United States Patent

Lucien

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[54] CONTROL DEVICE FOR AIRCRAFT UNDERCARRIAGES AND TRAP-DOOR HOUSING CLOSURE

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[52] **U.S. Cl.** ..... **244/102 SL**

[51] **Int. Cl.** **B64c 25/16**

[58] **Field of Search** 244/102; 137/625.69

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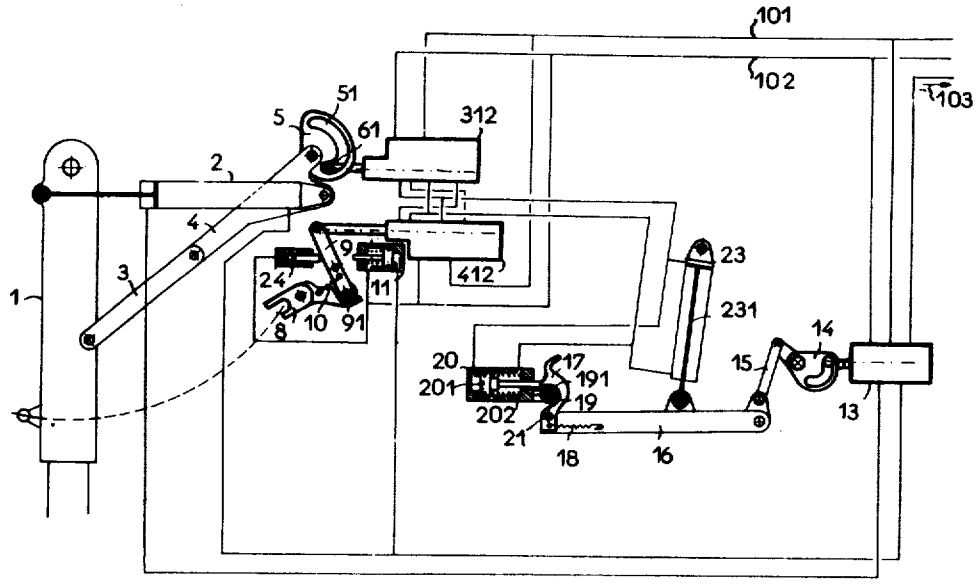
[57] **ABSTRACT**

A control device for a retractable aircraft undercarriage and for the trap-door closing its housing, with their actuating and locking members and control members supplying them in mechano-hydraulic sequences from a general undercarriage-lifting conduit and a general undercarriage-lowering conduit jack serves for actuating the trap-door, and a first slide-valve distributor and a second slide-valve distributor cooperate in supplying the jack. A first kinematic coupling is controlled by the retracted position of the undercarriage and places the first slide-valve in a characteristic undercarriage-up position and in a non-characteristic position. A second kinematic coupling is controlled by the down position of the undercarriage and places the second slide-valve in a characteristic position. A mechano-hydraulic means connects, in the non-characteristic positions, the opening chamber of the trap-door jack to the high-pressure supply, with hydraulic locking, and the closure chamber to the low-pressure supply.

