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Description

The invention is concerned with a winch device and in particular with a method for controlling the operation of the winch. In the present patent application, as an example of a winch device in accordance with the application will be used a winch device used in forestry for harvesting of timber, the designation winch being used for the said winch device in the following.

It is characteristic of such prior art winches (e.g. FI—C—59—378) as include a working rope and a control rope or cord for controlling the operation of the winch that the control rope must be tensioned or pulled outwards from the winch when the winch is supposed to pull the working rope into the winch. These winches known at present may be divided into two groups in respect of their principle of operation:

A simple winch started by tensioning the control rope. The reel of the working rope can revolve freely unless the control rope has been tensioned. In order to couple such a winch so that it pulls, the control rope must be tensioned so that the operating connection between the working-rope reel and the power source of the winch is connected, whereupon the winch keeps pulling the working rope into the winch until the counter-force caused by the working rope exceeds the power transmitted by the operating connection. In a winch of this type, the operating connection may be produced, e.g., by means of a friction coupling controlled by means of the control rope, or by means of a corresponding drive gear. Thus, such a winch operates in accordance with the on/off principle, i.e. the hoisting is started by tensioning the control rope and stopped by slackening the control rope. If controlling of the pulling force of the winch is desired, that control must be performed by regulating the compression force of the friction coupling, i.e. the tensioning of the control rope. In this winch type, the control rope moves little (e.g., 0.5 m) for the purpose of starting and controlling the hoisting, and even that in a direction opposite to the working rope, i.e., when the working rope is supposed to be wound into the winch, the control rope must be kept tensioned by pulling it outwards from the winch and, correspondingly, in order to stop the hoisting, the control rope must be allowed to be slackened towards the winch.

As an example of the winch described above, the winch in accordance with the FI—C—50,405 can be mentioned. The hydraulic winches in use at present also operate by means of the same control principle. In these winches, the control of the valve opening and closing, respectively, the supply of oil to the hydraulic motor has been accomplished so that the valve is opened when the control lever of the valve is tensioned, e.g., against a spring force, and that, correspondingly, the valve is closed by the effect of the said spring force when the control lever is released. If the operation of the control valve is supposed to be performed more remote from the winch, the operation of the said valve may be controlled, e.g., by means of a control cord attached to the control lever.

In the FI—C—59,378, a winch is described whose operation is affected, besides by the tensioning of the control cord, also by its movement. Such a winch possesses certain advantages, described in the said patent, over the simpler winch described above. In that winch, e.g., the revolving angle of the working-rope reel can be controlled more accurately. The winch is as such suitable, e.g., for loading a forest tractor if the hoisting distances are short, but in the case of long hoisting distances, the same problems are encountered as with the winch mentioned above.

In this winch as well, the control rope moves in a direction opposite to the working rope, i.e., when the control rope is being pulled out of the winch, the winch pulls the working rope into the winch, and the other way round. Thus, both the working rope and the control rope, or at least one of them, are always outside the winch.

It is a problem of both of the winch types mentioned above that, when the hoisting distance is long, the operator must handle a long control rope in his hands and, when he approaches the winch with the log, he must all the time reel out the control rope by hand, i.e. it must be kept tensioned. If the hoisting distance is, e.g., 40 metres and if the length of the control cord is the same, after the operator has hoisted the log to the proximity of the winch, e.g. in accordance with the FI—C—50,405, he has a skein of 40 metres of control rope in his hands. Thus, in practice, out of the above reason, the length of the control rope is limited to about ten metres, but that results in a new problem. If the length of the control rope is less than the hoisting distance, the operator must first attach the hoisting claws to the log and thereupon return to the control rope to start hoisting. However, in practice it often happens that when the working rope is tensioned, the hoisting claws slip off the log, and the operator must return to the log, attach the hoisting claws, go back to the control rope, etc.

In order to overcome these difficulties, a reeling device carried on the back is at present used as an aid to some extent, which said device reels the slack control rope by means of spring force into the device. The reeling device is full of rope when the operator is alongside the winch, but it is emptied when he walks off the winch. The quantity of rope that can be reeled into the device is, however, relatively limited, and in practice the extreme limit of its operation is often reached, at which time it can no longer deliver control rope. The reeling device is of some help, but the following deficiencies and drawbacks still remain:

The reeling device accommodates only about 30 to 40 metres of control rope, and if the log to be hoisted is more distant, the operator must take the reeling device off his back and, after he has attached the hoisting claws to the log, he must return to the reeling device in order to start hoisting. When a winch is used, e.g., for harvesting wood in the case of thinning out of the forest,

the hoisting distances are often longer than the distance of operation of the reeling device.

When the operator hoists the log and, at the same time approaches the winch together with the log, he must keep the control rope tensioned all the time, which means that he must reel the rope towards himself at least by the distance that he moves, and even more in the case of the winch types in which the control rope is placed on a reel revolving in a direction opposite to the working-rope reel.

The operator's walking along with the log to be hoisted may cause various dangerous situations, e.g. when the operator happens to fall down during hoisting. Thereat the control rope is most likely to be slackened, whereat, in the prior-art winch constructions, the consequence is that the operating connection pulling the working-rope reel, such as the friction coupling, is opened. For example, in a steep upwardly slanting hillside, this results in the situation that the log may rush down the hill against the operator unless the winch includes a particular safety device to prevent such a situation. Such a safety device is also required by the law in certain countries.

GB—A—805,725 discloses a winch wherein a control cable is wound in and out together with the working rope. Winding in of the working rope is controlled electrically either through conductors of the control cable or by acoustic wireless control. Common unwinding of the control cable and working rope is controlled by pull on the working rope.

It is an object of the present invention to control the winch by pull conditions of the control rope only, but to avoid the above drawbacks of pull-controlled winches and to provide such a method for controlling a winch and such a winch by means of which the working becomes easier, faster, safer, and more convenient. In view of achieving the effects stated above, the method in accordance with the invention is mainly characterized in the circumstances stated in claim 1. The essential characteristics of the winch invented for accomplishing the method come out from the attached claim 4.

