

TRACTION MACHINE AND ELEVATOR

Background of the Invention

The present invention relates to a traction machine for moving upward and downward a cage, and an elevator using the traction machine.

In recent years, an elevator using a large-size traction machine is installed in a high-rise building. The large-size traction machine is placed in a machine room provided at a top of a hoistway in the elevator. Therefore, a large space for the large-size traction machine is necessary in the machine room of the elevator.

In order to effectively use a floor area of the high-rise building, the size of the machine room for the elevator in the high-rise building is required to be reduced. In order to reduce the size of the machine room, it is requisite to reduce the size of the traction machine used in the elevator.

Conventionally, a traction machine including a combination of a sheave and a brake disk integrally formed by casting has been proposed (see JP-A-2002-20064). The technique disclosed in JP-A-2002-20064 integrates the brake disk with the sheave as a monolithic casting product to reduce the size in the radial direction of the brake disk and realize a reduction in the size of the traction machine.

In a conventional traction machine, a motor is located at an axial end thereof. A brake disk is located on an another axial opposite to the motor through a sheave. Therefore, a brake that clamps the brake disk is also located on the another axial end opposite to the motor. Further, since the brake in the conventional traction machine is large in size, an end of the brake projects axially outward beyond an end of a driving shaft attached to the motor. Therefore, the total length in the axis direction of the traction machine is the length from the end of the motor to the end of the brake.

Brief Summary of the Invention

In the technique disclosed in JP-A-2002-20064, the sheave and the brake disk are integrated by the casting, whereby the size in the radial direction of the traction machine can be reduced. However, the size in the axis direction of the traction machine cannot be reduced. Therefore, the size of the machine room for the elevator in which the traction machine is located cannot be reduced.

In the large-size traction machine, since the sheave and the brake disk have

respective large sizes, it is difficult for manufacture the sheave and the brake disk integrally by the casting. Therefore, it is necessary to manufacture the traction machine including the sheave and the brake disk fabricated as separate components. In this case, the brake disk is mounted onto the sheave having a flange section, from a side of the flange section opposite to the motor, and is fixed using bolts. As a result, the brake disk is located in a position away from the motor and the total length in the axis direction in the traction machine is increased.

An object of the present invention is to provide a traction machine capable of decreasing an axial size of the traction machine to decrease a size of a machine room of an elevator with taking the above problem(s) into consideration, and to provide the elevator using the traction machine.

According to the invention, for solving the above problem(s) to achieve the object of the present invention, a traction machine comprises a sheave including a driving shaft, a bearing stand for supporting the driving shaft as well as the sheave in a rotatable manner, a motor arranged on an axial end of the driving shaft to drive rotationally the sheave through the driving shaft, a flange section arranged an end of the sheave axially opposite to the motor, a brake disk contacting a surface of the flange section opposite to the motor and fixed with respect to the sheave through a fixing mechanism to rotate with the sheave, and a brake for clamping the brake disk to brake a rotation of the brake disk.

Further, according to the invention, an elevator comprises a cage movable upward and downward in a hoistway, a balancing weight connected to the cage through a rope, and the traction machine on which the rope is wound to move the cage upward and downward, and the traction machine is the above mentioned traction machine according to the invention.

According to the invention, since the brake disk contacts the surface of the flange section (axially) opposite to the motor, the brake disk can be arranged axially closer to an axial center of the sheave or be arranged between the motor and the flange (the surface of the flange contacting the brake disk). Therefore, the axial size of the traction machine is decreased to decrease the size of the machine room in which the traction machine is arranged.

Brief Description of the Several Views of the Drawings

Fig. 1 is a schematic partially cross sectional view showing an elevator as a first embodiment of the invention.

Fig. 2 is a side view showing a traction machine used in the first embodiment of the invention.

Fig. 3 is a side view of a brake disk of the traction machine used in the first

embodiment of the invention.

Fig. 4 includes (A) part of side view showing the brake disk and a sheave before being fixed to each other, and (B) part of side view showing the brake disk and the sheave after being fixed to each other.