7 Claims, 9 Drawing Figures



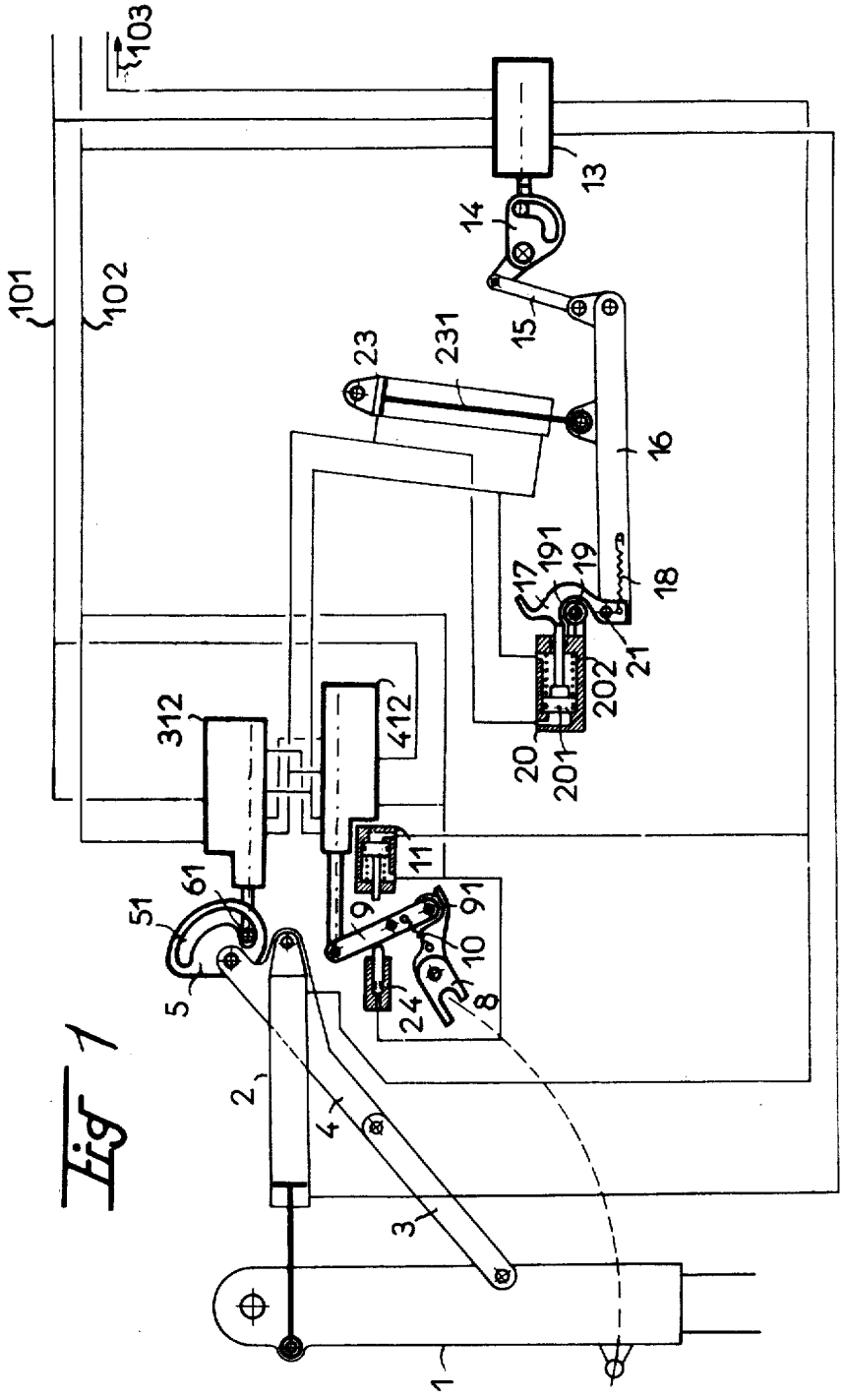

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Fig 1

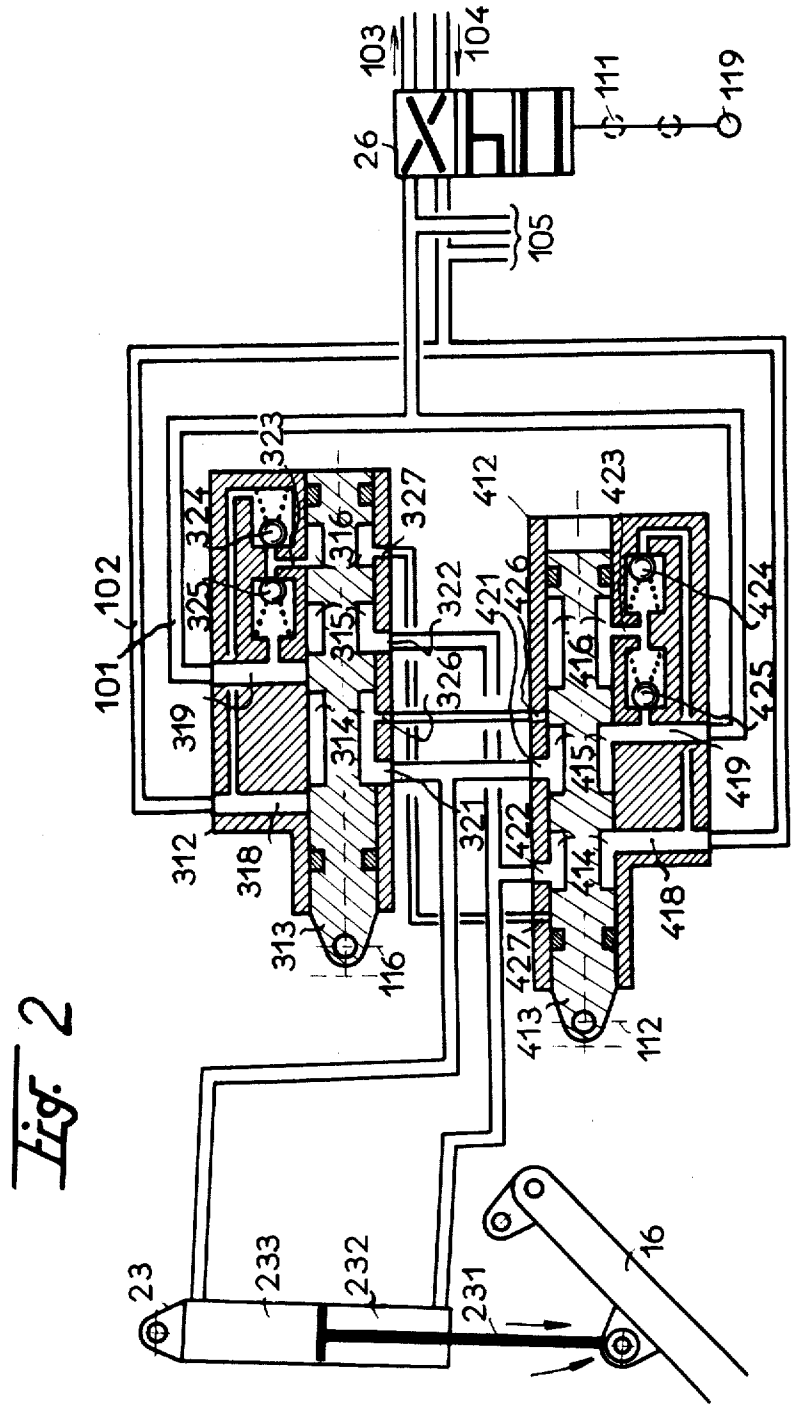
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Fig. 2