The winch in accordance with the invention will be described in detail with reference to the attached drawing, without in any way restricting the winch in accordance with the invention to the construction in accordance with the said drawing, because the winch in accordance with the invention can be accomplished in many different ways. In the drawing,

Figure 1 is an axonometric view of a winch in accordance with the invention, partly in section,

Figure 2 shows the rotational wedge member of the winch in accordance with the invention as viewed in the axial direction,

Figure 3 shows the wedge member of Fig. 2 as viewed in a direction perpendicular to the axial direction, and

Figure 4 is a sectional view of a part of the wedge member along line A—A in Fig. 2.

The winch device shown in Fig. 1 consists of a stationary hollow shaft 13 attached to an appropriate frame construction 19 as well as of a working-rope reel 7 and a control-rope reel 33, mounted on the said shaft 13 as freely revolving and having a limited axial movement, as well as of members, mounted on the said hollow shaft 13, for producing the driving power and for controlling the operation of the working-rope reel and the control-rope reel relative each other.

One of the applications of use of the winch is operation as a timber hoist in forest conditions, in which case the winch is constructed so that it can be mounted to the three-point fastening gear of a tractor, and in such a case it receives its operating power from the power take-off of the tractor. The reeling power for the winch is transmitted by means of appropriate equipment (not shown) to a chain 47 and, by means of the chain, further to the drive or chain wheel 16. In the embodiment shown, the same equipment also transmits the operating power to the control equipment of the winch by the intermediate of a chain 46 and a cogwheel 25.

At one end of the hollow shaft 13, the working-rope reel 7 of the winch is installed as freely revolving on bearings 10, the working rope 48 that pulls or lifts the load being wound onto the said reel 7, and, correspondingly, unwound for the purpose of hoisting a new load. The journalling of the working-rope reel 7 has been accomplished so that the working-rope reel can move substantially freely, but restrictedly, in a way to be described below, on the shaft 13.

A connecting shaft 1 is journalled inside the hollow shaft 13 as passing through it and projecting out of both of its ends. The connecting shaft 1 is concentric with the hollow shaft 13, and it is journalled as freely revolving relative the hollow shaft 13. At the end of the connecting shaft 1 that projects out of the end of the hollow shaft 13 next to the working-rope reel 7, a locking nut 2 or equivalent has been fastened as the outermost component. Between this locking nut and the working-rope reel 7, the first rotational wedge member 4,5,6 is installed, whose purpose will be explained later. At the opposite end of the connecting shaft 1, a locking nut 36 or equivalent has been fixed correspondingly and, inwards from the said nut 36, a rotational wedge member 31,32,35 corresponding to that mentioned above, the purpose of this second member being likewise explained later. Inwards from the rotational wedge member, on the projecting portion of the connecting shaft 1, the control-rope reel 33 is mounted further, being freely revolving but having a restricted axial movement.

The said chain wheel 16 is mounted on the hollow shaft 13 as freely revolving, but as axially immobile relative the hollow shaft. The said chain wheel 16 is mounted alongside the working-rope reel 7, at the side facing the control-rope reel 33, so that the working-rope reel 7 can reach contact with the friction face 15 on the chain wheel 16 within the limits of its axial movement. In the embodiment shown, the second said chain wheel

25 is mounted in connection with the control-rope reel 33, at the side facing the working-rope reel 7, so that the control-rope reel 33 can reach contact, by means of the members attached to the said reel 33, with the friction face 29 on the chain wheel 25 within the scope of its axial movement. The second said chain wheel 25 is also journalled on the hollow shaft 13 as freely revolving but as locked in respect of axial movement.

The said members attached to the working-rope reel 33, which act jointly with the friction face 29 on the chain wheel 25, consist of drag members 26 fixed onto the control-rope reel 33 as well as of a clutch disc 30 attached to the connecting shaft 1 non-rotatably but with a restricted movement in the axial direction.

In addition to the members described above, which are essential for the operation of the device, the device in accordance with the invention also includes a locking member 40, functioning as a safety device, which, in certain operating situations, locks the control-rope reel 33 against revolving in the direction of inward winding and, at the same time, causes stopping of the working-rope reel. The construction and the operation of the safety device will be described below.

The operation of the winch can be described by means of the following example. It is assumed as a starting situation that the drive chains 46 and 47 receive operating power, whereat the chain wheels 25 and 16 revolve in the direction indicated by the arrows, i.e. downwards at the front side in Fig. 1. The working rope has been pulled out, and there is a load at its end. The control rope 43 is also in the pulled-out position, substantially at an equal distance as compared with the working rope 48.

In this situation, if the control rope has been tensioned with a certain force so that the locking 40 is open and the winding-in of the control-rope reel is prevented by the tensioning force of the control rope, the rotational wedges 4 and 32 are in their narrowest positions in the axial direction, whereat the friction coupling 15 between the chain wheel 16 and the working-rope reel 7 is open and, likewise, the coupling between the clutch disc 30 and the friction coupling 29 is open. On the contrary, the control-rope reel 33 is in rubbing contact with the friction face on the chain wheel 25 by means of its dragging members 26. Under these circumstances, the said dragging members cause a tendency in the central-rope reel to revolve along with the chain wheel 25, i.e. in the direction winding the control rope inwards. The operator of the winch annuls this tendency by keeping the control rope tensioned in the way mentioned above.

In this situation, if he wishes that the working-rope reel 7 winds the working rope 48 inwards, he slackens the control rope 43 a little. Thereat the control-rope reel 33 is turned, being pulled by the dragging members 26, in the direction of winding-in, i.e. the control-rope reel 33 performs a little bit of a revolution relative the connecting shaft 1. This revolving movement, on the other hand, results in the circumstance that the rotational wedge member 32 expands in the axial direction and pushes the control-rope reel 33 in the axial direction towards the chain wheel 25 and the clutch disc 30. If the control-rope reel is allowed to revolve more in the same direction by slackening the control rope, a situation is reached in which the control-rope reel presses the clutch disc 30 against the friction face 29 on the chain wheel 25, whereat the connecting shaft 1 tends to revolve along with the control-rope reel 33.