5 Fig. 5A is a side view showing a conventional traction machine, and Fig. 5B is a side view of the traction machine as the first embodiment of the invention, wherein a difference in axial size between the conventional traction machine and the traction machine as the first embodiment of the invention is shown.

10 Fig. 6A is a front view showing a sheave including a part of a fixing mechanism of a traction machine as a second embodiment of the invention before being fixed to a brake disk, and Fig. 6B is a front view showing a brake disk including another part of the fixing mechanism of the traction machine as the second embodiment of the invention before being fixed to the sheave.

15 Fig. 7 is a front view showing a combination of the brake disk and the sheave of the traction machine as the second embodiment of the invention after being fixed to each other.

20 Fig. 8 includes (A) part of front view showing a sheave including a part of a fixing mechanism of a traction machine as a third embodiment of the invention before being fixed to a brake disk, and (B) part of front view showing the sheave and a brake disk including another part of the fixing mechanism of the traction machine as the second embodiment of the invention after being fixed to each other.

Fig. 9 is a side view showing a traction machine as a fourth embodiment of the invention.

Detailed Description of the Invention

25 Traction machines and elevators using the traction machines according to embodiments of the present invention are explained below with reference to Figs. 1 to 9. In the figures, common components are denoted by the same reference numerals and signs. The invention is not limited to the embodiments explained below.

The order of the explanation is as described below.

1. First embodiment

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- 1-1. Configuration example of an elevator
 - 1-2. Configuration example of a traction machine
 - 1-3. Method of fixing a brake disk
 - 1-4. Comparison with a conventional traction machine

2. Second embodiment
3. Third embodiment
4. Fourth embodiment

1. First embodiment

- 5 1-1. Configuration example of an elevator

First, the configuration of an elevator according to a first embodiment of the present invention (hereinafter referred to as "this embodiment") is explained with reference to Fig. 1.

Fig. 1 is a schematic configuration diagram showing a configuration example of
10 the elevator according to this embodiment.

As shown in Fig. 1, an elevator 1 according to this embodiment includes a hoistway 110, a cage 120, a rope 130, a balancing weight 140, and a traction machine 100. The hoistway 110 is formed in a building structure. A machine room 160 is provided at the top of the hoistway 110. The cage 120 is coupled to the balancing weight 140 via the rope 130. The
15 cage 120 moves up and down in the hoistway 110. The traction machine 100 is located in the machine room 160. The traction machine 100 winds the rope 130 therearound to thereby lift and lower the cage 120. A deflector wheel 150 on which the rope 130 is mounted is provided near the traction machine 100.

- 1-2. Configuration example of the traction machine

20 A configuration example of the traction machine according to this embodiment is explained with reference to Figs. 2 to 5.

Fig. 2 is a side view showing the configuration of the traction machine according to this embodiment.

[Traction machine]

25 As shown in Fig. 2, the traction machine 100 according to this embodiment includes a motor 10, a sheave 12, a brake disk 13, and a bearing stand 15. The sheave 12 includes a driving shaft 11. A brake 14 and a machine base 22 are provided in the traction machine 100.

[Motor and driving shaft]

30 The motor 10 and the driving shaft 11 are explained.

The motor 10 is located on the machine base 22. One end of the driving shaft 11 fixed to the sheave 12 is attached to the motor 10 in a rotatable manner. The driving shaft 11 is supported by the bearing stand 15 in a rotatable manner. When the motor 10 is driven, the

driving shaft 11 rotates. The sheave 12 rotates in association with the rotation of the driving shaft 11.

[Bearing stand]

The bearing stand 15 includes a motor side bearing stand 16 and a brake disk side bearing stand 17. The bearing stand 15 is supported by the machine base 22. The motor side bearing stand 16 supports the end on the motor 10 in the axis direction of the driving shaft 11. The brake disk side bearing stand 17 supports the end on the opposite side of the motor 10 in the axis direction of the driving shaft 11 and the brake 14.