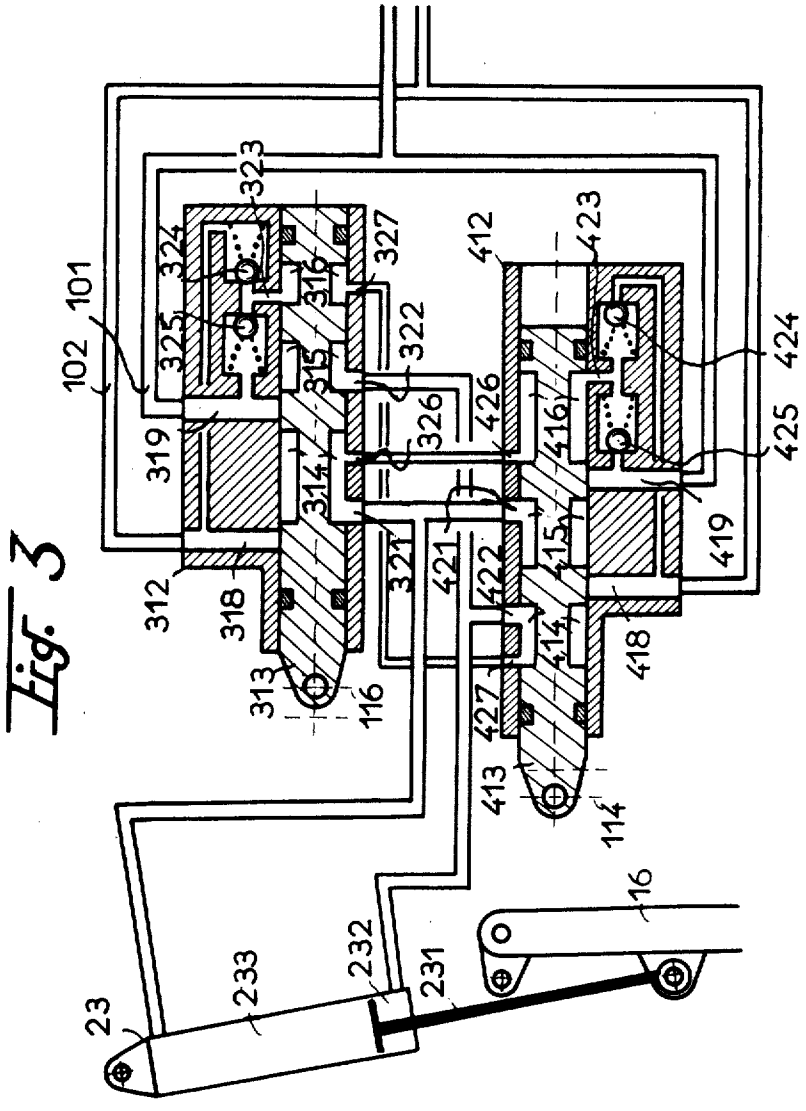
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Fig. 3