On the other hand, a revolution of the connecting shaft 1 in the direction of inward winding causes an expansion of the rotational wedge member 4 of the working-rope reel 7 in the axial direction, whereat this rotational wedge pushes the working-rope reel 7 towards the friction face 15 of the chain wheel 16. When the connecting shaft 1 revolves sufficiently in the direction of inward winding, the friction coupling 15 is coupled and the working-rope reel starts revolving. If the winch operator, in this situation, delivers control rope to the winch without braking the inward winding of the rope at all, i.e. if the control rope is allowed to be wound in completely freely at its maximum speed of inward winding, the chain wheel 16, the working-rope reel 7, the connecting shaft 1, the chain wheel 25, the clutch disc 30, and the control-rope reel 33 revolve as a unit of the same speed, and the winch pulls the load towards the winch device. Both the working rope 48 and the control rope 43 are then wound in the same direction, i.e. inwards, and, if the diameters of the reels have been selected correctly, substantially at the same speed, which is an essential advantage of the invention as compared with the prior-art corresponding winches.

If the winch operator wishes to reduce the speed of winding-in of the working rope or to stop the hoisting, he retards the winding-in of the control rope 43 to such an extent that the control-rope reel 33 remains a little angular movement after, relative the connecting shaft 1. Thereat, the rotational wedge member 32 is returned in the axial direction correspondingly in its narrowing direction, whereat the compression pressure between the control-rope reel 33, the clutch disc 30, and the friction face 29 is reduced. Thereby the clutch disc can slip in the trailing direction relative the chain wheel 25, whereat the connecting shaft 1 is no longer rotated at the same speed as in the earlier situation relative the working-rope reel 7, which also results in a slackening of the rotational wedge 4. As a result of this, the friction coupling 15 starts slipping, whereat the winding-in of the working-rope reel 7 is retarded by the effect of the burdening load. When the movement is stopped completely by means of the control rope 43, the said friction couplings are opened to such an extent that the burdening force of the load and the force developed by the clutch 15 fully overrule each other, whereat the winding is stopped, but the load cannot flow backwards either.

In the operating model described above, it has been assumed, for the sake of simplicity, that in

full-power winding-in the friction couplings are completely closed, i.e. non-slipping, but in practice, expressly in the winch application of the invention, it may be preferable that the speeds of revolution of the chain wheels 16 and 25 are selected high enough so that the friction couplings always slip to some extent.

After the load has been hoisted to the proximity of the winch, the operator detaches the load and starts pulling the working rope 48 and the control rope 43 out of the winch. Thereat, the control rope must be pulled ahead of the working rope, whereat the friction couplings causing the winding-in are opened in the way described above. The only force opposed to the pulling out of the ropes remains the friction caused by the dragging members 26 between the control-rope reel 33 and the chain wheel 25, which friction is necessary for the starting again of the winding. In this situation as well, it is possible to reduce the burdening force generated by the dragging members 26 essentially by means of a particular feature of the invention without any harm to the winding function of the winch. According to this particular feature, the winch has two sorts of dragging members 26. Some of them are long and resilient so that they extend onto the friction face 29 even when the control-rope reel is most distant from the chain wheel 25. On the other hand, others are shorter and more rigid than those mentioned above, whereat they do not reach contact with the friction face 29 until after the control-rope reel 33 has been shifted a certain distance towards the chain wheel 25. In this way, the resistance to revolving of the control-rope reel in the direction of winding-out can be made low, and its winding-in can be made to start softly. On the other hand, the rigid dragging members guarantee, at a later stage of starting of the winding process, strict following of the control reel along with the chain wheel 25, and consequently reliable connecting of the drive.

Another particular feature of the invention comes out by means of the attached figures 2, 3 and 4. According to this particular feature, the wedge faces of the rotational wedge members have been shaped so that they have variable pitch. When the rotational wedge starts operating out of its retracted position, i.e. when the components 4 in Fig. 3 tend to revolve relative each other, the pitch of the wedge faces 50 is steeply rising, whereat, at the final end of the operation of the rotational wedge members, the pitch of the wedge face becomes more gently rising. Thereby it is achieved that a slight movement at the initial stage of the winding process between the control-rope reel 33 and the connecting shaft 1 as well as between the connecting shaft and the working-rope reel 7, respectively, causes a strong axial expansion of the rotational wedge members, whereat any play movements slowing down the operation of the device can be eliminated efficiently and the winding can be made to start rapidly. On the other hand, when the winding takes place at full power, the gently rising wedge faces guarantee a strong axial compression effect of the rotational wedge members and thereby guarantee non-slipping of the friction couplings. Correspondingly, by means of this arrangement, the winch can be made to be released efficiently when the ropes are being pulled out for the next hoisting cycle.

For the purpose of describing the construction and operation of the safety lock included in the winch, we shall come back to Fig. 1. The safety lock consists of a shaft fixed to the frame 19 of the winch, on which shaft a lever member 39 has been arranged as pivotable so that it is provided with two projecting cams. One of the cams is provided with a pulley 42, over which the guide rope 43 is pulled. The opposite cam 40 is designed as a grasping member, which is arranged so as to engage in a tooth recess 34 provided at the end face of the guide-rope reel. The pivoting of the lever 39 in the direction engaging in the tooth recess 34 is caused by a spring member 44.

The objective of the said safety member is to watch the tensioning of the control rope 43 and to cause stopping of the hoisting if the tensioning of the control rope becomes lower than the value determined by the spring 44. Such a situation may occur, e.g., if the person operating the winch falls down during the hoisting, in which case the control rope may become slack. Thereat, if the winch did not have the said safety member, there would be a risk that the log or any other load resting on the working rope bruises the winch operator who fell down in the path of the load, for a slack control rope would mean a full-power hoist command for the winch.

