

Drive Sheave and Elevator

Technical Field

The present invention relates to a drive sheave and an elevator having the drive sheave.

Background

In the elevator, the hoisting machine has a drive sheave that is driven by the motor for rotation, a plurality of sheave grooves extending in the circumferential direction are formed on the outer periphery of the drive sheave, and a plurality of main ropes are wound around the drive sheave by being embedded into the plurality of sheave grooves respectively, with a car being suspended from one end of the main ropes and a counterweight from the other end. When the motor of the hoisting machine drives to rotate the drive sheave, the main ropes are moved by means of the friction between the drive sheave and the main ropes, so that the car and the counterweight are lifted and lowered in the lifting path.

Although not shown, a machine room is provided at the upper part of the lifting path, and a hoisting machine equipped with the drive sheave is arranged on the support beam in the machine room. From the viewpoint of reducing the burden on the support beam, the light duty design for the hoisting machine and the drive sheave thereof is expected.

However, in the conventional drive sheave, as shown in FIG. 4, although a plurality of weight-reducing holes are provided, the size of the weight-reducing holes is small, and the weight that can be reduced is limited. Hence, the problem that the self-weight of the drive sheave is too great still exists. Moreover, since the weight-reducing holes are small in size, the work space available for the operations of mounting and fixing the drive sheave and the drive shaft for rotating the drive sheave is small, and thus there is a problem that work is difficult.

Contents of the Invention

The present invention has been made in view of the above problems in the prior art, and one object of the present invention is to provide a drive sheave and an elevator, which can reduce the self-weight and increase the working space.

One aspect of the present invention relates to a drive sheave for a hoisting machine of an elevator, characterized in that the drive sheave comprises: a rim formed in a cylindrical

shape, rope grooves for winding main ropes being formed on the outer periphery of the rim; a drum formed in a cylindrical shape, for letting through a drive shaft that drives the drive sheave; and a support plate connecting the inner circumferential surface of the rim and the outer circumferential surface of the drum, wherein the support plate is uniformly drilled with five through holes in a circumferential direction penetrating in the axial direction of the drive shaft; formed on the support plate and between the two adjacent through holes is a reinforcing rib that extends from the outer circumferential surface of the drum toward the inner circumferential surface of the rim in the radial direction of the drive sheave; the drive sheave has a diameter of 322 mm; the thickness of the drum along the said radial direction ranges from 13.5 to 16.5 mm; the thickness of the rim along the said radial direction is in the range of 20-23mm; the thickness of the support plate along the said axial direction is in the range of 9-14mm; a minimum thickness of the reinforcing rib along the said axial direction is in the range of 52-57mm, and a width of the reinforcing rib along a direction orthogonal to the extending direction thereof and parallel to the support plate is in the range of 7-11 mm; an opening width of the through holes along the said radial direction is in the range of 50-60 mm; and a minimum distance between the adjacent sides of one of these adjacent through holes and of the other is in the range of 25-35 mm.

The drive sheave according to one aspect of the invention also may be designed such that the through hole is configured to be an annular sector in a cross section orthogonal to the axial direction, comprising: an inner arc-shaped side located close to the outer circumferential surface of the drum and formed to be parallel to the outer circumferential surface of the drum; an outer arc-shaped side located close to the inner circumferential surface of the rim oppositely the inner arc-shaped side, and formed to be parallel to the inner circumferential surface of the rim; and two straight sides each formed in parallel with the extending direction of the respective reinforcing ribs closest thereto, the joints of the inner and outer arc-shaped sides with the two straight sides being formed as rounded corners.

The drive sheave according to one aspect of the invention also may be designed such that a key groove for insertion of the drive shaft is formed in a penetrating manner on the inner circumferential surface of the drum in the axial direction.

The drive sheave according to one aspect of the invention also may be designed such that the rim, the drum and the support plate are integrally formed.

Another aspect of the present invention relates to an elevator characterized by

comprising a hoisting machine having the above-described drive sheave.

According to the above configurations, it is possible to provide a drive sheave and an elevator, which can reduce the self-weight and increase the working space.

Description of the Drawings

FIG. 1 is a perspective view illustrating a drive sheave of the invention.

FIG. 2 is a front view illustrating a drive sheave of the invention.

