of the corrugated ring member having the lining member fitted thereto;

20 Fig. 5 is a fragmentary vertical sectional side view of a second embodiment of driving sheave of the present invention; and

Figs. 6 and 7 are fragmentary vertical sectional side views of third and fourth embodiments of driving sheave.

25 A lift in which the driving sheave according to the invention is incorporated will be described

by referring to Fig. 1 in which a suspended cage 1
for hoisting passengers and a counterbalancing
weight 2 are hung from a rope 3. The rope 3 is
trained over the driving sheave 4 and a deflector
sheave 5 is mounted in a machine chamber above a
shaft in which the cage 1 is located. The driving
sheave 4 is rotated by a motor 6. One of the ends
of the rope 3 is connected to a floor of the machine
chamber after being trained over a sheave 7 attached
to the cage 1. The other end is also connected to
the floor of the machine chamber after being trained
over a sheave 8 attached to the counterbalancing
weight 2. The cage 1 and the counterbalancing
weight 2 are connected together at the lower ends
thereof by a counterbalancing rope 9 to prevent the
cage 1 and the counterbalancing weight 2 from
becoming too unbalanced in weight during movement of
the cage 1. This ensures safety of operation. To
impart a predetermined tension to the
counterbalancing rope 9, the lowermost portion of the
run of the rope 9 is trained over a sheave 10.

As described hereinabove, a multiplicity of
sheaves are used in a lift. However, it is only
the driving sheave 4 connected to the motor 6 that
moves the cage 1 up and down in elevatory movement.

An embodiment of a driving sheave 4 according to the present invention is constructed as shown in Figs. 2 and 3 in order to increase the frictional drive force exerted on the rope 3 and prevent slippage.

5 The embodiment of the driving sheave 4 shown in Figs. 2 and 3 comprises a rim 12 formed of cast iron supported on a support shaft 11, a corrugated ring member 13 and a lining member 15. The rim 12 has an outer circumferential surface 12S which is planar and smooth, and the axial length of the outer circumferential surface 12S is determined by the number of cables of the rope 3 for hanging the cage 1. The corrugated ring member 13 is formed from a steel sheet by means of a press, e.g. by press rolling, and provided with a plurality of V-shaped grooves 13G. The ring member 13 has flanges 13F₁ and 13F₂ at opposite ends thereof, and has a wave-like cross section. The flanges 13F₁ and 13F₂ are each formed with threaded openings 14 on the circumference of a circle which is concentric with the rotary shaft 11. The lining member 15 which is formed of a resilient organic material of high friction coefficient, such as polyurethane rubber, is vulcanized and bonded to the V-shaped grooves 13G of the lining member 13. Slots 15G, each for

guiding one of the cables of the rope 3, are formed at the surface of the lining member 15 in positions corresponding to the grooves 13G.

The unit of the aforesaid construction shown in a fragmentary vertical sectional perspective view in Fig. 2 is fitted to the outer circumferential surface 12S of the rim 12 as shown in Fig. 3. Side plates 16A and 16B bridging the rim 12 and the flanges 13F₁ and 13F₂ of the corrugated lining member 13 are attached to opposite ends of the rim 12 and secured in place by bolts. Other bolts 18 are threadably inserted in the threaded openings 14 at the flanges 13F₁ and 13F₂ through the side plates 16A and 16B. By bolting the unit to the rim 12, the unit is prevented from moving both circumferentially and axially of the rim 12.

The corrugated ring member 13 is formed from a relatively thin steel sheet because it is fabricated by press rolling. However, the use of a thin steel sheet might cause vibration and noise to be produced between the corrugated ring member 13 and the rim 12 when the rope 3 trained over the driving sheave 4 is driven thereby. To cope with this situation, a backing member 17 shown in Fig. 5, which may be formed of e.g. asphalt, rubber, or

synthetic rubber may be fitted in the space between the outer circumferential surface 12S of the rim 12 and the inner peripheral surface of the corrugated ring member 13. This has the advantage of suppressing the vibration and noise which might otherwise be produced.

