

Description

The present invention relates to a hoist and traction machine, and more particularly to a hoist and traction machine provided with; a load sheave; a driving shaft provided with a driven member and for driving the load sheave; a driving member screwable with the driving shaft; a braking pawl and a braking ratchet wheel and braking plates, which are interposed between the driving member and the driven member and constitute a mechanical brake; and driving means, such as a manual lever or the like, for driving the driving member normally or reversely.

Conventionally, this kind of hoist traction machine is generally provided with the above features, the braking pawl and braking plates being received within a brake cover on which is mounted an operating lever for driving the driving member in the normal or in the reverse direction. Thus the operating lever must be mounted to permit rotational movement of the lever with respect to the brake cover by means of a coupling arrangement.

One means for providing such a coupling arrangement involves providing an aperture in a panel portion of the lever and bending margins of the aperture outwardly so that they pass through a larger aperture formed in the brake cover. The margins are then further bent so that they flare outwardly of the aperture to form a rolled edge so rendering the panel member captive in the aperture in the brake cover but capable of rotation with respect thereto. An example of this type of arrangement is described in German Patent Specification No. DE-A-3323150 in which a portion of the lever is supported within the annular rolled edge formed by the margins of the brake cover. It will be appreciated that the preforming necessary to bend the margins outwardly into a generally cylindrical form and the on-the-spot manipulation necessary to flare the margins to ensure proper mounting, is inconvenient, labour-intensive and therefore uneconomical.

It is an object of the present invention to obviate the above difficulties and to provide a machine in which the coupling means between the brake cover and the operating lever is readily assembled. The invention therefore provides a hoist and traction machine including a load sheave, a driving shaft for driving said load sheave and provided with a driven member, a driving member screw-threadedly engageable with said drive shaft a mechanical brake arrangement interposed between said driving member and said driven member, an operating lever for operating the driving member in a normal direction or in a reverse direction and a brake cover arranged to cover the mechanical brake arrangement,

(a) said brake cover having an aperture therein through which passes a portion of said driving member having a diameter smaller than that of the aperture, characterised in that

(b) said operating lever comprises a mounting plate having an aperture through which passes said driving member portion, and which has a diameter at least substantially the same as that of the first mentioned aperture, and in that there is provided

(c) a coupling means for coupling said operating lever with said brake cover for rotation relative thereto, said coupling means comprising

(i) a sleeve encircling said driving member portion and received in said apertures of said brake cover and mounting plate, an outer surface of the sleeve having engagement means to receive lip portions of said apertures, said engagement means comprising a flange provided so as to extend substantially radially outwardly of said outer surface and a retaining groove provided so as to extend circumferentially around said outer surface at a position spaced from said flange, and

(ii) a retaining ring secured in said retaining groove so as to retain lip portions of said apertures between said flange and said ring to support said operating lever on said brake cover in a freely rotatable manner.

In one embodiment of the invention, the a hoist and traction machine is provided with a free rotation control apparatus for making said mechanical brake non-operable and enabling said load sheave to freely rotate, said free rotation control apparatus provided with,

d) a stopper provided at an axial end of said driving shaft;

e) an operating handle for free rotation operation interposed between said stopper and said driving member in relation to being axially movable across from a first position in proximity to said driving member to a second position apart therefrom so as to be non-relative-rotatable with respect to said driving shaft;

f) an elastically biasing member interposed between said stopper and said operating handle and for biasing said operating handle toward the first position where said operating handle moves toward said driving member;

g) regulation means which is provided between said operating handle and said driving member, can regulate a relative rotation range of said driving member with respect to said driving shaft when said operating handle is put in the first position, and can release said regulation when said operating handle is put in the second position;

h) free rotation control holding means which releases regulation by putting said operating handle in the second position and, when said operating handle rotates for free rotation, applies a biasing force by said elastically biasing member onto said driving member so as to hold free rotation operation by said operating handle, said driving means comprising,

i) an operating lever for operating the driving member in a normal direction or in a reverse direction.

In one example of a machine including a coupling means according to the invention, the lip portions of the aperture of the brake cover and the mounting plate may be spaced apart by means of a ring member extending around the sleeve.

In a second example, one of the lip portions may comprise a flange which is turned inwardly around the margins of the aperture to form a bearing surface against lip portions of the other aperture. Preferably, the lip portions of the brake cover may provide the intumed flange which acts as a bearing surface against lip portions of the aperture of the mounting plate.

There will now be described two embodiments of the invention by way of example only and not by way of limitation. The description is intended to be read with reference to the drawings in which:-

Figure 1 is a longitudinal sectional view of a first embodiment of a lever type hoist and traction machine of the invention and including said operating lever mounting and coupling means;

Figure 2 illustrates engagement of ridges of an operating handle with engaging grooves of a stop means;

Figure 3 is a front view of a driving member, in which a relative rotation range of the driving member with respect to a driving shaft and a rotary position of each engaging projection with respect to the driving member during the free rotation are shown;

Figure 4 is a longitudinal sectional view of the hoist and traction machine in the condition in which it is operated to freely rotate and the free rotation control is held;

Figure 5 is a longitudinally sectional view of a second embodiment of the lever type hoist and traction machine of the invention and incorporating an alternative form of operating lever mounting;

Figure 6 is a fragmentary view of a portion of the machine of Figure 1 showing a coupling means;

Figure 7 is a similar fragmentary view of a modified coupling means; and

Figure 8 is an enlarged view of a part of Figure 7.

The first embodiment of the hoist and traction machine shown in Figures 1 through 5 will now be described.