FIG. 3 is a cross-sectional view illustrating a drive sheave of the invention.

FIG. 4 is a perspective view illustrating the prior art drive sheave.

List of reference signs:

- 1 rim
- 2 drum
- 21 key groove
- 3 support plate
- 4 reinforcing rib
- 5 through holes
- 50 straight sides
- 51 inner arc-shaped side
- 52 outer arc-shaped side

Embodiments

Before describing the specific structures of the drive sheave of the present invention, the general mechanism of the elevator will be described. The hoisting machine of the elevator has a drive sheave, and a plurality of main ropes are embedded in and wound around the rope grooves formed on the outer periphery of the drive sheave, a car being suspended from one end of the plurality of main ropes and a counterweight being suspended from the other end. The drive sheave is rotated by means of driving of the motor to cause a frictional force between the main ropes and the inner surface of the sheave grooves, and then the main ropes are moved, so that the car and the counterweight are lifted and lowered in the lifting path.

Hereinafter, a specific configuration of a drive sheave according to an embodiment of the invention will be described with reference to Figs. 1 to 3.

FIG. 1 is a perspective view illustrating a drive sheave of the invention. FIG. 2 is a

front view illustrating the drive sheave of the invention. FIG. 3 is a cross-sectional view illustrating the drive sheave of the invention.

As shown in FIG. 1, the drive sheave comprises: a rim 1 formed in a cylindrical shape, rope grooves for winding main ropes (not shown) being formed on the outer periphery of the rim; a drum 2 formed in a cylindrical shape, for letting through a drive shaft (not shown) that drives the drive sheave; and a support plate 3 connecting the inner circumferential surface of the rim and the outer circumferential surface of the drum, wherein the support plate 3 is uniformly drilled, in a circumferential direction, with five through holes 5 penetrating in the axial direction of the drive shaft; and formed on the support plate 3 and between the two adjacent through holes 5 is a reinforcing rib 4 that extends from the outer circumferential surface of the drum 2 toward the inner circumferential surface of the rim 1 in the radial direction of the drive sheave.

The drive sheave of the present invention is, for example, a casting formed by casting, and the rim 1, the drum 2 and the support plate 3 are integrally formed.

Further, as shown in FIGS. 1 and 2, a key groove 21 is axially formed on the inner circumferential surface of the drum 2 of the drive sheave in a penetrating manner, and the drive shaft is embedded into the key groove 21.

As described above, in the drive sheave of the present invention, the formed five through holes are greater in size than the prior art structure, and the wall thickness of the drum is reduced correspondingly, so that as a whole the self-weight of the drive sheave is reduced. Further, the reinforcing rib 4 is formed between the two adjacent through holes 5, thereby ensuring the strength of the drive sheave while reducing the self-weight of the drive sheave.

Specifically, the radial length between the centers of the main ropes respectively embedded into the key grooves on one radial side and radially opposite sides of the drive sheave is a diameter of the drive sheave, also referred to as a wheel diameter of the drive sheave. In a case where the diameter of the drive sheave of the invention is 322 mm, as shown in FIGS. 2 and 3, the drum 2 has a thickness B of 13.5-16.5 mm along the radial direction (the direction from the center of the drive sheave toward the outer circumference in FIG. 2, hereinafter sometimes referred to as radial direction for short) of the drive sheave; the thickness C of the rim 1 along the radial direction is in the range of 20-23 mm; the support plate 3 has a thickness D of 9-14 mm along the axial direction (the direction perpendicular to the paper surface in FIG. 2, the left-and-right direction in FIG. 3, hereinafter sometimes referred to as axial direction for short) of the drive shaft; the

thickness E of the reinforcing rib 4 along the axial direction is in the range of 52-57mm, and a width A of the reinforcing rib 4 along a direction orthogonal to the extending direction thereof and parallel to the support plate 3 is in the range of 7-11 mm; an opening width F of the through holes 5 along the radial direction of the of the drive sheave is in the range of 50-60 mm; and moreover, the minimum distance G between the adjacent sides 50, 50 of one (such as the through hole directly above in FIG. 2) of the adjacent through holes 5 and of the other (the upper-right through hole in FIG. 2) is in the range of 25-35 mm.

