

A TRACTION MACHINE FOR AN ELEVATOR

The present invention relates to an elevator and more particularly to a traction machine for an elevator.

Referring to Figures 1 and 2 of the attached drawings wherein is shown a conventional traction machine for an elevator. In Figures 1 and 2, the reference numeral 1 shows a hoist way or liftshaft for an elevator, 2 a machine room provided at the top end of the hoist way 1, and 3 a reduction gear installed on the floor of the machine room 2 and principally comprising an input shaft 3a and an output shaft 3b arranged in parallel with each other, each carrying spur gears. A traction sheave 4 is connected to the output shaft 3b of the reduction gear 3, and an electric motor 5 is arranged on the opposite side of the reduction gear 3 to the traction sheave 4, the shaft of the motor 5 being connected to the input shaft 3a of the reduction gear 3 and fixedly secured thereto by a bracket 6. A brake gear 7 is mounted on the motor 5 on the end surface remote from the reduction gear 3, and main hoisting wire ropes 8 are reeved on the traction sheave 4 and support a cage 9 and a counter weight 10 at their ends. A further sheave 11 acts as a deflector. Thus, it will be appreciated that since the conventional traction machine is formed such that the reduction gear

3, the traction sheave 4, the electric motor 5, etc. are arranged in series, a large space is required for installation of the traction machine, and in the case of a small elevator, etc. when the machine room 2 is narrow, the installment of the traction machine is made impossible, and the space necessary for carrying out maintenance operations for the traction machine is small, making the maintenance difficult, etc. Thus, the conventional traction machine clearly suffers from various disadvantages.

On the other hand, since it is usual that the traction sheave 4 is disposed substantially on the center line of the plane of the hoist way 1 as shown in Figures 1 and 2, it is necessary for the machine room 2 to be erected at the top end of the hoist way 1 with a portion protruding outwards from the position corresponding to the top end portion of the hoist way 1, so that inefficient use is made of the space in the building, revealing another defect of the conventional traction machine.

The present invention seeks to provide a traction machine for an elevator which can reduce at least some of the defects as above described inherent in the conventional one.

In accordance with the present invention, there is provided a traction machine for an elevator having a reduction gear with parallel input shaft and output shafts extending from the same side of a main housing, a traction sheave connected to said output shaft, an electric motor connected to said input shaft, a brake gear and a flywheel, wherein at least one of the elements consisting of said electric motor, said brake gear, and said flywheel is arranged on the same side of the reduction gear housing as said traction sheave and a peripheral portion of one of the side surfaces of said at least one element is disposed so as to face a peripheral portion of one of the side surfaces of said traction sheave.

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

Figure 1 is a plan view schematically showing an example of a conventional traction machine for an elevator;

Figure 2 is a front elevational view of Figure 1 partially in section;

Figure 3 is a partial cross section view of a first embodiment of a traction machine for an elevator according to the present invention;

Figure 4 is a plan view of the present invention

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shown in Figure 3 showing the manner of its installation within a machine room;

Figure 5 is a view similar to Figure 1 but showing a second embodiment of the present invention;

5 Figure 6 is a sectional view of Figure 5 taken along the line VI-VI of Figure 5;

Figure 7 is a view similar to Figure 5 but showing a third embodiment of the present invention;

10 Figure 8 is a view of the embodiment shown in Figure 7 as viewed from the right thereof and on a somewhat larger scale;

Figure 9 is a view similar to Figure 7 but showing a fourth embodiment of the present invention;

15 Figure 10 is a partial sectional plan view of a fifth embodiment of a traction machine for an elevator in accordance with the present invention;

Figure 11 is a view similar to Figure 10 but showing a sixth embodiment of the present invention;

20 Figure 12 is a partial cross sectional view of a seventh embodiment of the present invention; and

Figure 13 is an enlarged sectional view of Figure 12 taken along the line XIII-XIII of Figure 12.