The first embodiment of the lever type hoist and traction machine, as shown in Figure 1, is so constructed that a tubular shaft 4 having a load sheave 3 is rotatably supported between a first side plate 1 and a second side plate 2 disposed opposite to each other and spaced at a predetermined distance within the tubular shaft 4 is supported for rotation relative thereto a driving shaft 5 to which a driving torque is transmitted from an operating lever to be described below, and a reduction gear mechanism 6 comprising a plurality of reduction gears is interposed between an outside end of a driving shaft 5 projecting from the second side plate 2 and the load sheave 3, so that the reduction gear mechanism 6 reduces the driving torque and transmits it toward the load sheave 3.

A driven member 7 comprising a hub having a flange engages by a screw thread with an outer portion of the driving shaft 5 projecting from the first side plate 1, a driving member 8 having at the outer periphery thereof teeth 8a screw-threadedly engages with the driving shaft 5 at the outside of the driven member 7, a pair of braking plates 9 and 10 and a braking ratchet wheel 11 are interposed between the driving member 8 and the driven member 7, and a braking pawl 12 engageable with the braking ratchet wheel 11 is provided at the first side plate 1, so that the braking ratchet wheel 11 and braking plates 9 and 10 constitute a mechanical brake 13 having a brake cover 13a covering the outer periphery of the mechanical brake 13 and radially outwardly of the driving member 8 is provided driven means comprising an operating lever 16 which has a pawl member 14 provided with normal and reverse rotation pawls engageable with the teeth 8a provided at the outer periphery of the driving member 8 and has a control portion 15 for controlling the pawl member 14 to engage with or disengage from the teeth 8a.

The brake cover 13a is dish-like in shape and is provided at its outer periphery (shown at the left side thereof in Figures 1 and 6) a mounting flange 113 enabling the cover to be mounted on the side plate 1. An aperture 114 is provided at the central area of the cover 13a through which passes the driving shaft 5 and a small diameter portion of the driving member 8, which also pass through a similarly sized aperture 115 formed in an inner plate 16a of the operating lever 16. The lever 16 is also provided with an outer plate 16b which is coupled to the plate 16a by means of a bolt 116, a nut 117 and a spacing collar 118. The pawl member 14 is mounted on a shaft 119 supporting the control portion 15 and which is itself supported in the plates 16a and 16b by means of bushes 120.

The plate 16a is coupled to the brake cover 13a by means of a sleeve 121 which has a flange 122 (see Figure 6) at one side thereof and, spaced from the flange on the outer circumferential surface, a continuous groove 123.

In assembly of the coupling means the sleeve 121 is inserted in the aperture 115 of the plate 16a an optional spacer or bearing ring 124 is then placed on the sleeve and left hand, leading edge of the sleeve is inserted in the aperture 114 and a circlip 125 or other snap-fit retaining ring is inserted in the groove 123. Thus the operating lever 16 is freely rotatable with respect to the brake cover 13a on which it is mounted but is safely retained in position.

In the lever type hoist and traction machine constructed as above-mentioned, a stop means 17 is provided at an axial end of the driving shaft 5, an operating handle 18 non-rotatably mounted relative to the driving shaft 5 is interposed between the stop means 17 and the driving member 8 so as to be axially movable from a first position where the handle 18 moves toward the driving member 8 to a second position where the same moves away therefrom, between the operating handle 18 and the stop means 17 is provided an elastic biasing member 19 mainly comprising a coil spring and for biasing the handle 18 toward the driving member 8, and between the operating handle 18 and the driving member 8 is provided regulation means which can regulate a range of relative rotation of the driving member 8 with respect to the driving shaft 5 and release the regulation of the range by moving the handle 18 away from the driving member 8.

In other words, in the first embodiment shown in Figure 1, first and second threaded portion 20 and 21 and a splined portion 23 are provided on the driving shaft 5, the driving member 17 engages with the first threaded portion 20 and the driving member 8 with the second threaded portion 21, a coil spring 24 is interposed between the driven member 7 and the driving member 8 and restricts the axial movement of driven member 7 with respect to the driving shaft 5, and the driving member 8 is normally rotated with respect to the driving shaft 5 so as to screw forward in the leftward direction as viewed in Figure 1. Also, a pair of sleeves 25 and 26 are fitted onto the splined portion 23 on the driving shaft 5 axially outside of the driving member 8, a flange 25a is provided at the first sleeve 25, a means 17 is mounted by spline coupling to the end of the splined portion 23 outside the second sleeve 26, and a nut 27 is tightened to fix the means 17 to the driving shaft 5 through the sleeves 25 and 26.

Onto the second sleeve 26 is fitted, by means of a bore 18a, a boss 28 of the operating handle 18, so that the operating handle 18 is interposed

between the means 17 and the driving member 8 and, as shown in Figure 2, a pair of ridges 29 are provided at the inner periphery of operating handle 18 so as to engage with engaging grooves 30 provided at the outer periphery of means 17 as shown in Figures 1 and 2 thereby making the operating handle 18 non-rotatable relative to the driving shaft 5.

Between the axially outside surface of the boss 28 of operating handle 18 and the axially inside surface of the means 17 opposite to the boss 28 is interposed the elastic biasing member 18 in contact with the respective side surfaces so as to bias the operating handle 18 toward the flange 25a of the first sleeve 25 in the direction of movement away from the stop means 17, in other words, toward the driving member 8.