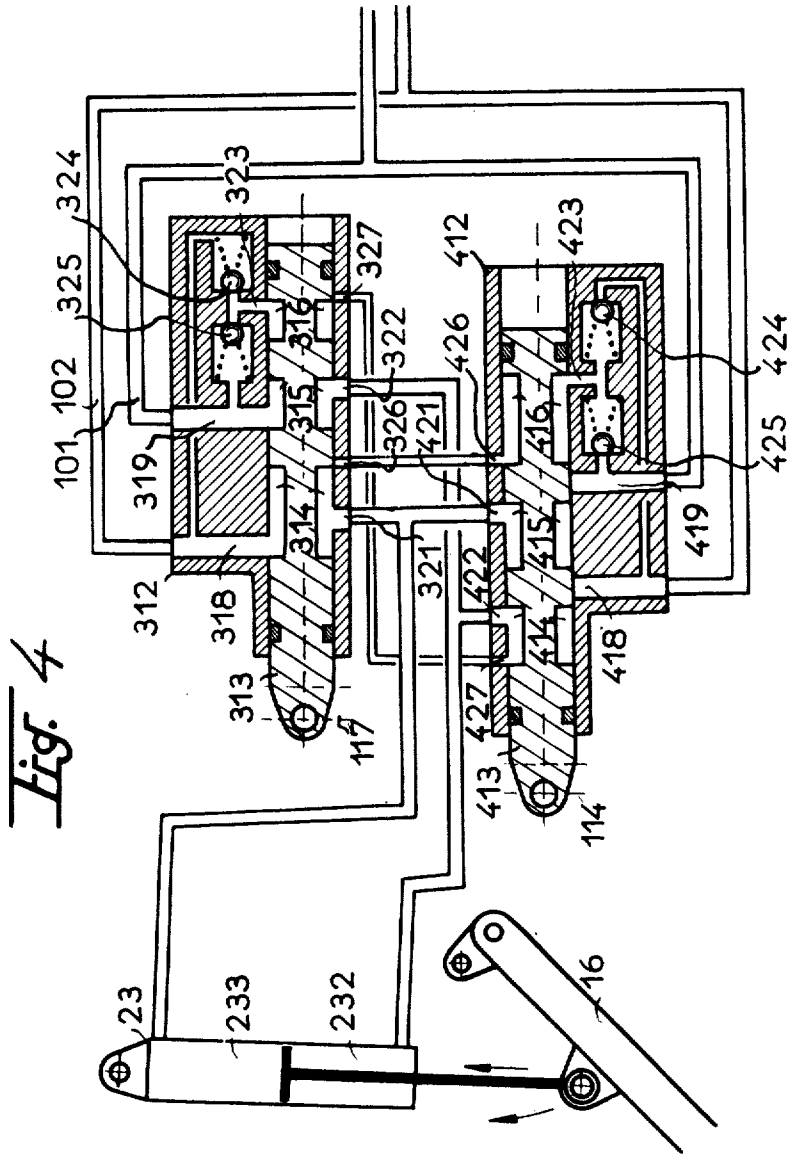
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Fig. 4