On the contrary, by the effect of the safety device, when the tensioning of the control rope 43 becomes lower than the value set by means of the spring 44, the cam 40 grasps the recess 34. Thereby the winding-in of the control-rope reel stops, which again results therein that the connecting shaft 1 and the working-rope reel reach the control-rope reel locked in position. This again results therein that the rotational wedge members becoming retracted and that the friction coupling acting upon the working-rope reel is opened. If, in this situation, the load happened to be, e.g., on a steep upwardly inclined hillside, it would tend to pull the working rope outwards, i.e. the working-rope reel 7 would tend to be wound open as pulled by the load. However, as the control-rope reel is locked in its position by the effect of the rotating forced produced by the chain wheel 25 and by the dragging members as well as by the effect of the locking effect produced by the cam 44, a relative movement is produced between the reels 7 and 33, which movement results in an axial re-opening of the rotational wedge members and in a coupling of the friction clutches so that the working-rope reel 7, having been stopped, remains slipping on its friction clutch 15.

Should it happen at this stage further that the winch loses its drive power, in the winch in acordance with the invention, precautions can be taken for that situation so that the chain wheel 16,

which transmits the drive power to the working-rope reel 7, is provided with a catch device, which, at the hoisting stage, permits revolving of the chain wheel in the direction of winding-in only. The said catch device is, however, not entirely indispensable, for in a situation in which the drive power of the winch is lost, reasonable security is obtained for the winch against winding-back by making the catch toothing 34 on the control-rope reel 33 such that it grasps in both directions, whereat, when the control rope becomes slack, the control-rope reel 33 is prevented from revolving in any of the directions. Thereby, when the working-rope reel 7 attempts to be wound out, the winch is wedged, owing to the opening of the rotational wedge members, and becomes a rigid unit, which is locked against winding-out by the intermediate of the lever member 39 against the frame 19 of the winch.

In order to restart the winding in a situation in which the winch receives drive power, it is enough that the control rope 43 is tensioned against the effect of the spring 44 to such an extent that the cam 40 comes out of the recess 34, whereby the control-rope reel can again revolve and the hoisting starts again.

By means of the winch construction described above, which is described as one embodiment of the method in accordance with the patent claim, the express advantage has been obtained, in view of the operation, that both the working rope and the control rope are always wound in the same direction, whereat, by means of correct choice of equipment, the speeds of winding can additionally be made substantially equal. Thus, the operator of the winch does not have to wind the control rope towards himself as he walks towards the winch when the hoisting makes progress. It is enough that he keeps the end of the control rope in his hand and walks towards the winch at his own speed. The winch itself takes care of the remaining of the control rope tensioned, i.e. winds it in at the walking speed of the operator, whereat, correspondingly, owing to the control functions of the winch, the winding in of the working rope takes place substantially at the same speed at which the operator approaches the winch.

Besides the fully mechanical exemplifying embodiment described above, the control method in accordance with the invention may also be accomplished by means of winches of hydraulic or electrical operation.

Moreover, the winch in accordance with the invention may also be accomplished as a dual construction in which the rope reels revolve in opposite directions, in which case the winch gives a good embodiment for a funicular drive.

Claims

1. Method for controlling the operation of a winch or a corresponding device, which comprises a working-rope reel which can be connected in operating connection with a drive gear and disconnected from operating connection with the drive gear, respectively, and which winds the working rope in and delivers the working rope out, respectively, which controlling takes place by means of pull conditions in a control rope, which is wound into and wound out of, respectively, the winch, in which winch a tendency has been arranged for the control rope to be pulled into the winch, characterized in that the winding-in of the working-rope reel is produced by allowing the control rope to be pulled in relative the working rope with controlled pull, whereby the speed of winding in of the working rope is restricted or the winding-in of the working rope is stopped, respectively, by restricting the winding-in of the control rope relative the winding-in of the working rope.

2. Method as claimed in claim 1, characterized in that the winding-in of the working rope is produced by allowing the control rope to be pulled in over a certain advance distance relative the working rope and that the speed of winding-in of the working rope is restricted, or the winding-in of the working rope is stopped, respectively, by restricting the winding-in of the control rope relative the winding-in of the working rope within the said advance distance so that the winding-in of the working rope is retarded relative the lag distance of the control rope, or is stopped, respectively, after the lag of the control rope has become equal to the advance distance mentioned above.

3. Method as claimed in claim 1 or 2, characterized in that the tensioning of the control rope is being watched, that when the tensioning becomes lower than a predetermined value, stopping of the winding-in of the control rope is caused and, thereby, stopping or locking of the working-rope reel, and that restarting of the winding-in of the control rope and the working rope is caused by tensioning the control rope so that the tension exceeds the said predetermined value.

4. Winch for carrying out the method as claimed in claim 1, having a working-rope reel (7), driving means for the same, and a control rope for controlling driving of said working-rope reel by the pull in said control rope, characterized in that the winch consists of a stationary hollow shaft (13) supported on a frame construction (19), of a working-rope reel (7) mounted at one end of the hollow shaft, revolving freely on the said shaft but having a restricted axial movement, of a connecting shaft (1) passing through the hollow shaft (13) and projecting out of both of its ends, the said connecting shaft being installed as freely revolving relative to the hollow shaft (13), of a control-rope reel (33) installed on the portion of the connecting shaft (1) projecting out of the end opposite to the working-rope reel (7), which control-rope reel (33) is arranged as substantially freely revolving on the connecting shaft (1) and has a restricted possibility of axial movement relative the said shaft (1), of a secondary drive wheel (16) installed on the hollow shaft (13) between the working-rope reel (7) and the control-rope reel (33) alongside the working-rope reel

as freely revolving but as locked in respect of axial movement, of a friction face between the working-rope reel (7) and the secondary drive wheel (16), of a rotational wedge member (32) between the locked end (36) of the connecting shaft (1) passing through the control-rope reel (33) and the control-rope reel, of a rotational wedge member (4) between the opposite locked end (2) of the connecting shaft (1) and the working-rope reel (7), of members (25,29,26) for forcing the control-rope reel (33) to revolve with a limited force relative the connecting shaft (1) in the direction expanding the rotational wedge member (32) that shifts the control-rope reel axially, as well as of members (25,29,30,21) for forcing the connecting shaft (1) to revolve along with the control reel (33).

5. Winch as claimed in claim 4, characterized in that the members (25,29,26) for forcing the control-rope reel (33) to revolve relative the connecting shaft (1) are dynamic members and receive their drive power from the drive members of the winch.