In this embodiment, the driving shaft 11 is supported by the two bearing stands, i.e., the motor side bearing stand 16 and the brake disk side bearing stand 17. However, the driving shaft 11 may be supported by one bearing stand.

[Sheave]

The sheave 12 is formed in a substantially columnar shape. A not-shown through-hole is formed in the center of the axis of the sheave 12. The diameter of the through-hole is equal to the outer diameter of the driving shaft 11. The driving shaft 11 is fixed to the sheave 12 piercing through the through-hole of the sheave 12.

A winding section 18 around which the rope 130 is wound is formed on a side surface portion of the sheave 12. The winding section 18 includes plural grooves 18a around which the rope 130 is wound. The grooves 18a of the winding section 18 wind the rope 130 according to the rotation of the sheave 12. A projecting section 19 and a flange section 20 are provided at both the ends in the axis direction of the sheave 12.

The projecting section 19 is provided at one end in the axis direction of the sheave 12. The projecting section 19 projects toward the outer side in the radial direction of the sheave 12. The projecting section 19 is formed in a diameter larger than the outer diameter of the winding section 18 of the sheave 12. Consequently, it is possible to prevent the rope 130 wound around the winding section 18 from coming off the winding section 18 from the projecting section 19.

The flange section 20 is provided at the other end in the axis direction of the sheave 12. The flange section 20 projects toward the outer side in the radial direction of the sheave 12. The outer diameter of the flange section 20 is formed larger than the outer diameter of the projecting section 19. A fitting section 21 is provided between the flange section 20 and the winding section 18 of the sheave 12.

The brake disk 13 is fixed to the fitting section 21. The outer diameter of the fitting section 21 is formed larger than the diameter of the projecting section 19. The length in

the axis direction of the fitting section 21 is formed the same as or slightly larger than the length in the axis direction of the brake disk 13.

[Brake disk]

The brake disk 13 is explained with reference to Figs. 2 and 3.

5 Fig. 3 is a side view showing a main part of the brake disk in the traction machine according to this embodiment.

As shown in Fig. 2, the brake disk 13 is in contact with an opposed surface 20a opposed to the motor 10 in the flange section 20 and is fixed to the fitting section 21. Consequently, the brake disk 13 rotates in association with the sheave 12 rotated by the driving
10 of the motor 10.

Details of the brake disk 13 are explained. As shown in Fig. 3, the brake disk 13 is formed in a substantially disc shape. The brake disk 13 includes a through-hole 13a, a thick section 13b, and thinned sections 13c.

The through-hole 13a of the brake disk 13 is continuously formed along the axis
15 direction of the brake disk 13 from one surface 13d to the other surface 13e of the brake disk 13 to close the surfaces. The through-hole 13a is provided in the center in the radial direction of the brake disk 13. Since the brake disk 13 is fixed to the sheave 12 by shrink fit or the like, the diameter of the through-hole 13a is formed smaller than the outer diameter of the fitting section 21. The thick section 13b is formed around the through-hole 13a.

20 The thick section 13b is provided to surround the through-hole 13a. Length X in the radial direction of the thick section 13b is equal to or larger than 1/5 of length Y in the axis direction of the thick section 13b.

The thinned sections 13c are formed on the outer side in the radial direction in the thick section 13b. The thinned sections 13c are provided on one surface 13d and the other
25 surface 13e of the brake disk 13. The thinned section 13c on the one surface 13d is formed to sink from the one surface 13d toward the other surface 13e. The thinned section 13c on the other surface 13e is formed to sink from the other surface 13e toward the one surface 13d. Since the thinned sections 13c are provided in the brake disk 13, it is possible to reduce the weight of the brake disk 13.

30 [Brake]

As shown in Fig. 2, the brake 14 is located on the brake disk 13 provided on the opposite side of the motor 10 and supported by the brake disk side bearing stand 17. The brake 14 comes into contact with the two surfaces 13d and 13e of the brake disk 13 to hold the brake disk 13 and brakes the rotation of the brake disk 13. Consequently, it is possible to brake the

rotation of the sheave 12 associated with the driving shaft 11 and adjust a winding action for the rope 130.