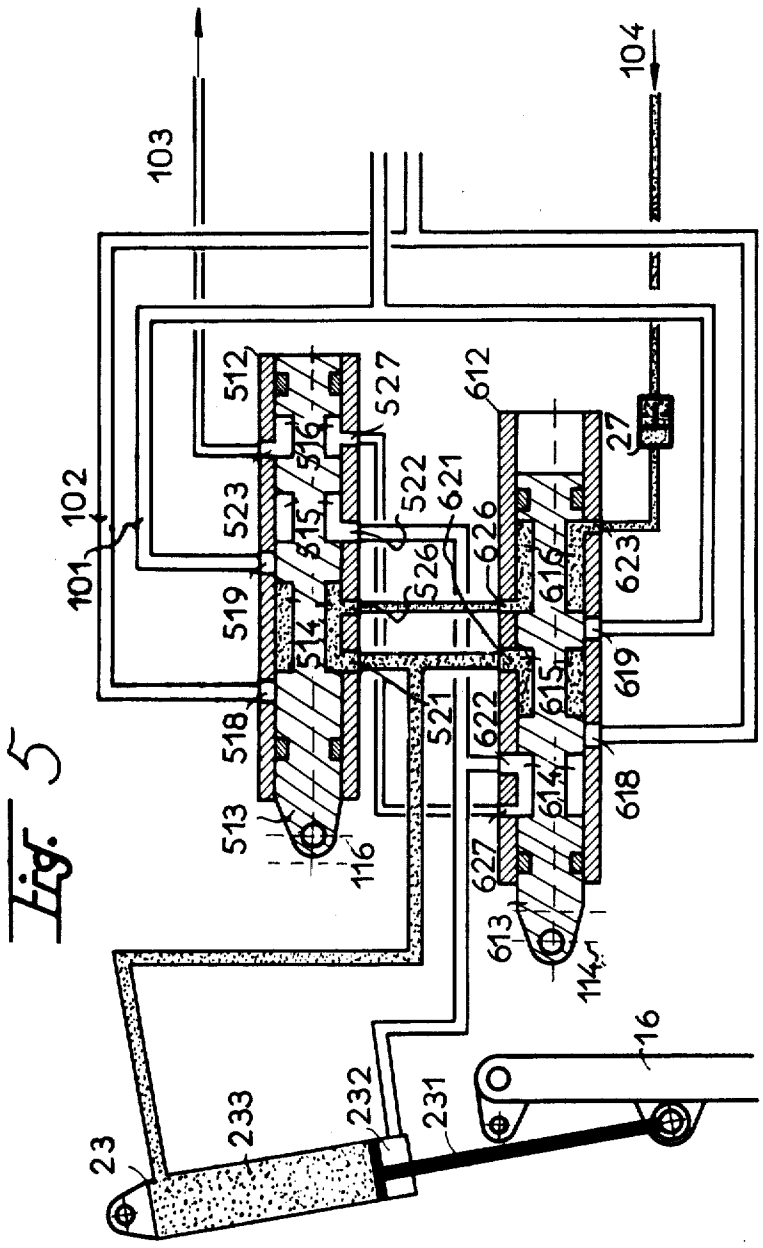
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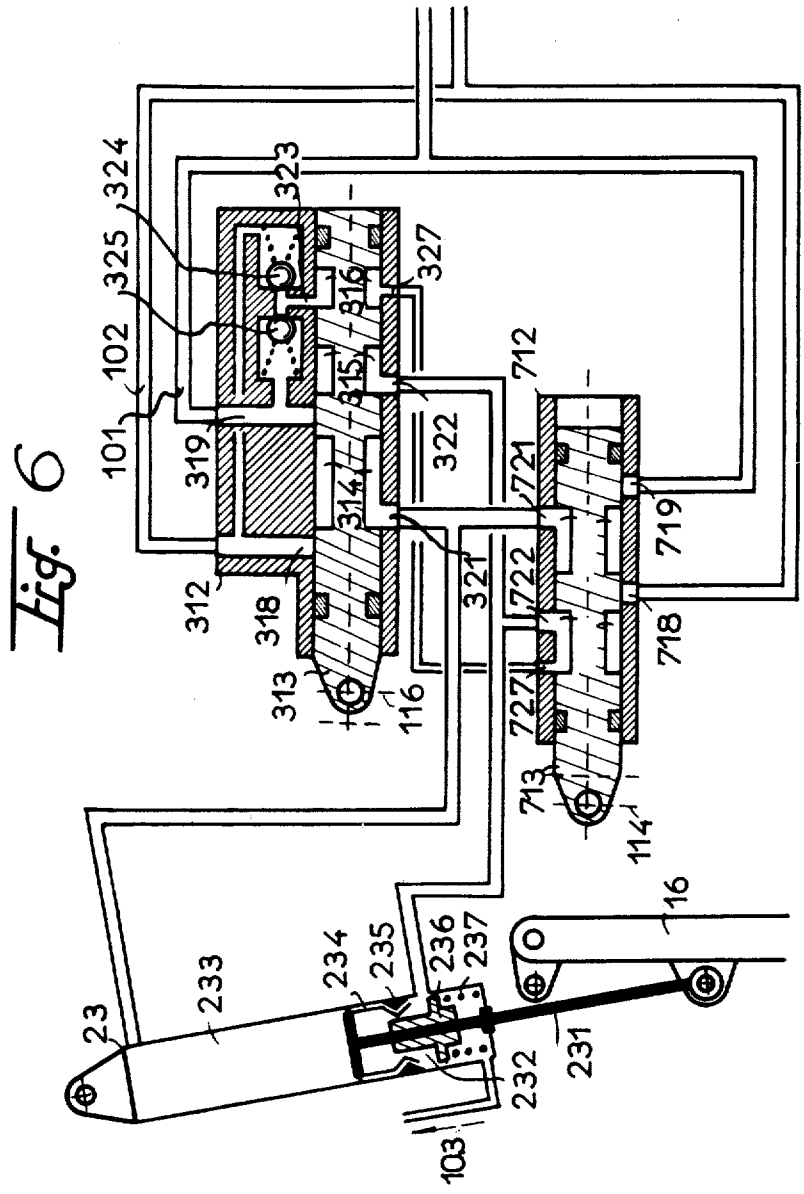
Fig. 5

