

Description

The invention relates to articulated fluid product transfer arms (for example for the loading or unloading of a ship), of the general type comprising a base, an inner tube and an outer tube hingedly connected to one another, and a system of counterweights, the inner tube being pivotable to the base and the outer tube carrying an arrangement comprising elbows and an emergency disconnection device, a part of this arrangement remaining attached to the ship on emergency disconnection.

A problem encountered in this field consists of the difficulty of connecting marine loading arms when they are out of balance during normal operation. Another problem is that of marine loading arms which, when they are overbalanced on the articulated arrangement or underbalanced (the filled or empty arm having undergone emergency disconnection), may tend to move closer to the ship, with a risk of impact. Another problem is that of the curve described by the end of that part of the arrangement comprising elbows and an emergency disconnection device which remains attached to the outer tube when the inner tube rises, particularly in cases where the angle between the outer tube and the inner tube remains constant or varies very slowly.

From the documents GB-A-1.337.726 and US-A-3.805.834 petroleum loading arms are known which have two counterweights comprising a deformable parallelo-

gram, one of the shorter sides of this parallelogram forming an extension of the outer arm and the other shorter side being pivotally connected to the base with a beam, while the inner arm constitutes the other longer side parallel to the beam.

In document GB-A-1.337.726 is found a counterweight on an extension of the beam and another counterweight on an extension of the inner tube or on an extension of the shorter side of the parallelogram pivotally connected to the base.

In document US-A-3.805.834 a pair of counterweights is disposed on rear extensions of the beam and another pair of counterweights on extensions of a pair of shorter sides of the parallelogram in question, jacks making the connection between the beam and the shorter sides.

In both documents mentioned above there is an interdependence between the pivoting of the parallelogram counterweight and the pivoting of the outer tube, and vice versa.

In addition, from the document FR-A-2.145.783 a loading arm is known in which there are not actually an inner tube and an outer tube, but an arrangement of three articulated pipes, this arrangement being in turn articulated to a vertical filling hose and serving more particularly for filling tanker trucks.

A jib comprises a movable part and a fixed part. This fixed part carries a longitudinally movable balancing weight, and mechanical transmission is

established in such a manner as to connect in respect of movement, but in opposite directions, the movable part of the jib and the balancing weight in relation to the fixed part of this jib.

In another loading arm known from the document GB-A-2.019.347 there is found a counterweight mounted on a beam pivoting on a rear extension of the inner arm.

The beam is associated with an attitude control system comprising a pair of pendulums and a pair of valves, together with sensing means attached to the beam in order to determine the attitude of the outer arm, and acting on jacks controlling the inner arm and controlling the pivoting of the beam.

Finally, from the document FR-A-2.373.487 a petroleum loading arm is known which has a balancing system designed in such a manner as to neutralise the vertical deflection of the arm, whatever the position of the arm. This system contains a single counterweight so guided as to make a vertical movement on a rod. The counterweight is suspended by means of two cables.

The invention relates to an arrangement described in the document US-A-3.805.834 and corresponding to the preamble of Claim 1.

The present invention overcomes the problems mentioned above and relates to a hydromechanical arrangement for permitting particularly emergency disconnection release of an articulated arm, character-

ized in that it comprises:

- a counterweight hydraulically movable on the arm, rearwardly of the inner tube;
- a jack depending on a sequential valve (VS) and controlling motions of said movable counterweight;
- a jack for controlling the inner tube, with over-pressure occurring under certain unbalanced conditions in said jack being used for causing said sequential valve (VS) to open; and
- a locking valve (V1) for the emergency disconnection device.

In one embodiment of the arrangement according to the invention the hydraulically movable counterweight is a cursor.

In another embodiment of this hydromechanical arrangement the hydraulically movable counterweight is tippingly mounted.

Other characteristics and advantages of the present invention will emerge from the following description, which is given with reference to the accompanying drawings, in which:

Figure 1 is a view in side elevation of a possible form of construction of a fluid product transfer arm equipped in accordance with the invention;

Figure 2 is a partial view in side elevation on a larger scale, of this embodiment, the inner tube of the articulated arm being disposed vertically, parallel to the base;

Figure 3 is a view similar to Figure 2, but

at 90° relative thereto;

Figure 4 is a view in section on the line IV-IV in Figure 3, on a larger scale and showing the hydraulically movable counterweight of that embodiment, the counterweight being a cursor;

Figures 5 and 6 are diagrams of the hydraulic control;

Figures 7 to 11 are diagrams showing the different locations of the device controlling the outer tube of the arm; and

Figure 12 is a diagram showing another form of construction of the hydraulically movable counterweight, this counterweight then being tippingly mounted.