Furthermore, two engaging projections 31 projecting toward the driving member 8, are, as shown in dotted lines in Figure 3, symmetrically provided at the radial end portion of the rear surface of the boss 28 of operating handle 18, a pair of projecting portions 32, as shown in Figures 3 and 4, are symmetrically provided at one axial side of the driving member 8 opposite to the boss 28 of the operating handle 18; at the projecting side surfaces of the projecting portions 32 are provided first and second regulating surfaces 33 and 34 which, when the operating handle 18 is rotated so as not to move away axially from the driving member 8 but to rotate the driving member 8 relatively with respect to the driving shaft 5, engage with the engaging projections 31 respectively to regulate the range of relative rotation of driving member 8 with respect to the driving shaft 5, and at the projecting front surfaces of the projecting portions 32 are provided free rotation control surfaces 35 which, when the operating handle is moved away from the driving member 8 and rotated relatively with respect thereof, are biased by the elastic biasing member 19, so as to be contactable with the outermost ends of engaging projections 31 respectively. Furthermore, at the projecting front surfaces of the projecting portions 32 are provided regulating portions 36 which rise from the free rotation control surfaces 35 and which, when driving member 8 rotates relatively with respect to the driving shaft 5 in the state where the outermost end faces of engaging projections 31 contact with the free rotation control surfaces 35 respectively, engage with the front sides of the engaging projections 31 in the rotating direction thereof respectively.

The operation of the lever type hoist and traction machine as above will now be described.

Firstly, for hoisting a load, the operating part 15 provided on the operating lever 16 operates to engage the feed pawl of the pawl member 14 with the teeth 8a of the driving member 8 and the lever

16 is operated in swinging motion relative to the brake cover 13a as mentioned above, thereby rotating the driving member 8 in the normal direction. The driving member 8, when rotating normally, screws forward leftwardly in Figure 1, that is, toward the driven member 7, the mechanical brake 13 operates, and the driving torque of driving member 8 is transmitted from the driving shaft 5 to the load sheave 3 through the reduction gear mechanism 6 and tubular shaft 4, so that the hoisting work of a load connected to the chain engaging with the load sheave 3 is performed on rotation thereof.

When the load is lowered, a reverse rotating pawl of the pawl member 14 at the operating part 15 is engaged with one of the teeth 8a of the driving member 8 to swing the lever 16, thereby reversely rotating the driving member 8. Since the engaging projections 31 are put in the positions X shown by the dotted lines in Figure 3, in other words, between the first regulating surface 33 and the second regulating surface 34, the driving member 8 rotates relatively with respect to the driving shaft 5 between the first regulation surface 33 and the second regulation surface 34 so as to be rearwardly movable with respect to the driven member 7. Hence, the driven member 7 moves backwardly to stop braking action of mechanical brake 13 and the driving shaft 5 can rotate reversely only to the extent of reverse rotation of driving member 8, thereby performing the load lowering work in safety.

In addition, during the load hoisting or lowering work, the operating handle 18 is rotated normally or reversely without being pulled toward the means 17 against the elastic biasing member 19, whereby the driving member 8 is moved in the direction of operation or non-operation of the mechanical brake 13 with respect to the driving shaft 5. Hence, the load sheave 3 is rotated normally or reversely only by a rotation angle corresponding to the rotation of operating handle 18, thereby enabling the amount by which the chain is pulled out or wound up to be finely adjusted.

Next, explanation will be given in the case where the load sheave 3 is put in the free rotation state to freely extend or reduce a length of the chain toward the load.

First, the reversing pawl of the pawl member 14 engages with one of the teeth 8a of driving member 8 and, when the operating handle 18 normally rotates, the driving member 8 is fixed so as not to rotate together with the operating handle 18. In this state, the operating handle 18 is pulled out toward the means 17 against the elastic biasing member 19, in other words, the same is moved from the first position as shown in Figure 1, to the second position away from the driving member 8,

thereby normally rotating the operating handle 18. At this time, while the driving member 8 cannot normally rotate because the reversing pawl of the pawl member 14 engages with the tooth 8a at the driving member 8, the driving shaft 5 screw-threadedly engaged with the driving member 8 rotate together with the operating handle 18 by means of stop means 17. In other words, the driving shaft 5 normally rotates relative to the driving member 8 and in excess of the range regulated by the first and second regulating surfaces 33 and 34. Accordingly, the driving member 8 axially moves away from the driven member 7 in Figure 1 so that the braking action by the mechanical brake 13 can be released and the load sheave 3 can be put in the free rotation state, in which the chain, when pulled toward the load side, can quickly be extended at the load side and, when pulled toward the no-load side, can quickly be shortened at the load side.

As above mentioned, the operating handle 18 is pulled out and rotatably operated so that the engaging projections 31 provided at the operating handle 18 can rotatably be moved to the position Y shown by the dotted line in Figure 3. In this state, since the operating handle 18 is biased toward the driving member 8 by the elastic biasing member 19, so that the projecting outermost ends of engaging projections 31 elastically contact with the free rotation control surfaces 35 of projecting portions 32 provided at the driving member 8 as shown in Figure 4, whereby frictional resistance caused by the elastic contact can hold the load sheave 3 in the free rotation state. Accordingly, when the chain is adjusted by holding the free rotation state, the input range of a pulling force of the chain can be further extended than in a conventional example, so that the chain at the load side can be pulled or contracted without requiring skill. In addition, in the first embodiment, an elastic ring 37 is interposed between the outer peripheral surface of the first sleeve 25 and the driving member 8 so that the load sheave 3 can further be easy to hold the free rotation state thereof by the resistance to relative rotation of the driving member 8 with respect to the first sleeve 25.