Fig. 6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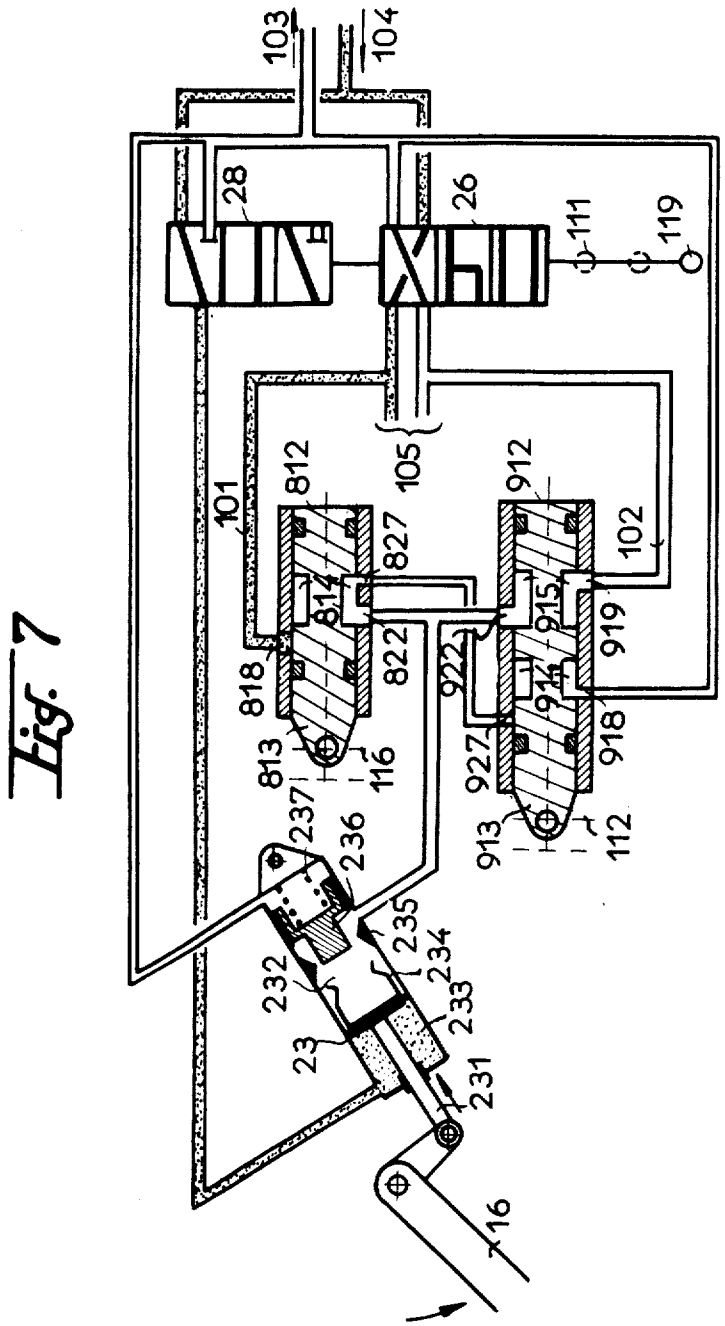
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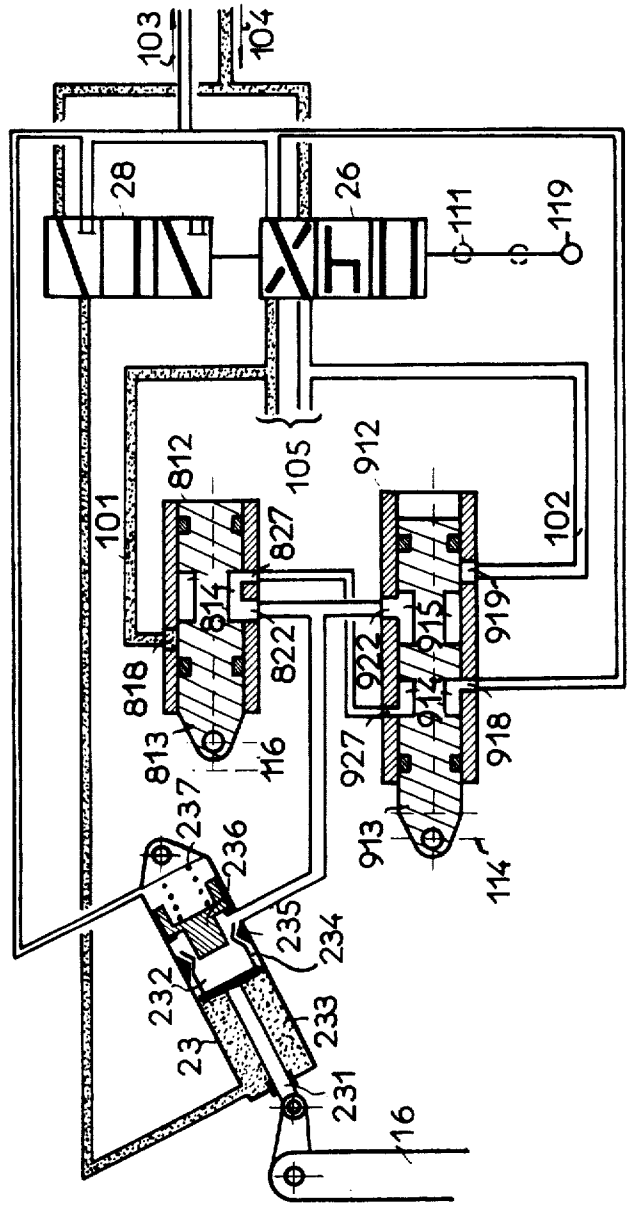
Fig. 7