Referring now to Figures 3 and 4 wherein is shown an embodiment of the present invention,
25 a reduction gear 3 comprises parallel shafts each carrying helical gears etc. and having an input shaft

3a and an output shaft 3b arranged in horizontal planes, and 3c is a main housing having a recessed portion 3d at the side where the input shaft 3a passes therethrough. A traction sheave 4 is
5 disposed near the housing 3c at the side where the recessed portion 3d is provided and is for rotation with the output shaft 3b of the reduction gear 3, and a brake drum 7 is arranged within the recessed portion 3d of the main housing 3c of
10 the reduction gear 3 with a clearance being left therefrom and mounted on the input shaft 3a to form a part of a brake gear. One of the end surfaces of brake drum 7 is disposed so as to face a portion of the periphery of one of the side surfaces of the traction sheave 4.
15 An electric motor 5 has its shaft 5a connected to the input shaft 3a of the reduction gear 3 through the brake drum 7, whereby one of the end surfaces of the motor 5 is disposed so as to face a portion of the periphery of the other side surface of the traction
20 sheave 4 remote from the reduction gear 3.
A flywheel 12 is fixedly secured to the brake drum 7 on its other side surface facing the recessed portion 3d of the reduction gear 3.

It will be appreciated that in this first embodiment
25 of the present invention, the peripheral portions of the side surfaces of the traction sheave 4 are disposed, in the plan view, between one of the side surfaces of the

brake drum 7 and one of the end surfaces of the motor 5, or in other words both side surfaces of the traction sheave 4 are arranged so as to face the brake drum 7 and the motor 5, and the housing 3c of the reduction gear 3 is provided with the recessed portion 3d to receive the brake drum 7 therein. Therefore, as shown in Figure 4, the dimensions A and B of the traction machine indicated therein are decreased so that it can be installed within a narrow machine room 2. Further, since the outer configuration of the traction machine is made small its transport action and packaging are also simplified. Thus, since in the first embodiment the housing of the reduction gear is provided with a recessed portion to receive the brake drum, and the peripheral portions of the side surfaces of the traction sheave 4 are arranged so as to face one of the end surfaces of the motor and one of the side surfaces of the brake drum, a traction machine for an elevator is realized which requires only a small space for installation, allowing easy installation within a small machine room, and which can be easily transported.

Although it has been described in reference to the first embodiment that one of the side surfaces of the brake drum 7 and one of the end surfaces of the electric motor 5 are constructed to face the peripheral portions of the side surfaces of the traction sheave 4,

even when only one of the side surface of the brake drum 7 and the end surface of the motor 5 is made to face the traction sheave 4, it may be possible to reduce the required space for and the outer configuration of the traction machine.

Figures 5 and 6 show a second embodiment of the present invention wherein 3 is a reduction gear having parallel shafts each carrying helical gears and comprising an input shaft 3a and an output shaft 3b arranged on a horizontal plane, all being enclosed within a main housing 3c. A mounting frame 13 has one of its end surfaces fixedly secured to the main housing 3c, and its peripheral surface faces the peripheral surface of a traction sheave 4, whereby the distance A between the centers of the input shaft 3a and the output shaft 3b of the reduction gear 3 is made smaller than the outer diameter of the electric motor 5 which is secured to one end of its end surfaces to the other end surface of the mounting frame 13 such that the end surface of the motor 5 faces a peripheral portion of one of the side surfaces of the traction sheave 4. The shaft 5a of the motor 5 passes through the bore 13a of the mounting frame 13 to be connected to the input shaft 3a. Thus, in the second embodiment, as shown in Figure 5, the peripheral portion of one of the side surfaces of the traction sheave 4 is arranged so as to face one of the end surfaces of the motor 5 by means of the mounting frame 13. Thanks to this measure, the distance A between the centers of the input

and output shafts 3a, 3b can be made small, contributing to make the outer configuration and the space required for installment of the traction machine small. Further, by appropriately selecting the gap c between the peripheral portions of one of the side surfaces of the traction sheave 4 and one of the end surfaces of the motor 5, the traction sheave 4 can be replaced without the need of dismounting the motor 5.

Figures 7 and 8 show a third embodiment of the present invention. In this third embodiment a mounting frame 13 as in the second embodiment shown in Figures 5 and 6, is secured at one of its end surfaces to the main housing 3c at a position remote from the traction sheave 4, and the mounting frame 13 is secured at the other end to the electric motor 5 at one of its end surfaces such that this end surface faces a peripheral portion of one of the side surfaces of the traction sheave 4. The shaft 5a of the motor 5 is connected to the input shaft 3a through a shaft coupling 14. Thus, also in this third embodiment, since the peripheral portions of one of the side surfaces of the traction sheave 4 and one of the end surfaces of the motor 5 are arranged so as to face each other, it is apparent, although the detailed explanation is omitted, that this embodiment reveals the same advantages as those obtainable from the second embodiment above described.