6. Winch as claimed in claim 5, characterized in that the members for forcing the control-rope reel (33) to revolve relative the working-rope reel (7) consist of a chain wheel or equivalent (25) mounted on the shaft (13) alongside the control-rope reel (33) as freely revolving, which wheel (25) receives the drive power of the winch in the direction of winding in, of a friction face (29) fixed onto the side of the chain wheel facing towards the control-rope reel, as well as of dragging members (26) attached to the control-rope reel (33) and reaching contact with the friction face (29).

7. Winch as claimed in claim 6, characterized in that there are two pairs of dragging members (26), one of them being constantly in contact with the dragging face (29) and the other pair not reaching contact with the said face until the rotational wedge (32) shifting the control-rope reel (33) axially expands.

8. Winch as claimed in any of claims 4 to 7, characterized in that the other rotational wedge member (4) is placed between the working-rope reel (7) and the locked (2) end of the connecting shaft (1) passing through the said reel (7).

9. Winch as claimed in claim 4, characterized in that the rotational wedges (32,4) consist of bearing members which have races (50) inclinded in the same direction relative the plane perpendicular to the axial direction of the bearing member, the inclination of the said races becoming gentler in the rolling direction bringing the races farther away.

10. Winch as claimed in any of claims 4 to 9, characterized in that it is provided with members (34,40,41,44,39,42) for locking the control-rope reel (33) relative the frame (19) of the winch against winding-in when the tensioning of the control rope (43) goes below a certain preselected value.

11. Winch as claimed in claim 10, characterized in that the locking member consists of a tooth member (34) stationarily fixed to the control-rope reel, of a lever member (39) pivotably fastened to the frame (19) of the winch, one of whose free ends (40) is arranged so that it grasps a tooth recess of the tooth member (34), while the opposite end is arranged so that it feels the tension of the control rope (43) relative a preset spring force (44), whereat the arrangement has been selected so that, when the tensioning force of the control rope becomes lower than the spring force, the lever member is locked in the recess (34) and, correspondingly, is released from the recess when the tensioning force of the control rope exceeds the spring force.

Patentansprüche

1. Verfahren zur Steuerung der Arbeitsweise einer Winde oder eines entsprechenden Gerätes, welche eine Arbeitsseil-Trommel aufweist, welche mit einem Antrieb verbunden und von demselben getrennt werden kann und welche das Arbeitsseil aufwindet bzw. ausgibt, wobei die Steuerung mittels Zugbedingungen in einem Steuerseil erfolgt, welches von der Winde aufgewunden bzw. ausgegeben werden kann, und wobei eine Tendenz zum Aufwinden des Steuerseils in die Winde vorgesehen ist, dadurch gekennzeichnet, dass das Aufwinden des Arbeitsseils erzeugt wird, indem man das Steuerseil mit kontrolliertem Zug aufwinden lässt, wobei die Aufwindgeschwindigkeit des Arbeitsseils begrenzt oder das Aufwinden des Arbeitsseils unterbrochen wird, indem das Aufwinden des Steuerseils relativ zum Aufwinden des Arbeitsseils gehemmt wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass das Aufwinden des Arbeitsseils erzeugt wird, indem das Aufwinden des Steuerseils mit einem bestimmten Vorsprung bezüglich des Arbeitsseils gestattet wird, und dass die Geschwindigkeit des Aufwindens des Arbeitsseils begrenzt oder das Aufwinden des Arbeitsseils unterbrochen wird, indem das Aufwinden des Steuerseils bezüglich des Aufwindens des Arbeitsseils innerhalb des erwähnten Vorsprungs gehemmt wird, so dass das Aufwinden des Arbeitsseils gemäss dem Rückstand des Steuerseils verzögert wird, nachdem der Rückstand des Steuerseils gleich dem vorgenannten Vorsprung geworden ist.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass der Zug im Steuerseil überwacht wird, dass das Aufwinden des Steuerseils unterbrochen wird, wenn der Zug unter einen vorbestimmten Wert fällt, wodurch das Arbeitsseil angehalten oder blockiert wird, und dass das Wiederinsetzen des Aufwindens des Steuerseils and des Arbeitsseils durch Anspannen des Steuerseils derart bewirkt wird, dass der Zug den vorbestimmten Wert übersteigt.

4. Winde zur Durchführung des Verfahrens nach Anspruch 1, mit einer Arbeitsseil-Trommel (7), Antriebsmitteln für dieselbe und einem Steuerseil zur Steuerung des Antriebs der genannten Arbeitsseil-Trommel mittels des Zugs im genann-

ten Steuerseil, dadurch gekennzeichnet, dass die Winde aus einer feststehenden hohlen Achse (13) die auf einer Rahmenkonstruktion getragen ist, aus einer Arbeitsseil-Trommel (7) welche am einen Ende der hohlen Achse angeordnet ist und auf der Achse frei drehbar ist aber begrenztes axiales Spiel hat, aus einer Verbindungswelle (1) welche die hohle Achse (13) durchsetzt und an deren beiden Enden vorsteht, wobei die Verbindungswelle bezüglich der hohlen Achse (13) frei drehbar angeordnet ist, aus einer Steuerseil-Trommel (33) die auf dem Teil der Verbindungswelle (11) angeordnet ist, welcher an dem der Arbeitsseil-Trommel (7) gegenüberliegenden Ende vorsteht, welche Steuerseil-Trommel (33) im wesentlichen frei drehbar auf der Verbindungswelle (1) angeordnet ist und eine begrenzte Möglichkeit axialer Bewegung bezüglich der genannten Welle (1) hat, aus einem sekundären Antriebsrad (16) welches auf der hohlen Achse (13) zwischen der Arbeitsseil-Trommel (7) und der Steuerseil-Trommel (33) seitlich der Arbeitsseil-Trommel frei drehbar aber axial unbeweglich angeordnet ist, aus einer Reibfläche zwischen der Arbeitsseil-Trommel (7) und dem sekundären Antriebsrad (16), aus einem Drehkeil (32) zwischen dem blockierten Ende (36) der Verbindungswelle (1) welche die Arbeitsseil-Trommel (33) und die Steuerseil-Trommel durchsetzt, aus einem Drehkeil (4) zwischen dem gegenüberliegenden blokkierten Ende (2) der Verbindungswelle (1) und der Arbeitsseil-Trommel (7), aus Teilen (25,29,26) welche die Steuerseil-Trommel (33) zwingen, mit begrenzter Kraft bezüglich der Verbindungswelle (1) in der den Drehkeil (32) weitenden Richtung zu drehen womit die Steuerseil-Trommel axial verschoben wird, und aus Teilen (25, 29, 30, 21) welche die Verbindungswelle (1) zwingen mit der Steuerseil-Trommel (33) mitzudrehen, besteht.