Fig. 8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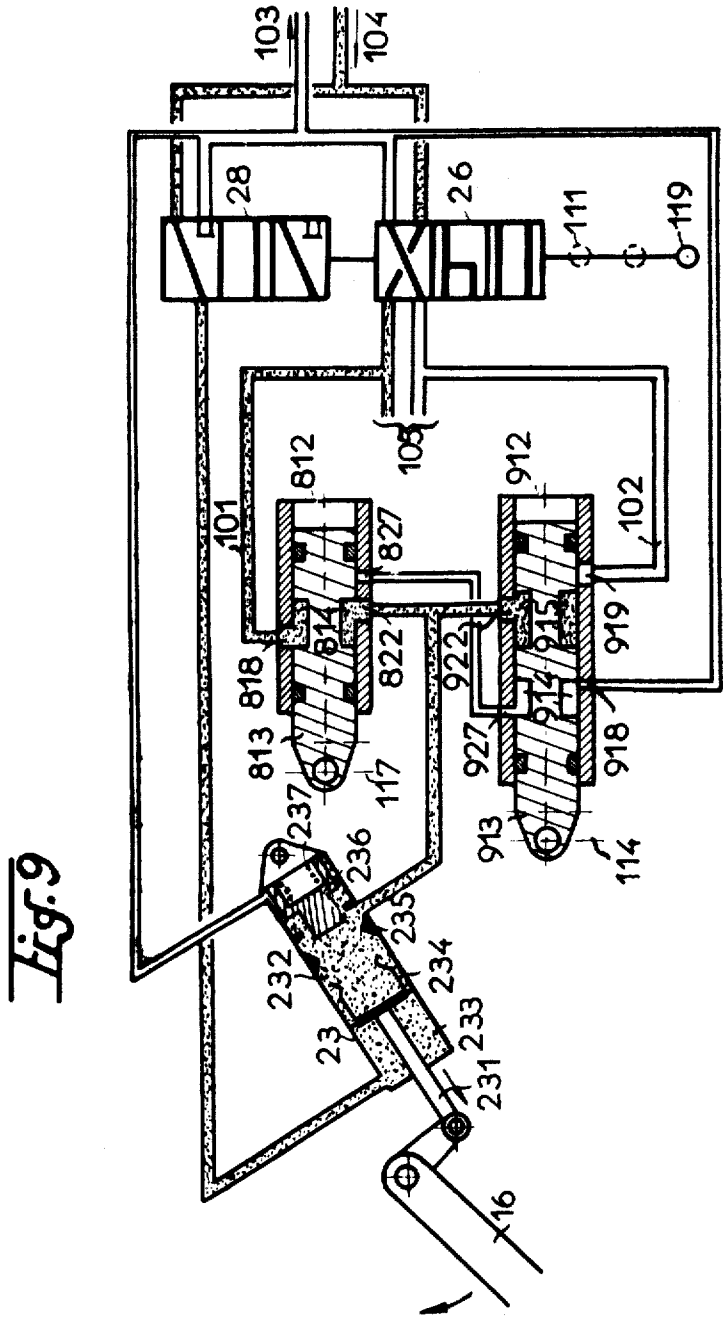
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Fig. 9

CONTROL DEVICE FOR AIRCRAFT UNDERCARRIAGES AND TRAP-DOOR HOUSING CLOSURE

The present invention relates to undercarriages for aircraft, and in more precise terms, to retractable undercarriages and the trap-doors of their housings, together with the mechano-hydraulic devices which actuate the undercarriages and trap-doors and permit the trap-door to be automatically re-closed when the landing gear is in the retracted position (undercarriage up) or in the extended position (undercarriage down).

In the present state of the known art, the system which approaches most closely to the system according to the invention is that described by the same applicant in U.S. co-pending application Ser. No. 12,526, filed Jan. 30, 1970.

The above-mentioned application relates to a control device for undercarriages and trap-doors with mechano-hydraulic sequences, the said device utilizing a distributor which controls the supply to the trap-door jack, and which is actuated mechanically by the undercarriage.