(23)

Figure 9 shows a fourth embodiment of the present invention wherein the electric motor 5 is secured to the main housing 3c of the reduction gear 3 on the side remote from the traction sheave 4, the shaft being
5 connected to the end of an input shaft not shown. The brake drum 7 mounted on the end of the input shaft through a mounting frame 13 similar to that in the second embodiment shown in Figures 5 and 6 such that a
10 peripheral portion of one of the end surfaces of the drum 7 faces a peripheral portion of one of the side surfaces of the traction sheave 4. Thus, also in this fourth embodiment, since the center distance A between the traction sheave 4 and the brake drum 7 can be made small, it is apparent, although no detailed explanation
15 is given herein, that also the fourth embodiment can exhibit advantages corresponding to those of the second embodiment described above.

From the foregoing it will be appreciated that since in the second, third and fourth embodiments at
20 least one of an electric motor or a brake drum is secured to a reduction gear on the same side as the traction sheave, through a mounting frame such that its side surfaces faces a peripheral portion of one of the side surfaces of the traction sheave, the central distance
25 between the input shaft and the output shaft of the reduction gear can be made small, enabling the outer

configuration of a traction machine for an elevator to be made small, and making the space required for its installment small, reducing the cost of the elevator equipment.

5 Figure 10 shows a fifth embodiment of the present invention, in which the frame 13 has a flange 13b at one of its ends to be secured to the reduction gear 3 by bolts, a flange 13c at its other end to mount the electric motor 5 through its
10 flange 5b by bolts, and an intermediate portion 13d having a diameter smaller than the outer diameter of the motor 5, whereby the frame 13 receives within it an input shaft of the reduction gear 3 and the shaft of the motor 5 connected thereto. The traction sheave
15 4 is keyed to the end of the output shaft 3b of the reduction gear 3, its peripheral surface being adjacent the intermediate portion 13d of the frame 13, one of the side surfaces of the sheave 4 faces the motor flange 13c of the frame 13 separated therefrom by a distance
20 D, the hub 4a of the sheave 4 having a length E.

 Thus, in this fifth embodiment the traction sheave 4 and the electric motor 5 are disposed on the same side of the reduction gear 3 and staggered from each other. Accordingly, the dimension of the traction machine in the
25 plan view is made small, reducing the space required for its installation. Further, by shaping and arranging the

traction sheave 4, so as to satisfy the condition described below, the sheave 4 can be dismounted the motor 5 from the frame 13, making the replacement of the sheave 4 when damaged, etc. easy. That is, 5 the dimension D is made larger than the dimension E. By doing so, upon releasing the fastening between the output shaft 3b and the traction sheave 4 and shifting the sheave in the axial of the output shaft 3b, the engagement of the traction sheave 4 10 with the end of the output shaft 3b is released prior to the abutment of one of the side surfaces of the traction sheave 4 against the motor mounting portion 13c of the bracket 13.

Figure 11 shows a sixth embodiment of the 15 present invention wherein the traction sheave 4 of Figure 5 is modified so as to comprise a central portion 4c having a hub 4a to be mounted on the end of the output shaft 3b of the reduction gear 3 and a flange portion 4b extending radially from the hub 20 portion 4a, and an outer portion 4f having an inwardly extending flange 4d partially overlapping and fastened to the periphery of the flange portion 4b 4c and a rim 4e integrally formed with the flange 4d and having an outer periphery around which hoist wire 25 ropes are reeved. The various reference numerals entered in the drawing for dimensions represent the following:

I = The extent of the axial overlap between the flanges 4c + 4d

F = The overlap between the periphery of the rim 4e and the flange 13c.

5 D = The distance between the rim 4e and the adjacent end surfaces of the flange 13c of the frame 13;

G = The distance between the outer periphery of the hub portion 4a and the inner periphery of the flange 4d and;

10 H = The distance between the outer periphery of the flange 4b and the inner periphery of the rim 4e.

Since the traction sheave 4 and the motor 5 are disposed similarly to the case of the fifth embodiment, it is apparent, although no detailed
15 explanation is given here, that the present embodiment operates similarly to the fifth embodiment. Further, by selecting the dimensions such