In the embodiment shown in Figures 1 to 4 in particular the invention is applied to an articulated fluid product transfer arm, particularly for petroleum products, between a quayside installation (Q) and a ship (N) for example. In this embodiment, selected solely by way of example to illustrate the application of the invention, the articulated arm comprises a base (1) and, mounted for pivoting on this base with the aid of two elbows (2) and (3) and of two bearings (4) and (5), an inner tube (6), at one end of which an outer tube (7) is hingedly connected. In this arrangement a first pivoting is effected about a vertical axis Z-Z of the base and a second pivoting is effected about a horizontal axis X-X. On a beam 8 rearwardly extending the inner tube (6) is disposed the

wheel (9) of the counterweight system (10), which is connected by a cable (11) to the other wheel (12) of the system. At its end the outer tube (7) carries an arrangement (13) comprising elbows (14) and an emergency disconnection device (15) for the connection to the ship. It must be observed that a part of this arrangement remains on the ship when an emergency disconnection is made.

In order to overcome the problems described above, according to the invention at least one hydraulically movable counterweight (16) is provided on the beam (8) rearwardly extending the inner tube (6) of the articulated arm. More precisely, the hydraulically movable counterweight (16) is in the form of a cursor adapted to move on slideways (17) fixed by struts (18) both to the elbow (3) of the inner tube (6) and to the beam (8). The cursor counterweight carries rollers (19) facilitating its movement on the slideways (17). It is divided into two weights (16A) and (16B) connected by a plate 20 on which is articulated at (21) the rod (22) of a control jack (23) fixed on the inner tube (6).

A jack (24) oscillatingly mounted on the inner tube (6), with its piston connected to a cable (25) connecting a pulley (26) fixed to the base and a pulley (27) mounted loose on the inner tube, constitutes the control device for the inner tube.

Another jack (28), whatever its location, permits control of the outer tube (7). Arrangements

for the location of this outer tube control device will be described later on.

The description of the "hydraulic" part of the hydromechanical arrangement according to the invention now follows in conjunction with an explanation given below of the general operation of an articulated arm equipped in accordance with this invention and in conjunction with an explanation of the actual hydraulic operation.

The general operation of an articulated fluid transfer arm equipped in accordance with the invention is therefore as follows:

In normal operation the arm is actuated for connection, with the counterweight (16) in the "empty balanced arm" position - position (P1), Figure 1. A detector (29) permits this actuation. After connection to the ship, the opening of the valve (V1) hydraulically locking the emergency disconnection device automatically controls the displacement (arrow F1) of the counterweight to the "filled balanced arm" position - position (P2), Figure 1. In this position, or loading position, a counterweight detector (30) then permits the opening of the valve (31) at the foot or base of the arm.

On the emergency disconnection of the filled arm the counterweight (16) slightly overbalances the inner tube (6), which rises.

The pressurization of the jack (32) of the emergency disconnection device locks the jack of the

outer tube (7) in position. Locking positioning is effected with the aid of the normal controls.

On emergency disconnection of the empty arm, with the counterweight (16) in the "filled balanced arm" position (P2), the unbalance of the inner tube (6) causes overpressure in the jack (24) of the inner tube, this overpressure controls the opening of a sequential valve (VS), and the oil is directed into the jack (23) controlling the displacement of the counterweight (16).

Consequently, in proportion to the movement of the inner tube, the counterweight is displaced (arrow F2) until balance is restored.

The outer tube (7) is locked by the pressurization of the jack (32) of the emergency disconnection device. The normal controls permit locking positioning.

The specifically hydraulic operation is as follows:

In normal service, with the loading arm connected to the ship, the operator opens the valve (V1) locking the disconnection system. The electric detector (13A) acts automatically on an electric valve (EV1), which pressurizes the jack (23) controlling the movable counterweight (16), which is displaced (arrow F1) to the "filled balanced arm" position (P2). Flow rate limiters (L1-L2) permit control of the speed of displacement of the counterweight, and piloted valves (C1-C2) permit the locking of the jack (23) in a fixed

position in the event of the fracture of hydraulic piping.