The regulating portions 36 are provided at the projecting portions 32 provided on the driving member 8 so that, when the driving member 8 rotates relatively with respect to the driving shaft 5 in the state where the outermost end faces of the engaging projections 31 are in elastic contact with the free rotation control surfaces 35 of the projecting portions 32, the front of each engaging projection 31 in the rotation direction thereof is regulated in its further rotation by the regulating portion 36, whereby, when the operating handle 18 is rotated relatively with respect to the driving member 8 for

freely rotating the load sheave 3, the front of each engaging projection 31 in the rotation direction thereof engages with the regulating portion 36 so as to restrict its rotational angle and an interval between the driving member 8 and the driven member 7 can be restricted not to be wider than required to freely rotate the load sheave 3. Accordingly, when the load sheave 3 freely rotates through the operating handle 18 rotating relatively with respect to the driving member 8, the free rotation operation is performable without unnecessary rotation of the operating handle 18 more than required. Also, when the chain is excessively pulled toward the load and the stop means provided at the no-load end of chain engages with the side plate 1 or 2 to prevent further pulling of chain so as to abruptly stop the rotation of driving shaft 5, the driving member 8 rotates by its inertia force and further moves rightwardly. As the result, the outermost end faces of engaging projections 31 elastically contact more firmly with the free rotation control surfaces 35 at the projecting portions 32 in a biting manner, thereby avoiding prevention of release of free rotation control.

Furthermore, in the state of the free rotation control as the above mentioned, when the pulling force of chain is strengthened to apply a strong force in the reverse direction onto the load sheave 3, the elastic contact of the projecting outermost end face of each engaging projection 31 with each free rotation control surface 35 is released so that each engaging projection 31 returns between the first regulating surface 33 and the second regulating surface 34 and, as the above mentioned, returns to the state where the mechanical brake 13 exerts or stops the braking action. In other words, during the free rotation, when the load sheave 3 is subjected to a strong force in the reverse direction, the driving member 8 screw-threadedly engages with the driving shaft 5 and its rotary inertia force is larger than that of the driving shaft 5, whereby the free rotation control surfaces 35 slide with respect to the engaging projections 31 and the driving member 8 starts rotation somewhat later than the rotation of operating handle 18. As the result, the elastic contact of the respectively projecting outermost end faces of engaging projections 31 with the free rotation control surfaces 35 is released, resulting in that each engaging projection 31 returns between the first regulating surface 33 and the second regulating surface 34. In addition, in this case, the operating handle 18 overcomes the relative rotational resistance of the projecting outermost end faces of the engaging projections 31 with respect to the free rotation control surfaces 35 and the relative rotational resistance by the elastic ring 37, thereby relatively rotating in the reverse rotation direction with respect to the driving mem-

ber 8. Hence, an input range of the pulling force for the chain during the free rotation control is widened so that the free rotation control is performable without requiring skill.

When the chain engaging with the load sheave 3 is subjected to a load and the load sheave 3 is applied with the load in the reverse rotation, even though the operating handle 18 is operated to carry out free rotation, the operating handle 18 together with the driving shaft 5 rotates relatively in the reverse rotation direction by the above mentioned load, so that the elastic contact of the outermost end faces of the engaging projection 31 with the free rotation control surfaces 35 is released, thereby returning to the state where the mechanical brake 13 exerts or stops the braking action. Accordingly, the load sheave 3 cannot be put in the free rotation state, thereby improving safety.

Next, explanation will be given on a second embodiment of the invention shown in Figure 4.

The second embodiment assembles an overload prevention mechanism in the first embodiment, and is similar in the fundamental construction to the first embodiment. Accordingly, the construction in common with the first embodiment is omitted in its description and the common components are designated with the same reference numerals.

In the second embodiment, the driving member 8 in the first embodiment comprises a first driving member 41 having a boss 41a screw-threadedly engageable with a driving shaft 5 and a larger diameter portion 41b opposite to a braking plate 9 of the mechanical brake 13 and a second driving member 42 relatively-rotatably supported on the outer periphery of the boss 41a, and at the outer periphery of the second driving member 42 are provided teeth 42a engageable with a pawl member 14 provided at the operating lever 16.

While the operating lever may be mounted with respect to the brake cover 13a in the same manner as shown in Figures 1 and 6, an alternative arrangement may be preferred, as shown in Figures 5, 7 and 8, in which similar parts are given the same reference numerals. In Figure 5, an aperture 126 is formed in the brake cover 13a which is initially smaller than the aperture 115. The aperture 126 is enlarged to the desired diameter to correspond to that of the aperture 115, by folding or rolling over lip portions 127 of the aperture 126 as shown in enlarged detail in Figure 8. Thus the folded or rolled lip portions provide a bearing surface against the margins of the aperture 115 in the plate 16a.

At the boss 41a of the first driving member 41 are disposed a pair of friction plates 43 and 44 in a manner of longitudinally sandwiching the second driving member 42 therebetween, an elastic member 46 of disc spring is disposed outside one

friction plate 44 through a holding plate 45, and an adjusting member 47 for changing a biasing force of the elastic member 46 to the friction plates 43 and 46 and for adjusting a slip load screws with the boss 41a outside the elastic member 46, thereby constituting the overload prevention mechanism 40.

In detail, the first driving member 41 is provided at one axial end of the boss 41a with the larger diameter portion 41b having a biasing surface opposite to the braking plate 9 and at the other axial end of boss 41a with a smaller diameter portion 41c having a screw thread at the outer periphery, and the elastic member 46 is free-fitted onto the smaller diameter portion 41c and the adjusting member 47 screws therewith. A locking groove 41d for the holding plate 45 is provided at the outer periphery of the boss 41a and a projection projecting from the inner periphery of the holding plate 45 is fitted into the groove 41d, the holding plate 45 being supported to the boss 41a in relation of being axially movable and non rotatable relatively thereto.

The second driving member 42 comprises a cylindrical member 42c having a vertical portion 42b and the teeth 42a; the vertical portion 42b is supported at the inner periphery thereof rotatably onto the boss 41a, and between the inner periphery of the vertical portion 42b and the outer periphery of the boss 41a is provided a unidirectional rotation mechanism which, when the second driving member 42 rotates in the driving direction, makes the second driving member 42 freely rotatable with respect to the first driving member 41 and, when rotating in the non-driving direction, makes the same rotatable integrally with the first driving member 41.