$D > I$, $G > F$ and $H > F$,

the rim 4f of the traction sheave 4 can be dismounted
20 from the fastening portion 4c of the traction sheave 4 and the fastening portion 4c can be dismounted from the output shaft 3b of the reduction gear 3 without the need of

dismounting the motor 5 from the frame 13. That is, upon releasing the fastening between the outer portion 4f and the central 4c of the traction sheave 4 and shifting the portion 4f in the longitudinal direction of the outer shaft 3b, the engagement of the flange portion 4b with the engaging portion 4d is released prior to the abutment of one of the side surfaces of the ring portion 4f against the confronting end surface of the motor mounting portion 13c of the bracket 13. In this state, upon shifting the rim portion 4f in a direction orthogonal to the axis of the output shaft 3b away from the frame 13, the engagement of one of the side surfaces of the rim portion 4f with the facing side surface of the motor mounting portion 13c of the frame 13 is released prior to the abutment of the inner periphery of the outer portion 4f against the outer periphery of the flange 4b, the inner periphery of the rim abutting against the outer periphery of the flange 4b. In this state, the outer portion 4f can be dismantled lengthwise from the output shaft 3b. Thus, this embodiment reveals an operation similar to that of the fifth embodiment.

Also it is conceivable that in the sixth embodiment shown in Figure 11 the central portion 4c of the traction sheave 4 may be integrally constructed

with the output shaft 3b of the reduction gear 3.

Thus, in the fifth and sixth embodiments, the traction sheave and the motor are disposed on the same side of the reduction gear comprising
5 parallel axis gears, and the motor is mounted on the reduction gear through a frame having a smaller diameter than the outer diameter of the motor, the peripheral surface of the traction sheave being adjacent the intermediate portion of the
10 bracket, and a peripheral portion of one of the side surfaces of the traction sheave is arranged so as to face the connecting portion of the motor with the bracket, making it possible to replace the traction sheave without necessitating the dismounting of the motor
15 from the bracket. By adopting such a construction, the traction machine can be easily installed within a small machine room, and the maintenance operation made easy, so that a traction machine for an elevator which has low installation and maintenance costs can be realized.

20 Figures 12 and 13 show a seventh embodiment of the present invention wherein the reference numeral 3 is a reduction gear comprising parallel axis gears such as spur gears, and having an input shaft 3a and an output shaft 3b disposed on the same side in a horizontal
25 plane, the reduction gear 3 being provided with a main housing 3c having recessed portion 3d at the portion

from which protrudes the input shaft 3a. A traction sheave 4 is arranged at the side of the recessed portion 3d of the main housing 3c of the reduction gear 3 and drivingly connected to the output shaft 3b of the reduction gear 3. A braking drum 7 is connected to the input shaft 3a of the reduction gear 3 and constitutes a brake gear, the braking drum 7 being adapted to serve simultaneously as a shaft coupling and having a flange-like shape, whereby a peripheral portion of one of the side surfaces of the brake drum 7 faces a peripheral portion of one of the side surfaces of the traction sheave 4. An electric motor 5 with its shaft 5a faces the input shaft 3a of the reduction gear 3, the motor 5 being connected at one of its end surfaces by bolts 5b to a mounting frame 13e, 13f, which comprises two members and is secured to the reduction gear 3 at one of its side surfaces so that a peripheral portion of one of the end surfaces of the motor 5 faces at the side of the shaft 5a a peripheral portion of the other side surface of the traction sheave 4. An opening 13g is provided in the mounting frame 13e, 13f adapted to receive the hoisting wire ropes not shown, and a plate-like coupling 15 of substantially rectangular configuration is mounted on the end of the shaft 5a of the motor 5 and secured to the brake drum 7 by bolts 15a

and connects the shaft 5a of the motor 5 with the input shaft 3a of the reduction gear 3. The dimension of the coupling 15 in the widthwise direction from the center of the shaft 5a is defined so as to be less than the distance from the center of the shaft 5a to the outer peripheral surface of the traction sheave 4. Thus, also in this seventh embodiment, as in the case of the first embodiment, it can make the space required for its installation small, making its installation within a small machine room easy, and make its outer configuration small. Further, since the coupling 15 is shaped so as to have a rectangular plate-like configuration, in a position where its longer side faces the outer peripheral surface of the traction sheave 4, when the bolts 15a are dismounted from the jointer 15 and the bolts 5b are dismounted from the motor 5, the motor 5 can be dismounted from the reduction gear 3 with the traction sheave 4 intact. Conversely the motor 5 can be mounted to the reduction gear 3 in a similar manner.