On emergency disconnection, with the arm filled, when the arm is connected to the ship the valve selector (SV1) enables the two chambers of the control jacks of the inner tube (line AB) and of the outer tube (line CD) to be brought into intercommunication.

In an emergency an electric valve (EV2) is placed under voltage and the jack (32) of the emergency disconnection device controls the disconnection of the arm if the closure control stop of the valves (FdC) is open and if the valve (V1) is in the unlocked (open) position. At the same time a blocking valve (VB) is piloted to the closed position. The jack (28) controlling the outer tube (7) is locked in position. It should be observed that, depending on the location selected for this jack (28), the outer tube is either locked relative to the inner tube (6) or is locked relative to the base (1).

With the emergency disconnection device open, the inner tube (6), being slightly overbalanced by the movable counterweight (16), rises slowly, its speed being controlled by a flow rate regulator (R2). The pressure in the chamber (B) of the jack (24) being lower than the setting of the sequential valve (VS), the latter remains closed and a piloted valve (VP) does not change state, and the oil coming from the chamber (B) returns through the valve selector (SV1)

47

to the chamber (A). The upward movement of the inner tube (6) stops when balance is achieved (inner tube nearly vertical).

On emergency disconnection, with the arm empty, no detector indicating whether the arm is empty or filled, it is considered that the movable counterweight (16) is in the "filled balanced arm" position P2. The emergency disconnection device being open, the outer tube (7) is locked as previously.

In this case the unbalance is very considerable, the flow rate regulator (R2) installed on the chamber (B) of the jack (24) of the inner tube (6) permits a fixed rate of flow, and consequently the pressure in this chamber is higher than the pressure setting of the sequential valve (VS), which opens. The pressurized oil coming from the chamber (B) pilots the piloted valve (VP), which changes state (Line P1), the flow of oil passing through the regulator (R2) is directed towards the line (P1). This line, which is also connected to the output of the sequential valve (VS), then feeds, via a direction selector (S1), the chamber (B) of the jack (23) controlling the movable counterweight (16). The oil escapes from the chamber (B) to the tank by way of the electric valve (EV1).

The movable counterweight rises, the unbalance and also the pressure in the chamber (B) of the jack (24) of the inner tube (6) are reduced. When the value of this pressure is lower than the setting

of the sequential valve (VS), the latter closes, but the upward movement of the inner tube continues slowly. The piloted valve (VP) remains in the piloted position, and the pressure coming from the chamber (B) of the jack is in communication with the piloting chamber (line P1) by way of a flow rate limiter (L3); this line still feeds the upward movement of the counterweight to a position of balance.

The change of state of the piloted valve (VP) is effected automatically when the operator resumes control of the arm. When the pressure is applied to the chamber (A) of the jack (24) of the inner tube (upward movement of the arm), line (A) of the valve selector (SV1), the pressurized oil controls the opening of a piloted valve (CP), which drains the line (P1) to the tank (R) of the hydraulic station. The piloting aperture of the valve (VP) is no longer under pressure; it returns to the normal operating position with the aid of its return spring. During the upward movement of the inner tube (6), the valve (VP) being piloted, the chamber (A) of the jack (24) of the inner tube is in communication with the tank of the hydraulic station by way of the piloted valve (VP).

Adjusted valves (CT) installed between the chambers (A) and (B) of the jack (24) of the inner tube permit intercommunication of these two chambers when the pressure reaches a value higher than the pressure setting of these valves, in the event of the malfunctioning of the equipment described above.

Figure 7 shows two curves. The curve (E1) shows the deflection of the end (0) of the outer tube (7) after disconnection, the position of this outer tube being locked relative to the inner tube (6). The curve (E2) shows the deflection of the same end (0) of the outer tube (7) after disconnection, the inclination of the outer tube remaining constant relative to the vertical axis ZZ of the base - hence the disengagement of the outer tube relative to the ship. In order to do this, the jack (28) controlling the outer arm acts on a movable pulley (33) connected by a cable (34) to a pulley (35) which is fixed in relation to the base. The body of the jack (28) is oscillatingly mounted on the wheel (9). Details of this mounting of the jack are shown in Figure 8.