5. Winde nach Anspruch 4, dadurch gekennzeichnet, dass die Teile (25, 29, 26) welche die Steuerseil-Trommel (33) zwingen bezüglich der Verbindungswelle (1) zu drehen, dynamische Teile sind und ihre Antriebsenergie von Antriebselementen der Winde erhalten.

6. Winde nach Anspruch 5, dadurch gekennzeichnet, dass die Teile welche die Steuerseil-Trommel (33) zwingen, bezüglich der Arbeitsseil-Trommel (7) zu drehen, aus einem Kettenrad oder dergleichen (25) welches auf der Achse (13) seitlich der Steuerseil-Trommel (33) frei drehbar angeordnet ist, welches Rad (25) die Antriebsenergie der Winde in der Aufwind-Richtung erhält, aus einer an der der Steuerseil-Trommel zugewandten Seite des Kettenrades befestigten Reibfläche (29) und aus Mitnahmeelementen (26) welche mit der Steuerseil-Trommel (33) verbunden sind und in Berührung mit der Reibfläche (29) reichen, bestehen.

7. Winde nach Anspruch 6, dadurch gekennzeichnet, dass zwei Paare von Mitnahmeelementen (26) vorgesehen sind von welchen das eine ständig in Berührung mit der Mitnahmefläche (29) steht, und von welchen das andere Paar nicht mit der ganannten Fläche in Berührung steht, bis der Drehkeil (32) welcher die Steuerseil-Trommel (33) verschiebt, axial expandiert.

8. Winde nach einem der Ansprüche 4 bis 7, dadurch gekennzeichnet, dass der andere Drehkeil (4) zwischen der Arbeitsseil-Trommel (7) und dem blockierten Ende (2) der Verbindungswelle (1) welche diese Trommel durchsetzt, angeordnet ist.

9. Winde nach Anspruch 4, dadurch gekennzeichnet, dass die Drehkeile (32,4) aus Lagerteilen bestehen, die bezüglich einer rechtwinklig zur Axialrichtung der Lagerteile stehenden Ebene in derselben Richtung geneigte Laufflächen (50) aufweisen, deren Neigung in der Rollrichtung welche die Laufflächen voneinander spreizt, abnimmt.

10. Winde nach irgendeinem der Ansprüche 4 bis 9, dadurch gekennzeichnet, dass sie mit Elementen (34, 40, 41, 44, 39, 42) versehen ist, welche die Steuerseil-Trommel (33) bezüglich des Rahmens (19) der Winde gegen Aufwinden sperren, wenn der Zug des Steuerseils (43) unter einen vorbestimmten Wert fällt.

11. Winde nach Anspruch 10, dadurch gekennzeichnet, dass das Sperrelement aus einem fest mit der Steuerseil-Trommel verbundenen gezahnten Element (34), aus einem Hebelelement (39) welches schwenkbar mit dem Rahmen (19) der Winde verbunden ist und dessen eines freies Ende (40) so angeordnet ist, dass es in eine Zahnlücke des gezahnten Elementes (34) greift, während das gegenüberliegende Ende so angeordnet ist, dass es den Zug des Steuerseils (43) bezügliche eine vorbestimmten Federkraft (44) abgreift, aufweist, wobei die Anordnung so gewählt ist dass das Hebelement in der Zahnlücke (34) blockiert wird, wenn der Zug im Steuerseil geringer wird als die Federkraft und entsprechend aus der Lücke ausgerückt wird, wenn der Zug des Steuerseils die Federkraft übersteigt.

Revendications

1. Procédé de commande du fonctionnement d'un treuil ou d'un dispositif correspondant, qui comprend une bobine de corde de travail qui peut être couplée opérativement resp. avec un engrenage d'entraînement et découplée de l'engrenage d'entraînement pour être déconnectée, et qui renvide la corde de travail, resp. délivre la corde de travail, cette commande étant effectuée dans des conditions de tension dans une corde de commande qui est resp. enroulée dans et déroulée du treuil, treuil dans lequel il a été prévu une tendance à tirer la corde de commande à l'intérieur du treuil, caractérisé en ce que le renvidage de la bobine de corde de travail est provoqué en permettant que la corde de commande soit renvidée avec une tension contrôlée relativement à la corde de travail, la vitese de renvidage de la corde de travail étant limitée, resp. le renvidage de la corde de travail étant arrêté en limitant le renvidage de la corde de commande relativement au renvidage de la corde de travail.

2. Procédé selon la revendication 1, caractérisé en ce que le renvidage de la corde de travail est

effectué en permettant que la corde de commande soit renvidée avec une certaine distance d'avance relativement à la corde de travail, et en ce que la vitese de renvidage de la corde de travail est resp. limitée ou le renvidage de la corde de travail est arrêté en limitant le renvidage de la corde de commande relativement au renvidage de la corde de travail dans les limites de ladite distance d'avance, de sorte que le renvidage de la corde de travail est resp. retardé relativement à la distance de retard de la corde de commande ou arrêté, après que le retard de la corde de commande soit devenu égal à la distance d'avance mentionnée plus haut.

3. Procédé selon la revendication 2, caractérisé en ce que la tension exercée sur la corde de commande est contrôlée, de sorte que lorsque la tension devient inférieure à une valeur prédéterminée, l'arrêt du renvidage de la corde de commande et en conséquence l'arrêt ou le verrouillage de la bobine de corde de travail est provoqué, et en ce que le redémarrage du renvidage de la corde de commande et de la corde de travail est provoqué en exerçant une tension sur la corde de commande de manière que la tension dépasse ladite valeur prédéterminée.