[Method of fixing the brake disk]

A method of fixing the brake disk 13 is explained.

5 (A) part of Fig. 4 is a side view showing a state before the brake disk is mounted in and fixed to the sheave. (B) part of Fig. 4 is a side view showing a state in which the brake disk is fixed to the sheave.

A mechanism for fixing the brake disk 13 (hereinafter referred to as "fixing mechanism") includes the fitting section 21 and the through-hole 13a of the brake disk 13 that
10 fits with the fitting section 21. In this embodiment, in order to fix the brake disk 13 to the sheave 12, interference fit such as shrink fit or press fit is performed.

For example, when the shrink fit is performed, first, the brake disk 13 is heated. Consequently, the brake disk 13 expands and the diameter of the through-hole 13a increases. Subsequently, as shown in (A) part of Fig. 4, the brake disk 13 is inserted into the sheave 12
15 from the projecting section 19 of the sheave 12. The diameter of the through-hole 13a of the brake disk 13 is larger than the diameter of the projecting section 19 and the diameter of the winding section 18. Therefore, the brake disk 13 can be inserted into the other side in the axis direction of the sheave 12 without interfering with the projecting section 19 and the winding section 18.

20 The through-hole 13a of the brake disk 13 expands because of the heating. The diameter of the through-hole 13a increases to be larger than the outer diameter of the fitting section 21. Therefore, as shown in (B) part of Fig. 4, it is possible to insert the brake disk 13 to a position where the brake disk 13 comes into contact with the opposed surface 20a opposed to the motor 10 in the flange section 20. It is possible to position the brake disk 13 by bringing the
25 brake disk 13 into contact with the flange section 20.

After the position of the brake disk 13 in the axis direction of the sheave 12 is aligned, the brake disk 13 is cooled to shrink. When the brake disk 13 shrinks, the diameter of the through-hole 13a of the brake disk 13 decreases. The through-hole 13a of the brake disk 13 fits with the fitting section 21. Consequently, the brake disk 13 is fixed to the sheave 12.

30 In this embodiment, since the thick section 13b is provided in the brake disk 13, it is possible to prevent deformation such as a warp of the brake disk 13 caused when the interference fit is performed.

[Comparison with a conventional traction machine]

The traction machine according to this embodiment and a conventional traction

machine are explained in comparison with each other with reference to Figs. 5A and 5B.

Figs. 5A and 5B are side views showing a difference between the size in the axis direction in the traction machine according to this embodiment and the size in the axis direction in the conventional traction machine. Fig. 5A is a side view showing the conventional traction machine. Fig. 5B is a side view showing the traction machine according to this embodiment. The traction machine 100 according to this embodiment and a conventional traction machine 500 are shown with an end of the motor 10 of the traction machine 100 and an end of a motor 510 of the traction machine 500 aligned.

The total lengths in the axis direction of the traction machines 100 and 500 are respectively from the ends of the motor 10 and the motor 510 to ends of the brake 14 and a brake 514. The total length of the conventional traction machine 500 is L1. The total length of the traction machine 100 according to this embodiment is L2. The conventional traction machine 500 is assembled by bringing a brake disk 513 in contact with the surface on the opposite side of the motor 510 in a flange section 520 and fixing the brake disk 513 to the flange section 520 with, for example, bolts 518.

On the other hand, in the traction machine 100 according to this embodiment, the brake disk 13 is mounted in the sheave 12 from the projecting section 19 of the sheave 12. The brake disk 13 is brought in contact with and fixed to the opposed surface 20a opposed to the motor 10 in the flange section 20. A positional relation between the brake disk 13 and the flange section 20 in the traction machine 100 according to this embodiment is opposite to a positional relation between the brake disk 513 and the flange section 520 in the conventional traction machine 500.