In the variant shown in Figure 9, the body of the jack (28) is still mounted oscillatingly on the wheel (9), and the rod of this jack is connected by a yoke to the pivot (9A) of the wheel, the pulley (33) being fixed on said pivot.

In the variant shown in Figures 2 and 3, the body of the jack (28) is mounted oscillatingly on the beam (8), while its rod is connected by a yoke to the pivot (9A).

Other locations of the jack (28) are shown in Figures 10 and 11 of the drawings, without these selections of location constituting limitations.

In Figure 10 two jacks (28) controlling the outer tube (7) are disposed on each of the sides of a

cable (36) connecting a pulley (37) fixed to the outer tube (7) and a pulley (38) fixed to the base.

In Figure 11 the body of the jack (28) controlling the outer tube (7) is oscillatingly mounted on the base (1), whereas the end of its rod is pivotally mounted at (39) on a pulley (40) mounted loose on the base. The pulley (40) is connected by a cable (41) to a pulley (42) fixed to the outer tube.

In the embodiment shown diagrammatically in Figure 12, the movable counterweight (16) is mounted rockingly on the beam (8) rearwardly extending the inner tube (6), but is still controlled in the same manner by the jack (23). The counterweight (16) is mounted on an arm (43A) of a bent lever pivoting on the beam (8) about an axis (44), the other arm (43B) of the lever being in addition articulated to the rod of the control jack (23). The counterweight (16) is shown in this Figure in two different rocking positions corresponding substantially to the positions (P1) and (P2) of the other embodiment.

Thus, the jack (23) controlling the movable cursor counterweight (16) can be fixed on the rear beam (8) instead of being fixed on the inner tube.

Revendications (as printed)

1. Agencement hydromécanique à deux contrepoids (10, 16) permettant notamment le dégagement, en déconnexion d'urgence, qu'il soit plein ou vide et quelle que soit sa position, d'un bras articulé de transfert de produits fluides, du type général comportant une embase (1), un tube interne (6) à prolongement arrière de ce tube et un tube externe (7) articulés entre eux, et un système de contrepoids à deux contrepoids, le tube interne (6) pivotant sur l'embase (1) et le tube externe portant un ensemble à coudes (14) et dispositif de déconnexion d'urgence, caractérisé en ce qu'il comprend:

- un contrepoids (16) mobile hydrauliquement sur le bras, à l'arrière du tube interne (6);

- un vérin (23), sous la dépendance d'une vanne de séquence (VS), provoquant les déplacements dudit contrepoids mobile;

- un vérin (24) de commande du tube interne (6) une surpression survenant dans certaines conditions de déséquilibre dans ledit vérin (24) étant utilisée pour commander l'ouverture de ladite vanne de séquence (VS); et

- une vanne (V1) de verrouillage du dispositif de déconnexion d'urgence.

2. Agencement selon la revendication 1 caractérisé en ce que le contrepoids (16) mobile hydrauliquement est un curseur se déplaçant sur des glissières (17) disposées sur une poutre (8) de prolongement arrière du tube interne (6).

3. Agencement selon la revendication 1 caractérisé en ce que le contrepoids (16) mobile hydrauliquement est monté à bascule sur la poutre (8) de prolongement arrière du tube interne (6) du bras articulé.

4. Agencement selon la revendication 1 caractérisé en ce qu'un autre vérin (28), quel que soit son emplacement, permet la commande du tube externe.

5. Agencement selon la revendication 4 caractérisé en ce que le corps du vérin (28) est monté oscillant sur la roue (9) du système classique de contrepoids (10) alors que sa tige est articulée à une poulie mobile (33) reliée par un câble (34) à une poulie (35) fixe par rapport à l'embase.

6. Agencement selon la revendication 4 caractérisé en ce que le corps du vérin (28) est monté oscillant sur la poutre arrière (8) alors que sa tige

est reliée par une chape au pivot (9A) de la roue (9) sur lequel est fixée la poulie (33).

7. Agencement selon la revendication 4 caractérisé en ce que deux vérins (28) de commande du tube externe (7) sont disposés sur chacun des brins d'un câble (36) reliant une poulie (37) fixée au tube externe (7) et une poulie (38) fixée à l'embase.