Further, as shown in FIG. 2, in the section of the drive sheave orthogonal to the axial direction, the through hole 5 comprises: an inner arc-shaped side 51 located at a position close to the outer circumferential surface of the drum and formed to be parallel to the outer circumferential surface of the drum; an outer arc-shaped side 52 located at a position close to the inner circumferential surface of the rim oppositely the inner arc-shaped side, and formed to be parallel to the inner circumferential surface of the rim; and two straight sides 50 each formed in parallel with the extending direction of the respective reinforcing ribs closest thereto, the joints of the inner and outer arc-shaped sides 51, 52 with the two straight sides 50, 50 being formed as rounded corners R.

The effects of the drive sheave of the present invention will be described below.

As described above, in the drive sheave of the invention, the self-weight of the drive sheave is reduced by forming the rim 1, the drum 2, the support plate 3 and the through holes 5 having the above-described dimensions, and increasing the size of the through holes 5, and further the strength of the drive sheave is ensured by providing the reinforcing ribs 4, so that the strength of the drive sheave can be ensured while reducing the self-weight of the drive sheave.

Further, in the present invention, the joints between the respective sides 50, 51, and 52 of the through holes 5 of the drive sheave are formed as rounded corners R, so as to reduce the stress concentration and then preventing the drive sheave from being damaged due to stress concentration. .

In addition, by increasing the size of the through holes 5, it is possible to increase the working space so as to facilitate the replacement of the drive sheave.

Although the embodiments of the invention have been described above, the embodiments are provided by way of example only and are not intended to limit the scope of the invention. These embodiments may be carried out in other various ways, and various omissions, substitutions and changes can be made without departing from the scope of the invention. These embodiments and their modifications are intended to be

included within the scope and spirit of the invention, and also within the scope of the appended claims and their equivalents.

CLAIMS

1. A drive sheave for a hoisting machine of an elevator, characterized in that, the drive sheave comprises:

a rim formed in a cylindrical shape, rope grooves for winding main ropes being formed on the outer periphery of the rim;

a drum formed in a cylindrical shape, for letting through a drive shaft that drives the drive sheave; and

a support plate connecting the inner circumferential surface of the rim and the outer circumferential surface of the drum, wherein

the support plate is uniformly drilled in a circumferential direction with five through holes penetrating in an axial direction of the drive shaft,

formed on the support plate and between the two adjacent through holes is a reinforcing rib that extends from the outer circumferential surface of the drum toward the inner circumferential surface of the rim in a radial direction of the drive sheave,

the drive sheave has a diameter of 322 mm,

the thickness of the drum along the said radial direction ranges from 13.5 to 16.5 mm,

the thickness of the rim along the said radial direction is in the range of 20-23mm,

the thickness of the support plate along the said axial direction is in the range of 9-14mm,

a minimum thickness of the reinforcing rib along the said axial direction is in the range of 52-57mm, and a width of the reinforcing rib along a direction orthogonal to the extending direction thereof and parallel to the support plate is in the range of 7-11 mm,

an opening width of the through holes along the said radial direction is in the range of 50-60 mm, and a minimum distance between the adjacent sides of one of these adjacent through holes and of the other is in the range of 25-35 mm.

2. The drive sheave according to claim 1, characterized in that,

the through hole is configured to be an annular sector in a cross section orthogonal to the axial direction, comprising:

an inner arc-shaped side located at a position close to the outer circumferential surface of the drum and formed to be parallel to the outer circumferential surface of the

drum;

an outer arc-shaped side located at a position close to the inner circumferential surface of the rim oppositely the inner arc-shaped side, and formed to be parallel to the inner circumferential surface of the rim; and

two straight sides each formed in parallel with the extending direction of the respective reinforcing ribs closest thereto,

the joints of the inner and outer arc-shaped sides with the two straight sides being formed as rounded corners.

3. The drive sheave according to claim 1, characterized in that,
a key groove for insertion of the drive shaft is formed in a penetrating manner on the inner circumferential surface of the drum in the axial direction.

4. The drive sheave according to claim 1, characterized in that,
the rim, the drum and the support plate are integrally formed.

5. An elevator, characterized by comprising
a hoisting machine having the above-described drive sheave.