United States Patent

Van Der Linde

[15] **3,643,922**

[45] **Feb. 22, 1972**

[54] DEVICE FOR THE CONTROL OF THE SHIFT MOVEMENTS OF A FLOATING BODY

[72] Inventor: **Franciscus Henricus Van Der Linde,** Wassenaar, Netherlands

[73] Assignee: **N. V. Industrieele,** Handelscombinatie, Netherlands

[22] Filed: **June 30, 1969**

[21] Appl. No.: **837,632**

[52] **U.S. Cl.** **254/172,** 60/53, 60/97

[51] **Int. Cl.** **B66d 1/48**

[58] **Field of Search** .....254/172, 184; 91/411, 412, 91/6; 60/53 W, 53 R, 53, 97 E; 37/58

[56] **References Cited**

UNITED STATES PATENTS

3,355,886	12/1967	Weisenbach	91/412
3,380,179	4/1968	Schmidt	37/58
3,154,925	11/1964	De Vita	60/97 E
3,361,080	1/1968	Born et al.	254/172
3,415,057	12/1968	Rosenberg	60/53
3,435,616	4/1969	Waldorff	60/53
3,458,053	7/1969	Reuter	254/172

FOREIGN PATENTS OR APPLICATIONS

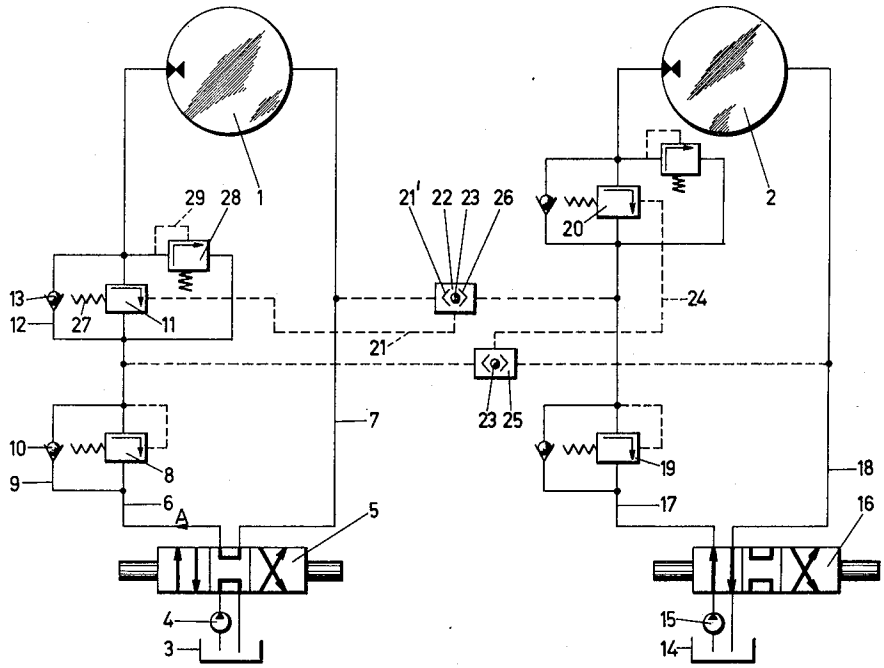
1,007,428	10/1965	Great Britain	254/184

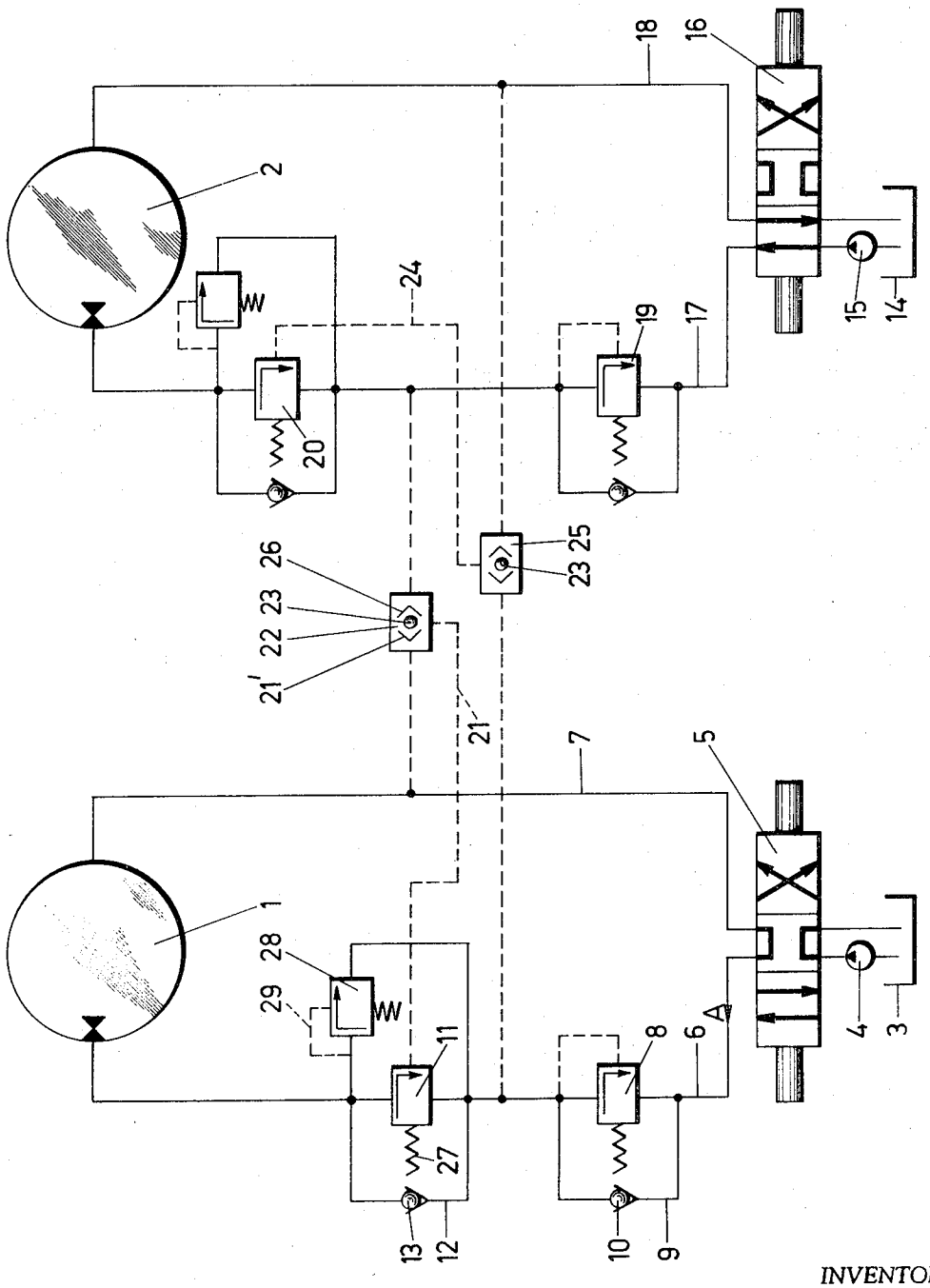
Primary Examiner—Joseph Wegbreit
Assistant Examiner—Merle F. Maffei
Attorney—Young & Thompson

[57] **ABSTRACT**

A suction dredger comprising a floating body carrying a suction pipe having a rotatably driven cutter at the lower end thereof and hydraulically operated winches to haul and veer the suction pipe, is characterized by means to limit the braking action on the veering winch when the other winch is hauling, and to increase the braking action on the veering winch when the load on the hauling winch decreases below a predetermined value. In the case of hydraulically operated winches, this is done by providing throttle valves in the fluid circuits of the winches, with each throttle valve responsive to the pressure in the high-pressure branch of the circuit of the other winch.

2 Claims, 1 Drawing Figure





INVENTOR

FRANCISCUS HENRICUS VAN DER LINDE

BY Young & Thompson

ATTORNEYS

DEVICE FOR THE CONTROL OF THE SHIFT MOVEMENTS OF A FLOATING BODY

The invention relates to a device for the control of the shift movements of a floating body which may be shifted by means of alternating hauling and veering winches, and while the winch or winches working in one direction is (are) hauled, the winch or winches working alternatively in the opposite direction during said hauling will be braked when being veered. Such shift movements may be applied with various floating bodies, preferably in such a way that both the cable of the hauling winch as well as the cable of the veering winch are kept taut. If the speed of the moving body has to be lowered, the speed of the hauling winch will be reduced. However, there will then be the risk that the floating body will run in on the cable.

This can be prevented in that the braking action of the veering winch is increased by the manual control on said winch, which, however, is troublesome when such actions have to be carried out frequently.