8. Agencement selon la revendication 4 caractérisé en ce que le corps du vérin (28) de commande du tube externe (7) est monté oscillant sur l'embase (1) alors que l'extrémité de sa tige est articulée à une poulie (40) montée folle sur l'embase, ladite poulie (40) étant reliée par un câble (41) à une poulie (42) fixée au tube externe.

9. Agencement selon l'une quelconque des revendications 1 à 8 caractérisé en ce qu'il comporte une centrale hydraulique, ladite vanne de séquence (VS) en relation avec lesdits vérins (23, 24, 28) et le vérin (32) du dispositif de déconnexion d'urgence, de sorte que le contrepoids (16) étant en position "bras équilibré plein" (P2) le déséquilibre du tube interne (6) provoque une surpression dans le vérin (24) du tube interne, cette surpression commandant l'ouverture de ladite vanne de séquence, d'où l'actionnement du vérin (23) de commande de déplacement du contrepoids (16).

10. Agencement selon la revendication 9 caractérisé en ce que ladite centrale hydraulique comprend, une électrovanne (EV1) mettant sous pression en service normal, le bras articulé étant connecté au point de chargement ou de déchargement (par exemple un navire), le vérin (23) de commande du contrepoids mobile (16) qui se déplace en position "bras équilibré plein" (P2), la vanne (V1) de verrouillage du système de déconnexion ayant été ouverte.

11. Agencement selon l'une quelconque des revendications 9 et 10 caractérisé en ce que des limiteurs de débit (L1, L2) permettent le contrôle de la vitesse de déplacement du contrepoids mobile (16).

12. Agencement selon l'une quelconque des revendications 9 à 11 caractérisé en ce que des clapets pilotés (C1, C2) permettent le blocage en position fixe du vérin (23) de commande du contrepoids mobile, en cas de rupture de canalisation hydraulique.

13. Agencement selon l'une quelconque des revendications 9 à 12, caractérisé en ce que la centrale hydraulique comprend un sélecteur-valve (SV1) permettant la mise en intercommunication des deux chambres des vérins de commande du tube interne et du tube externe, en déconnexion d'urgence, le bras étant plein et raccordé au navire.

14. Agencement selon l'une quelconque des revendications 9 à 13 caractérisé en ce que la centrale hydraulique comprend, en outre, une électrovanne (EV2) mise sous tension en cas d'urgence, afin que le vérin (32) du dispositif de déconnexion d'urgence commande la déconnexion du bras, le vérin de commande du tube externe comportant, également, une vanne de



blocage (V8) permettant le blocage, en cas d'urgence, du vérin (28) de commande du tube externe (7) soit par rapport au tube interne (6), soit par rapport à l'embase (1).

15. Agencement selon l'une quelconque des revendications 9 à 14 caractérisé en ce que le vérin de commande du tube interne comprend un régulateur de débit (R2) de contrôle de la vitesse de remontée du tube interne (6) et une vanne pilotée (VP) de sorte que, en déconnexion d'urgence, le bras étant plain, la pression dans l'une des chambres du vérin (24) étant inférieure au tarage de la vanne de séquence (VS) celle-ci reste fermée et la valve pilotée (VP) ne changeant pas d'état, l'huile venant de ladite chambre retourne à travers le sélecteur-valve (SV1) vers l'autre chambre du vérin (24).

16. Agencement selon la revendication 15 caractérisé en ce qu'en déconnexion d'urgence, le bras étant vide, ledit régulateur de débit (R2) permet un débit fixe, de sorte que la pression dans la chambre considérée du vérin (24) est supérieure à la pression de tarage de la vanne de séquence (VS) qui s'ouvre, de sorte que la valve pilotée (VP) change d'état et qu'une des chambres du vérin (23) du contrepoids mobile (16) se trouve alimentée.

Patentansprüche (as printed)

1. Hydromechanische Vorrichtung mit zwei Gegengewichten (10, 16), die insbesondere das Entkoppeln bei einer Nottrennung im gefüllten oder leeren Zustand und unabhängig von der Lage, eines gelenkigen Armes zur Übertragung von fluiden Erzeugnissen erlaubt, der allgemeinen Art, die aus einem Grundteil (1), einem inneren Rohr (6) mit einer hinteren Verlängerung des Rohres, und einem äußeren Rohr (7), welche miteinander gelenkig verbunden sind, und einem Gegengewichtssystem mit zwei Gegengewichten besteht, wobei das innere Rohr um das Grundteil schwenkbar ist und das äußere Rohr eine Anordnung von Krümmern (14) und Nottrenneinrichtung trägt, dadurch gekennzeichnet, daß sie umfaßt:

— ein an dem Arm hinter dem inneren Rohr (6) hydraulisch bewegbares Gegengewicht (16);

— eine Zylinder/Kolben-Anordnung (23) in Abhängigkeit von einem Folgeventil (VS), welche die Verschiebungen des bewegbaren Gegengewichtes hervorruft;

— eine Zylinder/Kolben-Anordnung (24) zur Steuerung des inneren Rohres (6), bei der ein unter bestimmten Ungleichgewichts-Zuständen auftretender Überdruck in der Zylinder/Kolben-Anordnung (24) benutzt wird zur Öffnungsteuerung des genannten Folgeventiles (VS); und

— ein Verriegelungsventil (V1) für die Nottrenneinrichtung.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das hydraulisch bewegbare Gegengewicht (16) ein Schieber ist, der sich an Gleitschienen (17) verschiebt, welche an einem

hinteren Verlängerungsträger (8) des inneren Rohres (6) angeordnet sind.

3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das hydraulisch bewegbare Gegengewicht (16) kippbar an dem hinteren Verlängerungsträger (8) des inneren Rohres (6) des Gelenkarmes angebracht ist.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß eine andere Zylinder/Kolben-Anordnung (28), unabhängig von ihrem Anbringungsort, die Steuerung des äußeren Rohres erlaubt.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß der Körper der Zylinder/Kolben-Anordnung (28) schwenkbar an dem Rad (9) des klassischen Gegengewichtssystems (10) befestigt ist, während ihre Kolbenstange an einer bewegbaren Seilscheibe (33) angelenkt ist, die über ein Seil (34) mit einer bezüglich des Grundteiles feststehenden Seilscheibe (35) verbunden ist.

6. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß der Körper der Zylinder/Kolben-Anordnung (28) an dem hinteren Träger (8) schwenkbar befestigt ist, während ihre Kolbenstange über eine Schwenkkappe (9A) mit dem Rad (9) verbunden ist, an welchem die Seilscheibe (33) befestigt ist.

7. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß zwei Zylinder/Kolben-Anordnungen (28) zur Steuerung des äußeren Rohres (7) jeweils an einem Trum eines Seiles (36) angeordnet sind, das eine an dem äußeren Rohr (7) befestigte Seilscheibe (37) und eine an dem Grundteil befestigte Seilscheibe (38) verbindet.

8. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß der Körper der Zylinder/Kolben-Anordnung (28) für die Steuerung des äußeren Rohres (7) an dem Grundteil (1) schwenkbar angebracht ist, während das Ende ihrer Kolbenstange an einer an dem Grundteil mitlaufend angebrachten Seilscheibe (40) angelenkt ist, wobei diese Seilscheibe (40) über ein Seil (41) mit einer an dem äußeren Rohr befestigten Seilscheibe (42) verbunden ist.

9. Vorrichtung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß sie eine Hydraulik-Zentrale aufweist, mit dem Folgeventil (VS) in Beziehung zu den Zylinder/Kolben-Anordnungen (23, 24, 28) und der Zylinder/Kolben-Anordnung (32) der Nottrenneinrichtung, derart, daß bei in der Stellung "Arm im Gleichgewicht gefüllt" (P2) befindlichem Gegengewicht (16) das Ungleichgewicht des inneren Rohres (6) einen Überdruck in der Zylinder/Kolben-Anordnung (24) des inneren Rohres hervorruft und dieser Überdruck die Öffnung des Folgeventils und daher die Betätigung der Zylinder/Kolben-Anordnung (23) zur Steuerung der Verschiebung des Gegengewichtes (16) einleitet.

10. Vorrichtung nach Anspruch 9, dadurch gekennzeichnet, daß die Hydraulik-Zentrale umfaßt ein Elektroventil (EV1) das im Normalzustand, bei dem der Gelenkarm mit einer Be- oder Entladestelle (z.B. einem Schiff) verbunden ist, die Zylinder/Kolben-Anordnung (23) zur Steuerung des Gegengewichtes (16) einleitet.



der/Kolben-Anordnung (23) zur Steuerung des bewegbaren Gegengewichtes (16) unter Druck setzt, welches sich in Stellung "Arm im Gleichgewicht gefüllt" (P2) verschiebt, wobei das Verriegelungsventil (V1) des Abtrennsystems offengehalten ist.