The unidirectional rotation mechanism, is so constructed that a recess 48 is formed at the output periphery of the boss 41a at the first driving member 41, an engaging member 49 is held in the recess 48 in relation of being biased always radially outwardly of the boss 41a through a spring 50, and at the inner periphery of the second driving member 42 are formed a plurality (only one shown) of engaging grooves which each allow the engaging member 49 to enter therein and extends circumferentially in a wedge-like manner, so that when the second driving member 42 is rotated in the chain lowering direction as shown by the arrow in Figure 9, the engaging member 49 engages with one of the engaging grooves 51 at an angle of at least 45° or more and the second driving member 42 and the first driving member 41 are combined with each other to be integrally rotatable, thereby coping with the case where a torque larger than a transmitting torque of the overload prevention mechanism 40 during the lowering the chain is required.

The second embodiment of the invention constructed as the above-mentioned assemblies therein the overload prevention mechanism 40 and also a free rotation control apparatus as the same as the first embodiment, the free rotation control apparatus is not different from that in the first embodiment, thereby omitting description thereof. The adjusting member 47 of the overload prevention mechanism 40 is disposed opposite to the operating handle 18 at the free rotation control apparatus.

At the adjusting member 47 are provided regulation portions 52 for regulating a range of relative rotation of the first driving member 41 with respect to the driving shaft 5 in the first position of the operating handle 18, and free rotation control surfaces 53 which come in elastic contact with the engaging projections 31 provided at the operating handle 18, apply resistance to the rotation of the first driving member 41 with respect to the driving shaft 5, and hold the free rotation of the driving shaft 5 by the operating handle 18, so that the adjusting member 47 may adjust a slip load and also hold the free rotation control at the overload prevention mechanism 40.

Next, explanation will be given on operation of the second embodiment constructed as above mentioned.

First, for the hoisting or traction of load, the feed pawl at the pawl member 14 provided at the operating lever 16 engages with tooth 42a at the second driving member 42 by operating the control portion 15 so as to swing the lever 16, whereby the second driving member 42 is rotated and the first driving member 41 together therewith is normally rotated through the overload prevention mechanism 40. In this case, since the projections 31, are positioned at the regulation portions 52 and between the regulating surfaces 54 and 55, the first driving member 41, when normally rotating, moves toward the braking plate 9 and the mechanical brake 13 operates. A driving torque of the second driving member 42 is transmitted to the first driving member 41 through the overload prevention mechanism 40, and to the driving shaft 5 through the mechanical brake 13, and also transmitted from the driving shaft 5 to the load sheave 3 through the reduction gear mechanism 6 and tubular shaft 4, thereby enabling the hoisting for traction of load. In this state, when the load sheave 3 is subjected to a load larger than the rating load adjusted by the adjusting member 47, the overload prevention mechanism 40 slips to eliminate power transmission to the first driving member 41, thereby enabling the hoisting or the traction over the rating to be regulated.

In a case where the chain lowering or the release of traction is performed, the reverse rotation pawl at the pawl member 14 engages with one

of the teeth 42a of the second driving member 42 so as to swing the lever 16, whereby the first driving member 4 is reversely and integrally rotated with the second driving member 42 through a unidirectional rotation mechanism. In this case, since the projections 31 are positioned at the regulation portions 52, the first driving member 41 relative-rotates with respect to the driving shaft 5 to move backwardly with respect to the braking plate 9, so that the driving shaft 5 can be rotated at a predetermined angle until the mechanical brake 13 operates, thereby enabling the hoisting or traction of the chain.

In this case, the lever 16 is operated in swinging motion to rotate the first and second driving members 41 and 42 in the non-driving direction, that is, to reversely rotate them, thereby reversely rotating the first driving member 41.

Explanation of the operation in the case where the driving shaft 5 is put in the free rotation state so as to carry out free extension or contraction of the chain at the load side, is similar to that of the first embodiment.

Although the invention has been described with reference to several different embodiments, these embodiments are merely by way of example and not intended to limit the scope of the invention which is defined solely by the appended claims.

Claims

1. A hoist and traction machine including a load sheave (3), a driving shaft (5) for driving said load sheave (3) and provided with a driven member (7), a driving member (8) screw-threadedly engageable with said drive shaft (5), a mechanical brake arrangement (13) interposed between said driving member (8) and said driven member (7), an operating lever (16) for operating the driving member (8) in a normal direction or in a reverse direction and a brake cover (13a) arranged to cover the mechanical brake arrangement (13),
 - (a) said brake cover (13a) having an aperture (114) therein through which passes a portion of said driving member (8) having a diameter smaller than that of the aperture, characterised in that
 - (b) said operating lever (16) comprises a mounting plate (16a) having an aperture (115) through which passes said driving member portion, and which has a diameter at least substantially the same as that of the first mentioned aperture (114), and in that there is provided,
 - (c) a coupling means for coupling said operating lever (16) with said brake cover (13a) for rotation relative thereto, said cou-

pling means comprising

- (i) a sleeve (121) encircling said driving member portion (8) and received in said apertures of said brake cover (13a) and mounting plate (16a), an outer surface of the sleeve (121) having engagement means to receive lip portions of said apertures, said engagement means comprising a flange (122) provided so as to extend substantially radially outwardly of said outer surface and a retaining groove (123) provided so as to extend circumferentially around said outer surface at a position spaced from said flange (122), and
- (ii) a retaining ring (125) secured in said retaining groove (123) so as to retain lip portions of said apertures between said flange and said ring to support said operating lever (16) on said brake cover (13a) in a freely rotatable manner.