Therefore, a traction machine for an elevator can be provided which makes the mounting or dismounting of an electric motor at the time of assembly or disassembly easy. That is, in this seventh embodiment, in a traction machine in which a peripheral portion of one of the side surfaces of the traction sheave and a portion of one of the end surfaces of the electric motor are arranged in a partially overlapping fashion, the dimension from one of

the sides of the jointer connecting the shaft of the motor with the input shaft of the reduction gear to the center of the shaft of the motor is selected to be less than the distance between the center of the shaft of the motor and the outer peripheral surface of the tractoin sheave. By adopting such a specific dimensional relationship, a traction machine for an elevator can be realized in which the motor can be easily mounted or dismounted in the condition of the traction sheave being mounted to the reduction gear, so the assembly or disassembly operation, particularly at the time of maintenance operations after the installation of the elevator, is simplified, sparing operational costs.

It is to be understood that although certain forms of the present invention have been illustrated and described, the intention is not to be limited thereto except so far as such limitations are included in the following claims.



(34)

CLAIMS:

1. A traction machine for an elevator having a reduction gear with parallel input shaft and output shafts extending from the same side of a main housing, a traction sheave connected to said output shaft, an
5 electric motor connected to said input shaft, a brake gear and a flywheel, wherein at least one of the elements consisting of said electric motor, said brake gear, and said flywheel is arranged on the same side of the reduction gear housing as said traction sheave and
10 a peripheral portion of one of the side surfaces of said at least one element is disposed so as to face a peripheral portion of one of the side surfaces of said traction sheave.

2. A traction machine for an elevator as claimed in
15 Claim 1, wherein the reduction gear comprises helical gears with parallel axes.

3. A traction machine for an elevator as claimed in Claim 1 or 2, wherein said main housing of said reduction gear is provided with a recessed portion on
20 the same side as the traction sheave and said input shaft passes through the recessed portion and within which recessed portion said brake drum is disposed on the input shaft such that a peripheral portion of one

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of the side surfaces of said brake drum faces a peripheral portion of one of the side surfaces of said traction sheave, the shaft of said electric motor being connected to said input shaft of said reduction gear through said brake drum, whereby one of the end surfaces of said electric motor is adapted to face a peripheral portion of the other side surface of said traction sheave.

4. A traction machine for an elevator as claimed in Claim 1 or 2, wherein a mounting frame is secured at one of its end surfaces to said reduction gear at the side where said traction sheave of said reduction gear is disposed, such that the peripheral surface of said mounting frame faces the peripheral surface of said traction sheave, and the other end surface of said mounting frame is rigidly secured to at least one of said electric motor and said brake gear such that a peripheral portion of one of the side surfaces of said at least one element confronts a peripheral portion of one of the side surfaces of said traction sheave.

5. A traction machine for an elevator as claimed in Claim 1 or 2, wherein a mounting frame is secured at one of its end surfaces to said reduction gear at the side where said traction sheave of said reduction gear is disposed and remote from said traction sheave, and the other end of said mounting frame is connected to



(36)

said electric motor so that one of the end surfaces of said electric motor faces a peripheral portion of one of the side surfaces of said traction sheave, the shaft of said electric motor being connected to said input shaft
5 of said reduction gear through a shaft coupling means.

6. A traction machine for an elevator as claimed in Claim 1 or 2 wherein a frame is secured at one of its end surfaces to said reduction gear on the side where said traction sheave of said reduction gear is disposed,
10 and the other end surface of said frame is fixedly secured to the electric motor such that the securing portion projects outwardly from the intermediate portion of said frame in an axial direction of said frame, whereby the peripheral surface of said traction sheave faces
15 said intermediate portion of said frame and a peripheral portion of one of the side surfaces of said traction sheave faces said securing portion of said frame so that, upon release of the fastening of said traction sheave with said output shaft of said reduction gear and shift
20 of said traction sheave in the longitudinal direction of said output shaft of said reduction gear till one of the side surfaces of said traction sheave abuts said securing portion of said frame, the engagement of said traction sheave with said output shaft of said reduction
25 gear is released so that the sheave is shiftable in this disengaged state in a direction orthogonal to the axis of said output shaft of said reduction gear till said side surface of said traction sheave reaches a position not confronting said securing portion of said frame.