11. Vorrichtung nach einem der Ansprüche 9 oder 10, dadurch gekennzeichnet, daß Strombegrenzer (L1, L2) die Steuerung der Verschiebungsgeschwindigkeit des bewegbaren Gegengewichtes (16) erlauben.

12. Vorrichtung nach einem der Ansprüche 9 bis 11, dadurch gekennzeichnet, daß vorgesteuerte Verschlussventile (C1, C2) die Sperrung der Zylinder/Kolben-Anordnung (23) zur Steuerung des bewegbaren Gegengewichtes in feste Stellung im Falle des Reißens der hydraulischen Verrohrung erlauben.

13. Vorrichtung nach einem der Ansprüche 9 bis 12, dadurch gekennzeichnet, daß die Hydraulik-Zentrale ein Wahlventil (SV1) enthält, das die Herstellung einer Verbindung der beiden Kammern der Zylinder/Kolben-Anordnungen zur Steuerung des inneren und der äußeren Rohres bei Notabtrennung erlaubt wobei der Arm gefüllt und mit dem Schiff verbunden bleibt.

14. Vorrichtung nach einem der Ansprüche 9 bis 13, dadurch gekennzeichnet, daß die Hydraulik-Zentrale weiter ein im Notfall unter Spannung gesetztes Elektroventil (EV2) enthält, damit die Zylinder/Kolben-Anordnung (32) der Nottrenneinrichtung die Abtrennung des Armes steuert, wobei die Zylinder/Kolben-Einrichtung zur Steuerung des äußeren Rohres gleicherweise ein Sperrventil (VB) enthält, welches die Sperrung im Notfall der Zylinder/Kolben-Anordnung (28) zur Steuerung des äußeren Rohres (7) sei es bezüglich des inneren Rohres (6), sei es bezüglich des Grundteils (1) erlaubt.

15. Vorrichtung nach einem der Ansprüche 9 bis 14, dadurch gekennzeichnet, daß die Zylinder/Kolben-Anordnung zur Steuerung des inneren Rohres einen Stromregler (R2) zur Steuerung des Aufsteiggeschwindigkeit des inneren Rohres (6) und ein vorgesteuertes Ventil (VP) derart enthält, daß bei Nottrennung mit gefülltem Arm der Druck in einer der Kammern der Zylinder/Kolben-Einrichtung (24) unterhalb des Ansprechwertes des Folgeventiles (VS) ist, dieses geschlossen bleibt und das vorgesteuerte Ventil (VP) seinen Zustand nicht ändert, und das in die Kammer kommende Öl über das Wahlventil (SV1) in die andere Kammer der Zylinder/Kolben-Anordnung (24) zurückkehrt.

16. Vorrichtung nach Anspruch 15, dadurch gekennzeichnet, daß bei Nottrennung mit leerem Arm der Stromregler (R2) einen festen Stromwert erlaubt, derart, daß der Druck in der in Betracht kommenden Kammer der Zylinder/Kolben-Anordnung (24) oberhalb des Ansprechdruckes des Folgeventils (VS) liegt, welches sich öffnet, in der Weise, daß das vorgesteuerte Ventil (VP) seinen Zustand ändert und die eine der Kammern der

Zylinder/Kolben-Anordnung (23) des bewegbaren Gegengewichtes (16) speist.

Claims (as printed)

1. A hydromechanical arrangement with two counterweights (10, 16) for permitting particularly emergency disconnection release of an articulated fluid product transfer arm, whether filled or empty and whatever be its position, of the general type comprising a base (1), an inner tube (6) with rearward extension thereof and an outer tube (7) hingegly connected to one another, and a counterweight system with two counterweights, the inner tube (6) being pivotable to the base (1) and the outer tube carrying an elbow means (14) and emergency disconnection device, characterized in that it comprises:

— a counterweight (16) hydraulically movable on the arm, rearwardly of the inner tube (6);

— a jack (23) depending on a sequential valve (VS) and controlling motions of said movable counterweight;

— a jack (24) for controlling the inner tube (6), with overpressure occurring under certain unbalanced conditions in said jack (24) being used for causing said sequential valve (VS) to open;

— and, a locking valve (V1) for the emergency disconnection device.