Relative to the center N in the axis direction of the sheave 12 and a sheave 512, a position where brake disk 13 of the traction machine 100 according to this embodiment is located is close to the center N in the axis direction of the sheave 12 compared with a position where the brake disk 513 of the conventional traction machine 500 is located. In other words, as the brake disk 13 is positioned close to the center N of the sheave 12, the position of the brake 14 that clamps the brake disk 13 is brought close to the center N.

Therefore, the end of the brake 14 of the traction machine 100 according to this embodiment is closer to the center N by length M than the end of the brake 514 of the conventional traction machine 500. As a result, the total length L2 in the axis direction of the traction machine 100 according to this embodiment can be small by the length M compared with the total length L1 in the axis direction of the conventional traction machine 500. Consequently, it is possible to realize a reduction in the size in the axis direction of the traction

machine 100 and easily secure a space necessary in the maintenance of the traction machine 100. Further, it is possible to reduce the size of the machine room 160 in which the traction machine 100 is located.

5 In the conventional traction machine 500, the brake disk 513 is fixed to the sheave 512 by the bolts 518. The plural bolts 518 are arranged along the circumferential direction of the brake disk 513. Therefore, it is necessary to secure a space for the bolts 518 in the brake disk 513. The outer diameter of the flange section 520 increases.

10 On the other hand, in the traction machine 100 according to this embodiment, the brake disk 13 is fixed to the fitting section 21 of the sheave 12 by the interference fit such as shrink fit or press fit. Therefore, it is possible to prevent the outer diameter of the flange section 20 from increasing and reduce the bolts 518. As a result, it is possible to reduce material costs of the traction machine 100. Since tightening work for the bolts 518 is unnecessary, it is possible to reduce a work load.

2. Second embodiment

15 A traction machine according to a second embodiment of the present invention is explained with reference to Figs. 6A and 6B and Fig. 7.

20 Figs. 6A and 6B are front views of a main part of a fixing mechanism in the traction machine according to the second embodiment of the present invention. Fig. 6A is a front view showing a sheave before fixing of a brake disk thereto. Fig. 6B is a front view showing the brake disk fixed to the sheave.

Fig. 7 is a front view showing a state in which the brake disk in the traction machine according to the second embodiment of the present invention is fixed to the sheave.

25 The traction machine according to the second embodiment is different from the traction machine 100 according to the first embodiment in a fixing mechanism for fixing the brake disk to the sheave. Therefore, components related to the fixing mechanism for fixing the brake disk to the sheave are explained. Components common to the traction machine 100 are denoted by the same reference numerals and signs and redundant explanation of the components is omitted.

30 As shown in Fig. 6A, the driving shaft 11 pierces through a sheave 212. The sheave 212 includes a not-shown winding section provided on a side surface portion of the sheave 212, a projecting section 219, a fitting section 221, and a flange section 220. A dent 221a is formed in the fitting section 221.

A brake disk 213 is formed in a substantially disc shape. As shown in Fig. 6B, the brake disk 213 includes a through-hole 213a. The diameter of the through-hole 213a is

formed to match the diameter of the fitting section 221. In the brake disk 213, a groove 214 sunken from the edge of the through-hole 213a toward the outer side in the radial direction of the through-hole 213a is provided. The groove 214 is opposed to the dent 221a of the fitting section 221 when the brake disk 213 is attached to the sheave 212.

5 A method of fixing the brake disk 213 in the second embodiment is explained. First, as in the first embodiment, the brake disk 213 is mounted in the sheave 212 from the projecting section 219 of the sheave 212. Thereafter, the brake disk 213 is brought into contact with an opposed surface 220a opposed to a motor side in the flange section 220. When the brake disk 213 is brought into contact with the opposed surface 220a, the groove 214 of the
10 brake disk 213 and the dent 221a of the fitting section 221 are opposed to each other.

As shown in Fig. 7, a fixing groove 222 (a key groove) is formed by the dent 221a and the groove 214. Subsequently, a fixing member 223 (a key) is embedded in the fixing groove 222. Consequently, the through-hole 213a of the brake disk 213 and the fitting section 221 are fixed and the brake disk 213 is fixed to the sheave 212.