2. A machine as claimed in claim 1 characterised in that said lip portions of the aperture of said brake cover (13a) and the mounting plate (16a) are spaced apart by means of a ring member (124) extending around the sleeve.
3. A machine as claimed in claim 1 characterised in that one of said lip portions comprises margins (127) which are turned inwardly around the margins of the aperture (126) to form a bearing surface against the lip portions of the other aperture.
4. A machine as claimed in claim 1 characterised in that the lip portions of the aperture (126) of said brake cover (13a) comprises margins (127) which are turned inwardly around the margins of the associated aperture (126) to provide a bearing surface against lip portions of the aperture (115) of the mounting plate (16a).
5. A machine as claimed in claim 1 characterised in that there is provided a free rotation control apparatus for making said mechanical brake (13) non-operable and enabling said load sheave (3) to freely rotate, said free rotation control apparatus having:-
 - d) a stopper (17) provided at an axial end of said driving shaft (5);
 - e) an operating handle (18) for free rotation operation interposed between said stopper (17) and said driving member (8) in relation to being axially movable across from a first position in proximity to said driving member (8) to a second position apart therefrom so



of the teeth 42a of the second driving member 42 so as to swing the lever 16, whereby the first driving member 4 is reversely and integrally rotated with the second driving member 42 through a unidirectional rotation mechanism. In this case, since the projections 31 are positioned at the regulation portions 52, the first driving member 41 relative-rotates with respect to the driving shaft 5 to move backwardly with respect to the braking plate 9, so that the driving shaft 5 can be rotated at a predetermined angle until the mechanical brake 13 operates, thereby enabling the hoisting or traction of the chain.

In this case, the lever 16 is operated in swinging motion to rotate the first and second driving members 41 and 42 in the non-driving direction, that is, to reversely rotate them, thereby reversely rotating the first driving member 41.

Explanation of the operation in the case where the driving shaft 5 is put in the free rotation state so as to carry out free extension or contraction of the chain at the load side, is similar to that of the first embodiment.

Although the invention has been described with reference to several different embodiments, these embodiments are merely by way of example and not intended to limit the scope of the invention which is defined solely by the appended claims.

Claims

1. A hoist and traction machine including a load sheave (3), a driving shaft (5) for driving said load sheave (3) and provided with a driven member (7), a driving member (8) screw-threadedly engageable with said drive shaft (5), a mechanical brake arrangement (13) interposed between said driving member (8) and said driven member (7), an operating lever (16) for operating the driving member (8) in a normal direction or in a reverse direction and a brake cover (13a) arranged to cover the mechanical brake arrangement (13),

(a) said brake cover (13a) having an aperture (114) therein through which passes a portion of said driving member (8) having a diameter smaller than that of the aperture, characterised in that

(b) said operating lever (16) comprises a mounting plate (16a) having an aperture (115) through which passes said driving member portion, and which has a diameter at least substantially the same as that of the first mentioned aperture (114), and in that there is provided,

(c) a coupling means for coupling said operating lever (16) with said brake cover (13a) for rotation relative thereto, said cou-

pling means comprising

(i) a sleeve (121) encircling said driving member portion (8) and received in said apertures of said brake cover (13a) and mounting plate (16a), an outer surface of the sleeve (121) having engagement means to receive lip portions of said apertures, said engagement means comprising a flange (122) provided so as to extend substantially radially outwardly of said outer surface and a retaining groove (123) provided so as to extend circumferentially around said outer surface at a position spaced from said flange (122), and

(ii) a retaining ring (125) secured in said retaining groove (123) so as to retain lip portions of said apertures between said flange and said ring to support said operating lever (16) on said brake cover (13a) in a freely rotatable manner.

2. A machine as claimed in claim 1 characterised in that said lip portions of the aperture of said brake cover (13a) and the mounting plate (16a) are spaced apart by means of a ring member (124) extending around the sleeve.

3. A machine as claimed in claim 1 characterised in that one of said lip portions comprises margins (127) which are turned inwardly around the margins of the aperture (126) to form a bearing surface against the lip portions of the other aperture.

4. A machine as claimed in claim 1 characterised in that the lip portions of the aperture (126) of said brake cover (13a) comprises margins (127) which are turned inwardly around the margins of the associated aperture (126) to provide a bearing surface against lip portions of the aperture (115) of the mounting plate (16a).

5. A machine as claimed in claim 1 characterised in that there is provided a free rotation control apparatus for making said mechanical brake (13) non-operable and enabling said load sheave (3) to freely rotate, said free rotation control apparatus having:-

d) a stopper (17) provided at an axial end of said driving shaft (5);

e) an operating handle (18) for free rotation operation interposed between said stopper (17) and said driving member (8) in relation to being axially movable across from a first position in proximity to said driving member (8) to a second position apart therefrom so



as to be non-relative-rotatable with respect to said driving shaft;

f) an elastically biasing member (19) interposed between said stopper (17) and said operating handle (18) and for biasing said operating handle (18) toward the first position where said operating handle (18) moves toward said driving member;

g) regulation means which is provided between said operating handle (18) and said driving member (8), can regulate a relative rotation range of said driving member (8) with respect to said driving shaft (5) when said operating handle (18) is put in the first position, and can release said regulation when said operating handle is put in the second position;

h) free rotation control holding means which releases regulation by putting said operating handle (18) in the second position and, when said operating handle (18) rotates for free rotation, applies a biasing force by said elastically biasing member (19) onto said driving member so as to hold free rotation operation by said operating handle, said driving means comprising,

i) an operating lever (16) for operating and driving member (8) in a normal direction or in a reverse direction.

6. A machine as claimed in claim 1, characterised in that said sleeve (121) is disposed so that the flange (122) is engaged with an inner surface of said mounting plate (16a) and the retaining ring (125) is engageable with an inner surface of said brake cover (13a).