4. Treuil pour la mise en oeuvre du procédé selon la revendication 1, avec une bobine de corde de travail (7), des moyens d'entraînement de celle-ci et une corde de commande pour commander l'entraînement de ladite bobine de corde de travail par la tension dans ladite corde de commande, caractérisé en ce que le treuil consiste en un arbre creux stationnaire (13) supporté sur une construction de bâti (19), en une bobine de corde de travail (7) montée à une extrémité de l'arbre creux, tournant librement sur ledit arbre mais avec un mouvement axial limité, en un arbre de liaison (1) passant à travers l'arbre creux (13) et dépassant aux deux extrémités de celui-ci, ledit arbre de liaison étant installé de manière à tourner librement relativement à l'arbre creux (13), en une bobine de corde de commande (33) disposée sur la partie de l'arbre de liaison (1) dépassant de l'extrémité opposée à la bobine de corde de travail (7), cette bobine de corde de commande (33) étant disposée de manière à tourner substantiellement librement sur l'arbre de liaison (1) et ayant une possibilité restreinte de mouvement axial relativement audit arbre (1), en une roue d'entraînement secondaire (16) disposée sur l'arbre creux (13) entre la bobine de corde de travail (7) et la bobine de corde de commande (33) à côté de la bobine de corde de travail, ladite roue tournant librement mais étant bloquée en rapport avec un mouvement axial, en une joue de friction entre la bobine de corde de travail et la roue d'entraînement secondaire (16), en un élément de cale tournant (32) entre l'extrémité bloquée (36) de l'arbre de liaison (1) passant à travers la bobine de corde de commande (33) et la bobine de corde de commande, en un élément de cale tournant (4) entre l'extrémité opposée bloquée (2) de l'arbre de liaison (1) et la bobine de corde de travail (7), en éléments (25,29,26) pour forcer la bobine de corde de commande (33) à tourner avec une force limitée relativement à l'arbre de liaison (1) dans la direction dilatant l'élément de cale tournant (32) qui déplace la bobine de corde de commande axialement, ainsi qu'en éléments (25,29,30,31) pour forcer l'arbre de liaison (1) à tourner avec la bobine de commande (33).

5. Treuil selon la revendication 4, caractérisé en ce que les éléments (25,29,26) pour forcer la bobine de corde de commande (33) à tourner relativement à l'arbre de liaison (1) sont des éléments dynamiques et qu'ils reçoivent leur puissance d'entraînement des éléments d'entraînement du treuil.

6. Treuil selon la revendication 5, caractérisé en ce que les éléments pour forcer la bobine de corde de commande (33) à tourner relativement à la bobine de corde de travail (7) consistent en une roue à chaine ou similaire (25) montée sur l'arbre (13) à côté de la bobine de corde de commande (33) et tournant librement, cette roue (25) recevant la puissance d'entraînement du treuil dans la direction de renvidage, en une joue de friction (29) fixée au côté de la roue à chaine faisant face à la bobine de corde de commande, ainsi qu'en des éléments d'entraînement (26) attachés à la bobine de corde de commande (33) et en contact avec la joue de friction (29).

7. Treuil selon la revendication 6, caractérisé en ce qu'il y a deux paires d'éléments d'entraînement (26), une de celles-ci étant constamment en contact avec la joue de friction (29) et l'autre paire n'étant pas en contact avec ladite joue jusqu'à ce que l'élément de cale tournant (32) qui déplace la bobine de corde de commande se dilate axialement.

8. Treuil selon l'une des revendications 4 à 7, caractérisé en ce que l'autre élément de cale tournant (4) est placé entre la bobine de corde de travail (7) et l'extrémité bloquée (2) de l'arbre de liaison (1) passant à travers ladite bobine (7).

9. Treuil selon la revendication 4, caractérisé en ce que les éléments de cale tournants (32,4) consistent en éléments de support qui ont des voies (50) inclinées dans la même direction relativement au plan perpendiculaire à la direction axiale des éléments de support, l'inclinaison desdites voies devenant plus modérée dans la direction de roulement éloignant les voies de plus en plus.

10. Treuil selon l'une des revendications 4 à 9, caractérisé en ce qu'il comprend des éléments (34,40,41,44,39,42) pour bloquer la bobine de corde de commande (33) relativement au bâti (19) du treuil contre le renvidage lorsque la tension de la corde de commande (43) tombe en dessous d'une certaine valeur prédéterminée.

11. Treuil selon la revendication 10, caractérisé en ce que l'élément de blocage consiste en un élément denté (34) fixé de manière stationnaire à la bobine de corde commande, en un élément de levier (39) fixé de manière pivotante au bâti (19) du treuil, l'une de ses extrémités libres (40) étant arrangée de manière à pénétrer dans l'espace

entre deux dents de l'élément denté (34), alors que l'extrémité opposée est arrangée de manière à sentir la tension de la corde de commande (43) relativement à la force préajustée d'un ressort (44) dont la disposition a été choisi de manière que, lorsque la force de tension de la corde de commande devient inférieure à la force du ressort, l'élément de levier est bloqué dans le logement (34) et, en correspondance, est libéré du logement lorsque la force de tension de la corde de commande dépasse la force du ressort.