In a cutter dredge the floating body of the suction dredge with the suction pipe and the cutter is continuously swung by the starboard winch and the port winch. These actions have to be carried out frequently and continuously. Moreover, with a cutter dredge one has also to deal with the influence exercised by the rotating cutter. When the cutter rotates opposite to the direction of motion of the floating body and the cutter will, thus, act as an undercutting means, there will be no additional problems. When, however, the direction of rotation of the cutter coincides with the direction of motion of the floating body, the cutter acts as an overcutting means with the risk that the cutter will suddenly run off over the ground. This may happen with a higher speed than the hauling speed of the pulling winch, as a result of which the cable of the hauling winch becomes slack.

The braking action of the veering winch should preferably be kept as low as possible. However, as it is impossible for the operator to adjust the braking force, in particular with the overcutting cutter, continuously to the conditions by means of manual control, it is now customary to apply a strong braking action to the veering winch in order to be able to cope with all situations that may occur, said braking action having to be overcome, of course, by the hauling winch. This leads to undesirable load of the hauling winch, unnecessary tensions in the cable and will mean a considerable loss of energy and additional wear.

The object of the invention is to provide a device in order to prevent said objections and with which just sufficient braking force may be exerted by the veering winch in order to keep the hauling cable in a taut condition.

According to the invention, said object is achieved by an adjusting device controlling the braking action of the veering winch dependent on the load of the hauling winch, in such a way that the braking action of the veering winch is increased when the load on the hauling winch is decreased below a certain value and vice versa. In control engineering, this can be realized in many ways.

With electric drive of the winches the load of the motor of the hauling winch is measured and said load is then a value for the adjustment of the braking action of the veering winch. Thus, the operating staff need not pay attention to maintaining the right tension in the veering winch and the braking action of the veering winch can be adjusted to a minimum value. When there is a sudden change in that the floating body moves faster than the corresponding speed of the cable of the hauling winch, e.g., when lowering the speed of the winch during a shift movement or in that wind and current forces will move the body faster or in that an overcutting cutter dredge will run off, then the braking action of the veering winch will be increased at the same moment when the load of the motor of the hauling winch is decreased below said value, whereby the movements of the floating body can be controlled completely.

When the winches are driven by means of hydraulic motors, the invention may be realized in a simple and effective way in that a controllable throttle valve is provided in the feed circuit

of the veering winch, the control element of said valve being connected to the feed circuit of the hauling winch. The pressure in the feed circuit of the hauling winch will determine the position of the throttle valve. Said throttle valve will be fully open beyond a certain load of the hauling winch. However, when the load decreases below said determined amount and the pressure in the feed circuit will, thus, drop, the throttle valve will more or less be closed, as a result of which the veering winch will be braked more as the load of the hauling winch decreases more. Said action may result in that the feed circuit of the veering winch is locked entirely, in which case it is preferred to provide a safety valve which determines the upper limit of the braking force.

With a device in which the feed circuits of both winches are provided with a controllable throttle valve and in which each feed circuit has a control valve with which it is possible to reverse the direction of rotation of the hydraulic motor, it is possible according to the invention, to provide a selection valve in the control conduit between the throttle valve and the feed circuit, said valve being also connected to the normally low-pressure branch of the feed circuit of the veering winch, and being designed so that it connects in one position the control member of the throttle valve to the normally high-pressure branch of the feed circuit of the hauling winch and that said valve connects in another position said control member to the normally low-pressure branch of the feed circuit of the veering winch. If a winch has to be veered, e.g., for renewed location of an anchor of the winch rope, the winch is driven in the opposite direction, which is effected by means of a known control valve.

The selection valve will then be brought automatically in the position in which the throttle valve in the feed circuit of the veering winch is connected to the low-pressure branch of the feed circuit of the veering winch; the consequence of which is that the throttle valve is placed in the full open-position by its control member, as the low-pressure branch of the feed circuit is connected to the high-pressure branch by the other position of the control valve.

The invention will now be described more in detail with reference to the accompanying diagram, which shows the hydraulic motor **1** of the port winch of e.g., a cutter dredge and the hydraulic motor **2** of the starboard winch.

The hydraulic circuit of the motor **1** consists of a reservoir **3**, a pump **4**, a control valve **5**, the high pressure branch **6** and the low-pressure branch **7**, a pressure control valve **8** being provided in the high pressure branch **6**. Said valve is set a fixed valve in order to assure a minimum braking force. Said pressure control valve **8** is bridged by a pipe **9** with a nonreturn valve **10**. Thus, the pressure control valve **8** is bypassed when the flow in the branch **6** takes place in the direction of arrow A, which is the case when the control valve **5** is moved to the right into the position as shown in the circuit of the pump **2**.