Patentansprüche

1. Hebe- und Zugvorrichtung mit einer Lastseilscheibe (3), einer Antriebswelle (5) zum Antreiben der Lastseilscheibe (3), die mit einem angetriebenen Element (7) versehen ist, einem Antriebselement (8), das mit der Antriebswelle (5) gewindeartig in Eingriff bringbar ist, einer mechanischen Bremsanordnung (13), die zwischen dem Antriebselement (8) und dem angetriebenen Element (7) eingesetzt ist, einem Bedienungshebel (16) zum Betätigen des Antriebselements (8) in eine normale Richtung oder in eine Gegenrichtung, und einer Bremsabdeckung (13a), die zur Abdeckung der mechanischen Bremsanordnung (13) angeordnet ist,

(a) wobei die Bremsabdeckung (13a) eine Öffnung (114) aufweist, durch welche ein Teil des Antriebselements (8) mit einem geringeren Durchmesser als die Öffnung hin-

durchgeht, dadurch gekennzeichnet, daß (b) der Bedienungshebel (16) eine Befestigungsplatte (16a) mit einer Öffnung (115) umfaßt, durch welche der Teil des Antriebselements hindurchgeht und die einen Durchmesser aufweist, der zumindest im wesentlichen derselbe wie jener der erstgenannten Öffnung (114) ist, und daß folgendes vorgesehen ist:

(c) ein Kupplungsmittel zum Kuppeln des Bedienungshebels (16) mit der Bremsabdeckung (13a) für eine relative Drehung in bezug darauf, welches Kupplungsmittel folgendes umfaßt:

(i) eine Hülse (121), die den Teil des Antriebselements (8) umgibt und in den Öffnungen der Bremsabdeckung (13a) und der Befestigungsplatte (16a) aufgenommen ist, wobei eine äußere Oberfläche der Hülse (121) Eingriffsmittel zur Aufnahme von Lippenteilen der Öffnungen aufweist, wobei die Eingriffsmittel einen Flansch (122) umfassen, der so angeordnet ist, daß er sich im wesentlichen radial außerhalb der äußeren Oberfläche erstreckt, sowie eine Befestigungsnut (123), die so angeordnet ist, daß sie sich um den Umfang der äußeren Oberfläche in einer von dem Flansch (122) beabstandeten Position erstreckt, und

(ii) einen Halterungsring (125), der in der Befestigungsnut (123) befestigt ist, so daß Lippenteile der Öffnungen zwischen dem Flansch und dem Ring gehalten sind, um den Bedienungshebel (16) auf der Bremsabdeckung (13a) in einer freidrehbaren Weise zu halten.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Lippenteile der Öffnung der Bremsabdeckung (13a) und der Befestigungsplatte (16a) durch ein sich um die Hülse erstreckendes Ringelement (124) voneinander beabstandet sind.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß einer der Lippenteile Ränder (127) umfaßt, die um die Ränder der Öffnung (126) nach innen gedreht sind, um eine Auflagefläche gegen die Lippenteile der anderen Öffnung zu bilden.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Lippenteile der Öffnung (126) der Bremsabdeckung (13a) Ränder (127) umfassen, die um die Ränder der zugehörigen Öffnung (126) nach innen gedreht sind, um eine Auflagefläche gegen Lippenteile der Öff-



nung (115) der Befestigungsplatte (16a) zu bilden.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß eine Steuervorrichtung für die freie Drehbarkeit vorgesehen ist, um die mechanische Bremse (13) außer Betrieb zu setzen und eine freie Drehung der Lastseilscheibe (3) zu ermöglichen, wobei die Steuervorrichtung für die freie Drehbarkeit folgendes aufweist:

d) einen Anschlag (17), der an einem axialen Ende der Antriebswelle (5) angeordnet ist;

e) einen Bedienungsgriff (18) für einen freien Drehbetrieb, der zwischen dem Anschlag (17) und dem Antriebselement (8) angeordnet ist, wobei er im Verhältnis zu diesem axial aus einer ersten Position in der Nähe des Antriebselements (8) in eine zweite Position mit Abstand zu diesem bewegbar ist, so daß er in bezug auf die Antriebswelle nicht relativ drehbar ist;

(f) ein elastisches Spannelement (19), das zwischen dem Anschlag (17) und dem Bedienungsgriff (18) eingesetzt ist und zum Vorspannen des Bedienungsgriffs (18) in die erste Position dient, in der sich der Bedienungsgriff (18) zu dem Antriebselement bewegt;

g) ein Regulierungsmittel, das zwischen dem Bedienungsgriff (18) und dem Antriebselement (8) angeordnet ist und einen relativen Drehbereich des Antriebselements (8) in bezug auf die Antriebswelle (5) regulieren kann, wenn der Bedienungsgriff (18) in die erste Position gebracht ist, und diese Regulierung aufheben kann, wenn der Bedienungsgriff in die zweite Position gebracht ist;

h) Halterungsmittel zur Steuerung der freien Drehbarkeit, das die Regulierung aufhebt, indem der Bedienungsgriff (18) in die zweite Position gebracht wird und, wenn sich der Bedienungsgriff (18) für die freie Drehung dreht, eine Spannkraft durch das elastische Spannelement (19) auf das Antriebselement ausübt, so daß der freie Drehbetrieb durch den Bedienungsgriff angehalten wird, wobei das Antriebsmittel aufweist:

i) einen Bedienungshebel (16) zum Betätigen und Antreiben des Elements (8) in eine normale Richtung oder in eine Gegenrichtung.

6. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Hülse (121) so angeordnet ist, daß der Flansch (122) mit einer inneren

Oberfläche der Befestigungsplatte (16a) in Eingriff steht und der Halterungsring (125) mit einer inneren Oberfläche der Bremsabdeckung (13a) in Eingriff bringbar ist.