15 The fixing mechanism according to the second embodiment includes the dent 221a formed in the fitting section 221, the groove 214 provided in the brake disk 213 and positioned to be opposed to the dent 221a, and the fixing member 223 embedded in the dent 221a and the groove 214.

The fixing method by the interference fit such as shrink fit or press fit and the
20 fixing mechanism by the fixing groove 222 and the fixing member 223 may be combined to fix the brake disk 213 and the sheave 212. Consequently, it is possible to firmly fix the brake disk 213 to the sheave 212 and prevent the brake disk 213 from coming off the sheave 212. As a result, safety of the traction machine is improved.

The other components are the same as those of the traction machine 100
25 according to the first embodiment. Therefore, explanation of the components is omitted. With the traction machine according to the second embodiment including the configuration explained above, it is possible to obtain action and effect same as those of the traction machine 100 according to the first embodiment.

In the traction machine according to the second embodiment, one fixing groove
30 222 including the dent 221a and the groove 214 is provided. However, this is not a limitation. Two or more fixing grooves 222 may be formed and fixing members 223 may be respectively embedded in the fixing grooves 222.

3. Third embodiment

A traction machine according to a third embodiment of the present invention is

explained with reference to Fig. 8.

(A) part of Fig. 8 is a front view showing a state before a brake disk is mounted in and fixed to a sheave. (B) part of Fig. 8 is a front view showing a state in which the brake disk is mounted in and fixed to the sheave.

5 The traction machine according to the third embodiment is different from the traction machine 100 according to the first embodiment in a fixing mechanism for fixing the brake disk to the sheave. Therefore, components related to the fixing mechanism for fixing the brake disk to the sheave are explained. Components common to the traction machine 100 are denoted by the same reference numerals and signs and redundant explanation of the components
10 is omitted.

The sheave and the brake disk used in the traction machine according to the third embodiment are shown in (A) part of Fig. 8. A brake disk 313 includes a configuration same as the configuration of the brake disk 213 in the second embodiment. Therefore, explanation of the brake disk 313 is omitted.

15 As shown in (A) part of Fig. 8, the driving shaft 11 pierces through a sheave 312. The sheave 312 includes a not-shown winding section provided on a side surface portion of the sheave 312, a projecting section 319, a fitting section 321, and a flange section 320. A protrusion 321a is provided in the fitting section 321.

A method of fixing the brake disk 313 in the third embodiment is explained.
20 First, as in the first embodiment, the brake disk 313 is mounted in the sheave 312 from the projecting section 319 of the sheave 312. The brake disk 313 is brought into contact with an opposed surface 320a opposed to a motor side in the flange section 320. When the brake disk 313 is brought into contact with the opposed surface 320a, as shown in (B) part of Fig. 8, a groove 314 of the brake disk 313 and the protrusion 321a of the fitting section 321 engage with
25 each other. Consequently, a through-hole 313a of the brake disk 313 and the fitting section 321 are fit. The brake disk 313 is fixed to the sheave 312. As a result, it is possible to easily fix the sheave 312 and the brake disk 313.

The fixing mechanism in the third embodiment includes the protrusion 321a formed in the fitting section 321 and the groove 314 provided in the brake disk 313 and
30 configured to engage with the protrusion 321a.

The fixing method by the interference fit such as shrink fit or press fit and the fixing mechanism by the groove 314 and the protrusion 321a in the third embodiment may be combined to fix the brake disk 313 and the sheave 312. Consequently, it is possible to firmly fix the brake disk 313 to the sheave 312 and prevent the brake disk 313 from coming off the

sheave 312. As a result, safety of the traction machine is improved.

The other components are the same as those of the traction machine 100 according to the first embodiment. Therefore, explanation of the components is omitted. With the traction machine according to the third embodiment including the configuration explained above, it is possible to obtain action and effect same as those of the traction machine 100 according to the first embodiment.