The throttle valve **11** is also bridged by a pipe **12**, comprising a nonreturn valve **13** which has the same function as the pipe **9** and the nonreturn valve **10**. The circuit of the motor **2** comprises a reservoir **14**, a pump **15**, a control valve **16**, a high-pressure branch **17** and a low-pressure branch **18**, a pressure control valve **19**, which is the same as the pressure regulating valve **8** and a throttle valve **20**, which is the same as the throttle valve **11**, both of which are bridged by a conduit with a nonreturn valve. The control conduit **21** runs from the throttle valve **11** to the selection valve **22**, which makes a connection to one of the two pipes **7** or **17**, i.e., to the pipe which has the highest pressure.

The throttle valve **20** is connected to the selection valve **25** by the pipe **24**, and said valve **25** may be connected to the branches **6** or **18** in the same way as the selection valve **22** to one of the two pipes **7** or **17**.

The motor **2** is driven as is shown in the illustrated position of the control valves **5** and **16**, as a consequence of which the starboard winch is pulling. The high pressure in the branch **17** is exerted on the control member of the throttle valve **11** via the selection valve **22** and the pipe **21**. Said throttle valve will thus be kept normally in the fully opened position.

The hydraulic circuit of the motor **1** is short-circuited by the control valve **5** so that the motor **1** may run freely at the same time and the flow in the circuit is braked by the pressure control valve **8**. If the load of the motor **2** is reduced for one reason or other, the pressure in the branch **17** will drop and, as a consequence, also the pressure on the control member of the throttle valve **11**. Said valve will be put into a position by the spring **27** in which throttling of the liquid flow in the branch **6** will take place, which will increase the braking action of the motor **1**. A safety valve **28** is provided with a control conduit **29**, and said conduit limits the maximum braking force so that the braking motor will not be locked completely.

If the anchor of the cable of the winch driven by the motor **1** has to be shifted and, therefore, said winch has to be veered, then the control valve **5** is moved completely to the left so that high pressure will be supplied to the branch **7**. The motor **1** will then be driven in the same direction as the direction in which said motor is driven by the unwinding cable during shifting of the floating structure. There will be a connection between the branch **7** and the control member of the throttle valve **11** via the selection valve **22**, said member will be put under pressure and the throttle valve will be opened, which makes it possible that the direction of motion of the motor is reversed.

When the control valves **5** and **16** are put in such a position that the motor **1** is driven and the motor **2** is braking, the valves **19** and **20** fulfill the same function as the valves **8** and **11** and the selection valve **25** fulfils the same function with regard to the motor **2** as does the selection valve **22** with regard to the motor **1**.

It should be noted that by the selection valves **22** and **25** a valve is meant in which e.g., a ball **23** is positioned between two seats **21** and **26**, said ball closing one or the other seat according to the side with the highest pressure.

What is claimed is:

1. In a suction dredge having veering and hauling winches, a hydraulic motor for each winch, each hydraulic motor having a hydraulic circuit having a high-pressure branch to drive the motor; the improvement comprising a separate throttle valve in each said hydraulic circuit, and means responsive to the pressure in each high-pressure branch to control the throttle valve in the other hydraulic circuit such that a decrease in the pressure in either high-pressure branch closes the throttle valve in the other hydraulic circuit to apply braking action to the motor of said other circuit and an increase in the pressure in either high-pressure branch opens the throttle valve in the other hydraulic circuit to decrease braking action on the motor of said other circuit.

2. In a suction dredge as claimed in claim **1**, a control valve in each hydraulic circuit for reversing the associated hydraulic motor, each said hydraulic circuit having a low-pressure branch which upon reversal of the associated hydraulic motor becomes subjected to high pressure, and a selection valve connected between said low-pressure branch and the associated said throttle valve to open said associated throttle valve when pressure is increased in said low-pressure branch upon reversal of said motor.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,643,922 Dated February 22, 1972

Inventor(s) Franciscus Henricus Van Der Linde

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [73] "N. V. Industrieele, Handelscombinatie, Netherlands" should read -- N. V. Industriele Handelscombinatie Holland, Rotterdam, Netherlands --.

Signed and sealed this 8th day of January 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
★ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.