Revendications

1. Engin de levage et de traction comprenant une poulie de charge (3), un arbre d'entraînement (5) qui entraîne ladite poulie de charge (3) et comporte un organe entraîné (7), un organe d'entraînement (8) qui peut se visser sur ledit arbre d'entraînement (5), un dispositif de frein mécanique (13) interposé entre le dit organe d'entraînement (8) et ledit organe entraîné (7), un levier de manoeuvre (16) pour actionner l'organe d'entraînement (8) dans une direction normale ou dans une direction inverse, et un couvercle de frein (13a) agencé de manière à couvrir le dispositif de frein mécanique (13) ;

(a) ledit couvercle de frein (13a) comportant une ouverture (114) à travers laquelle passe une partie dudit organe d'entraînement (8) ayant un diamètre plus petit que celui de l'ouverture, caractérisé en ce que

(b) ledit levier de manoeuvre (16) comprend une plaque de montage (16a) comportant une ouverture (115) à travers laquelle passe ladite partie de l'organe d'entraînement et dont le diamètre est au moins sensiblement le même que celui de l'ouverture citée en premier (114), et en ce qu'il est prévu :

(c) des moyens d'assemblage pour relier ledit levier de manoeuvre (16) audit couvercle de frein (13a), pour rotation par rapport à ce dernier, lesdits moyens d'assemblage comprenant :

(i) un manchon (121) qui entoure ladite partie de l'organe d'entraînement (8) et qui est reçu dans lesdites ouvertures dudit couvercle de frein (13a) et de ladite plaque de montage (16a), une surface extérieure du manchon (121) comportant des moyens d'accouplement pour recevoir des parties de lèvres desdites ouvertures, les dits moyens d'accouplement comprenant une collerette (122) disposée de manière à s'étendre sensiblement radialement vers l'extérieur à partir de ladite surface extérieure et une gorge de retenue (123) disposée de manière à s'étendre circonférentiellement autour de ladite surface extérieure, à une position espacée de la dite collerette (122), et

(ii) un anneau de retenue (125) fixé dans ladite gorge de retenue (123) de manière à retenir les parties de lèvres desdites ouvertures entre la dite collerette et ledit



anneau afin de supporter ledit levier de manoeuvre (16) sur ledit couvercle de frein (13a), en rotation libre.

2. Engin de levage suivant la revendication 1, caractérisé en ce que lesdites parties de lèvre de l'ouverture dudit couvercle de frein (13a) et de l'ouverture de ladite plaque de montage (16a) sont espacées mutuellement au moyen d'un élément annulaire (124) s'étendant autour du manchon. 5
3. Engin de levage suivant la revendication 1, caractérisé en ce qu'une desdites parties de lèvre comprend des rebords (127) qui sont rabattus vers l'intérieur autour des bords de l'ouverture (126), pour définir une surface d'appui contre les parties de lèvre de l'autre ouverture. 10
4. Engin de levage suivant la revendication 1, caractérisé en ce que les parties de lèvre de l'ouverture (126) dudit couvercle de frein (13a) comprennent des rebords (127) qui sont rabattus vers l'intérieur autour des bords de l'ouverture associée (126) pour définir une surface d'appui contre les parties de lèvre de l'ouverture (115) de la plaque de montage (16a). 15
5. Engin de levage suivant la revendication 1, caractérisé en ce qu'il comprend un dispositif de commande de rotation libre pour rendre ledit frein mécanique (13) inopérant et permettre à ladite poulie de charge (3) de tourner librement, ledit dispositif de commande de rotation libre comprenant : 20
 - (d) une pièce d'arrêt (17) prévue à une extrémité axiale dudit arbre d'entraînement (5) ;
 - (e) une poignée de manoeuvre (18) pour le fonctionnement en rotation libre, interposée entre ladite pièce d'arrêt (17) et ledit organe d'entraînement (8) et pouvant être déplacée axialement d'une première position, proche dudit organe d'entraînement (8), à une deuxième position espacée de celui-ci, de sorte que ladite poignée ne peut pas tourner par rapport au dit arbre d'entraînement ;
 - (f) un élément de rappel élastique (19) interposé entre ladite pièce d'arrêt (17) et ladite poignée de manoeuvre (18) de manière à pousser ladite poignée de manoeuvre (18) vers la première position dans laquelle ladite poignée de manoeuvre (18) se rapproche dudit organe d'entraînement ;
 - (g) des moyens de régulation qui sont prévus entre la dite poignée de manoeuvre (18) et ledit organe d'entraînement (8), qui peu- 25

vent réguler une plage de rotation relative dudit organe d'entraînement (8) par rapport audit arbre d'entraînement (5) lorsque la dite poignée de manoeuvre (18) est placée dans la première position, et qui peuvent supprimer ladite régulation lorsque ladite poignée de manoeuvre est placée à la deuxième position ;

(h) des moyens de maintien de commande de rotation libre qui suppriment la régulation par aménée de ladite poignée de manoeuvre (18) à la deuxième position et qui appliquent, lorsque ladite poignée de manoeuvre (18) tourne pour rotation libre, une force de sollicitation exercée par ledit élément de rappel élastique (19) sur ledit organe d'entraînement de manière à maintenir le fonctionnement en rotation libre commandé par ladite poignée de manoeuvre, lesdits moyens d'entraînement comprenant :

(i) un levier de manoeuvre (16) pour actionner et entraîner l'organe (8) dans une direction normale ou dans une direction inverse.

6. Engin de levage suivant la revendication 1, caractérisé en ce que ledit manchon (121) est disposé de sorte que la collerette (122) est en contact avec une surface intérieure de ladite plaque de montage (16a) et l'anneau de retenue (125) peut venir en contact avec une surface intérieure dudit couvercle de frein (13a). 30