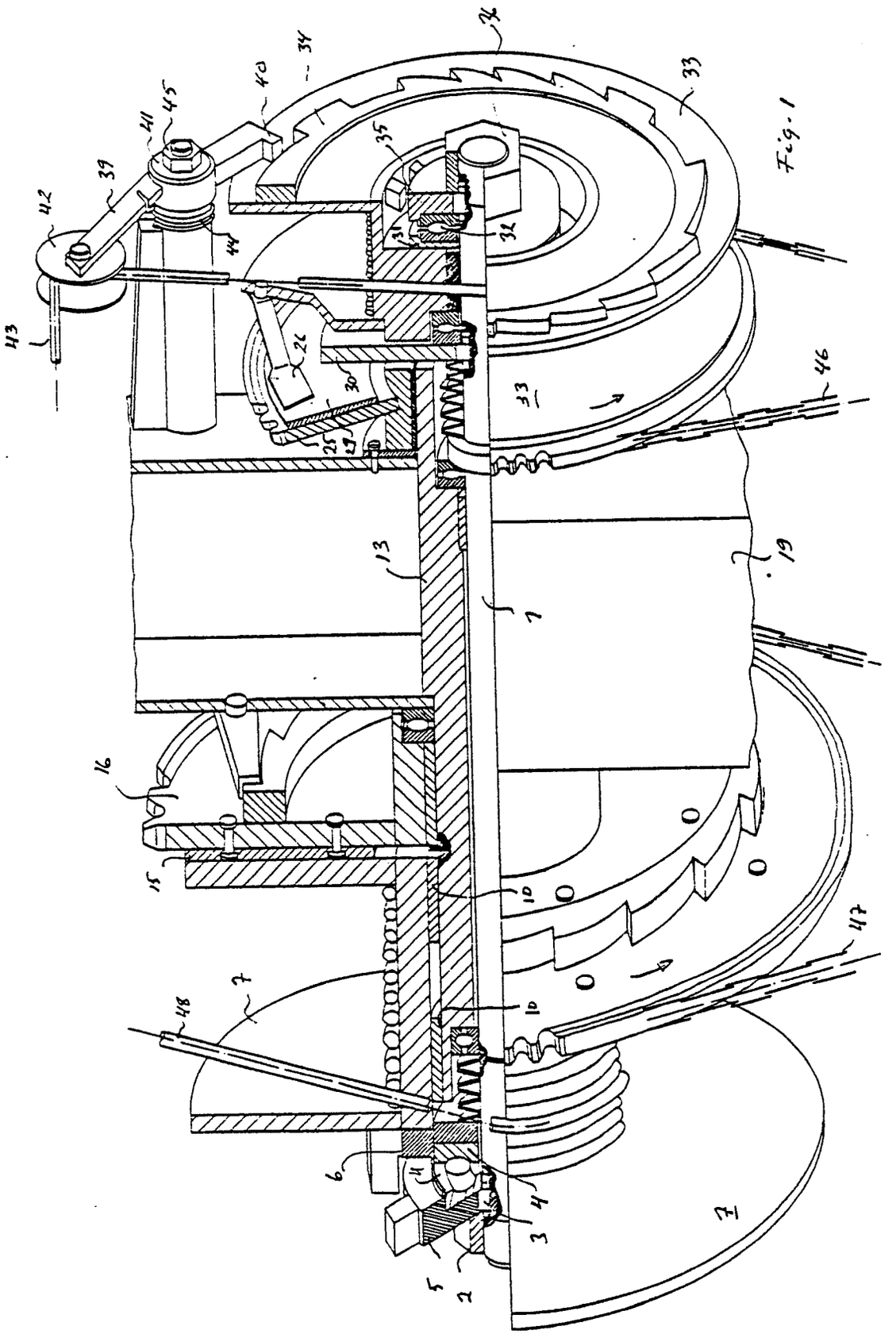

Fig. 1

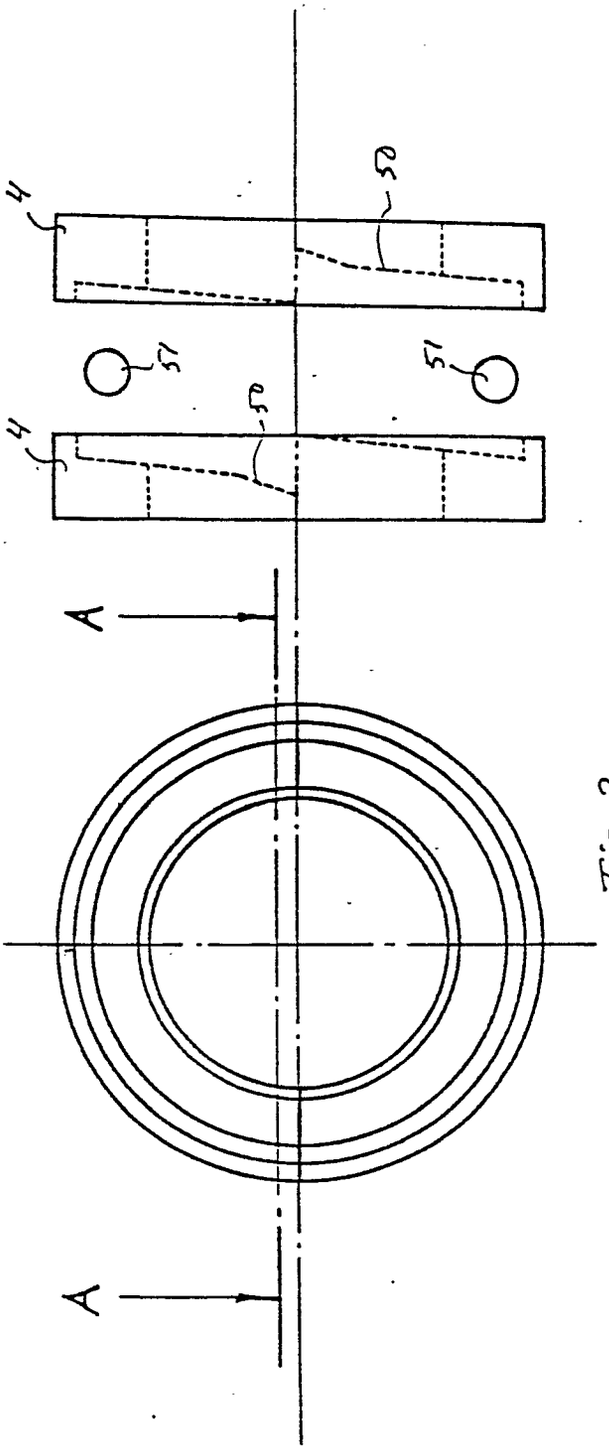

Fig. 2

Fig. 3

A–A

Fig. 4