In the embodiment described above, the corrugated ring 13 formed with a plurality of grooves 13G can be fabricated as a unitary structure by shaping a steel sheet by means of a press. Therefore machining of the rim to form grooves on its outer circumferential surface, which has hitherto been necessary in the prior art, is eliminated. The number of parts is less and the driving sheave 4 as a whole can be produced at low cost. The corrugated ring 13 is formed from a steel sheet to which an organic material forming the lining member 15 adheres well, so that the latter can be adhered to the former with high bond strength. When the lining member 15 wears, one has only to replace the corrugated ring member 13 with the worn lining member 15 by a new corrugated ring member 13 with a sound lining member 15, so that replacing worn lining members 15 poses no problem.

Figs. 4 and 5 show another embodiment, which

differs from the embodiment shown in Figs. 2 and 3 in that one flange 13F₁ of the corrugated ring member 13 is extended toward an inner circumferential surface of the rim 12 from the outer circumferential surface 12S thereof and a flange 12F disposed outwardly of the other flange 13F₂ is formed at the end of the rim 12. Also the side plates 16A and 16B of the embodiment shown in Figs. 2 and 3 are eliminated. One flange 13F₁ has an inner surface of its extension positioned directly against one end face of the rim 12 and the other flange 13F₂ is positioned directly against the flange 12F of the rim 12, and they are connected together by the bolts 18.

The embodiment shown in Figs. 4 and 5 not only achieves the same effects as the embodiment shown in Figs. 2 and 3 but also eliminates the side plates 16A and 16B. In addition, the number of the bolts 18 for securing the corrugated ring member 13 in place is reduced in the embodiment shown in Figs. 4 and 5 as compared with the embodiment shown in Figs. 2 and 3, thereby reducing the number of parts. Also, assembling and disassembling of the corrugated ring member 13 can be facilitated.

In the two embodiments described above, the

grooves formed at the corrugated ring member 13 have been described as being V-shaped grooves 13G. However, the invention is not limited to this specific form of the grooves, and grooves of the shape shown in Figs. 6 and 7 may be used with the same results. More specifically, the grooves 13G shown in Fig. 6 are shaped such that they are V-shaped grooves with a flat bottom, and the grooves 13G shown in Fig. 7 each have arcuate side walls and a flat bottom.

By providing the grooves 13G with flat bottoms, the area of the corrugated ring member 13 at which the corrugated ring member 13 is in contact with the outer circumferential surface 12S of the rim 12 can be increased. As a result, the load of the rope 3 applied to the grooves 13G can be transmitted efficiently to the rim 12, thereby making it possible to suppress noise and vibration.

From the foregoing description, it will be appreciated that, according to the invention: a corrugated ring member formed with a plurality of grooves may be fabricated as a unitary structure by performing a pressing operation on a steel sheet. This offers the advantages that the machining operation relied on in the prior art for forming

grooves can be eliminated, operations for fabricating the parts can be facilitated, the number of the parts can be substantially reduced.

Therefore the driving sheave can be produced at low

5 cost. The corrugated ring member to which the lining member is attached is formed of a steel sheet to which the lining member of organic material can be adhered with a high bonding strength. This

10 offers the advantages that the lining member can be adhered to the corrugated lining member with

increased bond strength and the worn lining member can be efficiently replaced by a new one because the corrugated ring member having the worn lining member attached thereto has only to be replaced by a new

15 corrugated ring member having a new lining member attached thereto.



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CLAIMS:

1. A driving sheave for a lift comprising a rim supported on a rotary shaft, a ring member located on an outer circumferential surface of said rim and formed with a plurality of grooves, and a lining member fitted in the grooves of the ring member, said lining member being formed of a resilient organic material of high friction coefficient, said ring member being in the form of a corrugated ring member substantially in the form of waves in cross section formed of a steel sheet separate from the rim and provided with a plurality of grooves, said corrugated ring member being removably mounted on the outer circumferential surface of the rim.
 2. A driving sheave for a lift as claimed in claim 1, further comprising a backing member interposed between the outer circumferential surface of the rim and an inner peripheral surface of the corrugated ring member.
 3. A driving sheave for a lift substantially as herein described with reference to and as illustrated in Figs. 1 to 4, Fig. 5, Fig. 6 or Fig. 7 of the accompanying drawings.
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