2. An arrangement according to claim 1, characterized in that the hydraulically movable counterweight (16) is a slide moving on slideways (17) disposed on a beam (8) for rearwardly extending the inner tube (6).

3. An arrangement according to claim 1, characterized in that the hydraulically movable counterweight (16) is tippingly mounted to the beam (8) for rearward extension of the inner tube (6) of the articulated arm.

4. An arrangement according to claim 1, characterized in that another jack (28), whatever be its location, permits to control the outer tube.

5. An arrangement according to claim 4, characterized in that the body of the jack (28) is pivotably mounted to the wheel (9) of the conventional counterweight system (10), whereas its rod is hingedly connected to a movable pulley (33) connected through a cable (34) to a pulley (35) stationary relative to the base.

6. An arrangement according to claim 4, characterized in that the body of the jack (28) is pivotably mounted to the rearward beam (8), whereas its rods is connected through a shell to the pivot (9A) of the wheel (9) to which the pulley (33) is secured.

7. An arrangement according to claim 4, characterized in that two jacks (28) for controlling the outer tube (7) are disposed on each of the wires of a cable (36) connecting a pulley (37) secured to the outer tube (7) and a pulley (38) secured to the base.

8. An arrangement according to claim 4, charac-



terized in that the body of the control jack (28) for the outer tube (7) is oscillatingly mounted to the base (1) whereas the end of the rod thereof is hingedly connected to a pulley (40) mounted idle to the base, said pulley (40) being connected through a cable (41) to a pulley (42) secured to the outer tube.

9. An arrangement according to any one of claims 1 to 8, characterized in that it comprises a hydraulic station, said sequential valve (VS) in connection with said jacks (23, 24, 28) and the jack (32) of the emergency disconnection device, such that, the counterweight (16) being in the "filled balanced arm (P2)" position, unbalance in the inner tube (6) causes overpressure in the jack (24) of the inner tube, such overpressure causing said sequential valve to open, thereby actuating the jack (23) for controlling motion of the counterweight (16).

10. An arrangement according to claim 9, characterized in that said hydraulic station comprises an electric valve (EV1) for pressurizing in normal operation, the articulated arm being connected to the loading or unloading point (for example, a vessel), the jack (23) for controlling the movable counterweight (16) which moves to the "filled balanced arm (P2)" position, the locking valve (V1) for the disconnection system having been opened.

11. An arrangement according to any one of claims 9 and 10, characterized in that the flow rate limiters (L1, L2) control the speed of displacement of the movable counterweight (16).

12. An arrangement according to any one of claims 9 to 11, characterized in that piloted valve means (C1, C2) permit to block in a fixed position the jack (23) for controlling the movable counterweight in the event that the hydraulic pipe should be broken.

13. An arrangement according to any one of

claims 9 to 12, characterized in that the hydraulic station comprises a valve selector (SV1) to permit intercommunication of both chambers of the control jacks for the inner tube and the outer tube in emergency disconnection, with the arm being filled and connected to the vessel.

14. An arrangement according to any one of claims 9 to 13, characterized in that the hydraulic station moreover comprises an electric valve (EV2) which is energized in case of emergency so that the jack (32) of the emergency disconnection device causes disconnection of the arm, the control jack for the outer tube also comprising a blocking valve (VB) for blocking in case of emergency the control jack (28) for the outer tube (7) either relative to the inner tube (6) or relative to the base (1).

15. An arrangement according to any one of claims 9 to 14, characterized in that the control jack for the inner tube comprises a flow rate regulator (R2) for controlling the ascending speed of the inner tube (6) and a piloted valve (VP) such that, in emergency disconnection with the arm being filled and pressure in one of the chambers of the jack (24) being lower than the setting of the sequential valve (VS), the latter remains closed and, the piloted valve (VP) not changing its state, the oil from said chamber flows back through the valve selector (SV1) to the other chamber of jack (24).

16. An arrangement according to claim 15, characterized in that upon emergency disconnection and the arm being empty, said flow rate regulator (R2) provides for fixed flow rate such that pressure in the mentioned chamber of the jack (24) is higher than the setting pressure of the sequential valve (VS), which opens, so that the piloted valve (VP) changes its state and one of the chambers of the jack (23) for the movable counterweight (16) is fed.