In the traction machine according to the third embodiment, one protrusion 321a and one groove 314 are provided. However, this is not a limitation. Two or more protrusions 321a and two or more grooves 314 may be provided.

4. Fourth embodiment

A traction machine according to a fourth embodiment of the present invention is explained with reference to Fig. 9.

Fig. 9 is a side view showing the configuration of the traction machine according to the fourth embodiment of the present invention.

A traction machine 400 according to the fourth embodiment is different from the traction machine 100 according to the first embodiment in a fixing mechanism for fixing a brake disk to a sheave. Therefore, components related to the fixing mechanism for fixing the brake disk to the sheave are explained. Components common to the traction machine 100 are denoted by the same reference numerals and signs and redundant explanation of the components is omitted.

First, a method of fixing a brake disk 413 in the fourth embodiment is explained. As shown in Fig. 9, as in the first embodiment, the brake disk 413 is mounted in a sheave 412 from the projecting section 19 of the sheave 412. Thereafter, the brake disk 413 is brought into contact with an opposed surface 420a opposed to the motor 10 in a flange section 420.

Bolts 423 functioning as a fixing mechanism in the fourth embodiment are inserted into the flange section 420 from the opposite side of the motor 10 in the flange section 420 to fix the brake disk 413 and the sheave 412. As a result, even if the brake disk 413 and the sheave 412 are large, it is possible to easily fix the brake disk 413 and the sheave 412. The bolts 423 may be inserted from a surface 413d opposed to the motor 10 of the brake disk 413 toward the flange section 420 to fix the brake disk 413 and the sheave 412.

The other components are the same as those of the traction machine 100 according to the first embodiment. Therefore, explanation of the components is omitted. With the traction machine 400 including the configuration explained above, it is possible to obtain action and effect same as those of the traction machine 100 according to the first

embodiment.

The present invention is not limited to the embodiments explained above and shown in the figures. Various modifications of the embodiments are possible without departing from the spirit of the invention described in patent claims.

Claims :

1. A traction machine comprising,
 a sheave including a driving shaft,
 a bearing stand for supporting the driving shaft as well as the sheave in a rotatable manner,
 a motor arranged on an axial end of the driving shaft to drive rotationally the sheave through the driving shaft,
 a flange section arranged an end of the sheave axially opposite to the motor,
 a brake disk contacting a surface of the flange section opposite to the motor and fixed with respect to the sheave through a fixing mechanism to rotate with the sheave, and
 a brake for clamping the brake disk to brake a rotation of the brake disk.
2. The traction machine according to claim 1, wherein the fixing mechanism has a fitting section formed on the surface and a through-hole formed on the brake disk to be fitted onto the fitting section, and the brake disk and the sheave are fixed with respect to each other with a tight fit.
3. The traction machine according to claim 2, wherein the brake disk has a thickened part.
4. The traction machine according to claim 1, wherein the fixing mechanism has a dent formed on the sheave, a groove formed on the brake disk to face to the dent, and a fixing member fitting into each of the dent and the groove.
5. The traction machine according to claim 1, wherein the fixing mechanism has a protrusion formed on the sheave, and a groove formed on the brake disk to engage with the protrusion.
6. The traction machine according to claim 1, wherein the fixing mechanism has a bolt fixing the flange section and the brake disk to each other.
7. An elevator comprising,
 a cage movable upward and downward in a hoistway,
 a balancing weight connected to the cage through a rope, and
 a traction machine on which the rope is wound to move the cage upward and downward,
 wherein the traction machine has,
 a sheave including a driving shaft,
 a bearing stand for supporting the driving shaft as well as the sheave in a rotatable manner,

a motor arranged on an axial end of the driving shaft to drive rotationally the sheave through the driving shaft,

a flange section arranged an end of the sheave axially opposite to the motor,

a brake disk contacting a surface of the flange section opposite to the motor and fixed with respect to the sheave through a fixing mechanism to rotate with the sheave, and

a brake for clamping the brake disk to brake a rotation of the brake disk.