It is however not always possible, or desirable to effect the said actuation of the distributor by the undercarriage. The present invention has for its object devices giving the same safety and advantages, but applied to aircraft in which the mechanical actuation of the distributor by the undercarriage would involves a construction which is insufficiently reliable or too awkward because it extends over excessive distances, especially when the locking device for the undercarriage-up is distant from the point at which the undercarriage-down signal can be made. A coupling by levers and crank-arms between these two points would then constitute a considerable mechanical system with its concomitant disadvantages due to flexibility and play with the risk in addition of false indications due to the effect of structural deformations between these two distant points.

The present invention has consequently for its object to eliminate these disadvantages and difficulties.

The present invention essentially provides two hydraulic distributors, together with of course their interconnections and various hydraulic connections which control together and in co-operation the supply to the trap-door jack, which are mechanically independent and which are mechanically actuated by the position of the undercarriage, one of these two distributors being actuated by the undercarriage-up position and the other by the undercarriage-down position.

More precisely and according to the alternative embodiments which will be described, the trap-door distributor actuated by the undercarriage-up position may be actuated either by the position of the undercarriage, that is to say up or not up, or by the corresponding locking, that is to say undercarriage both in the up position and locked in this position, or on the contrary in the up position not locked or in a position other than the up position.

Furthermore, the two trap-door distributors according to the invention ensure the two sequences of operation described in the above-mentioned application (which effected them by a single trap-door distributor, as already stated).

The first sequence which takes place in the presence of the hydraulic order for lowering the undercarriage supplied the trap-door jack in the opening direction when the undercarriage is locked in the retracted position and supplies it in the opening direction but with reduced power when the undercarriage is not locked; supplies it in the closure direction when the undercarriage is locked in the down position. The second sequence, which takes place in the presence of the hydraulic order to lift the undercarriage supplies the jack in the opening direction when the undercarriage is locked in the down position, supplies it in the opening direction but with reduced power when the undercarriage is not locked, and supplies it in the closure direction when the undercarriage is locked in the retracted position.

It is furthermore necessary, both in this case and in the above application, to hold the trap-door open with certainty when the undercarriage is in the intermediate position, even in the case of a hydraulic failure. To this end, the present invention provides a plurality of means in co-operation with the said two distributors for the trap-door jack.

According to one of these means, the open trap-door controls the undercarriage distributor, the chamber of the trap-door jack ensuring the opening of the trap-door is connected to the high-pressure and is locked hydraulically while the closure chamber is connected to the low-pressure. Two corresponding structures will be described later, one with reference to FIGS. **2** to **4**, the other referring to FIG. **5**.

According to another of these means, the open trap-door is locked mechanically; this mechanical locking controls the undercarriage distributor while the opening chamber can be left under an undetermined pressure and the closure chamber is put to the return.

A corresponding structure will be described later with reference to FIG. **6**. According to still another of these means, both when the open trap-door directly controls the undercarriage distributor and when the open trap-door only controls the undercarriage distributor through the intermediary of a mechanical locking of the open trap-door, there is employed a controlled non-return valve or alternatively the sections of the chambers of the trap-door jack are given appropriate dimensions. A corresponding structure will be described below with reference to FIGS. **7** to **9**.

The present invention will now be described with reference to the accompanying diagrammatic drawings, given by way of non-limitative examples. In these drawings:

FIG. **1** diagrammatically shows the application of the present invention to a landing-gear with a leg and strut, shown in the down position;

FIGS. **2**, **3** and **4** shows the operations of the trap-door distributors in the three positions of the undercarriage, for an embodiment of the present invention comprising spring valves forming a hydraulic locking device;

FIG. **5** shows a further embodiment comprising a non-return valve to insure hydraulic locking;

FIG. **6** shows a further embodiment comprising spring clapper valves and a mechanical locking for the open trap-door;

FIGS. **7**, **8** and **9** show the operations in the three positions of the undercarriage of another embodiment of the invention, comprising a mechanical locking of the open trap-door and a particular dimensioning of the trap-door jack.

The following description refers by way of non-limitative examples to undercarriages comprising mainly a leg, a folding strut and a jack; it is specified that the invention can be applied to any landing gear with a retractable undercarriage.

With reference to FIG. **1** herein is shown shown an undercarriage, shown in the down position, consisting of a leg **1** actuated by a jack **2** acting between the top of the leg **1** and a strut comprising a lower arm **3** and an upper arm **4**, with a jack **11** for releasing the retracted undercarriage, and a trap-door **16** in the closed position, with its locking device in the closed position constituted by a hook **17** articulated on a shaft **21** and restored by a spring **18**, a roller **19** articulated on a fixed shaft **191** and rigidly secured to a jack **20** comprising a piston **201** returned by a spring **202**.

The device according to the invention mainly comprises a distributor **13** controlling the movements of the undercarriage (lowering conduit **101**, lifting conduit **102**, return conduit **103**), and two distributors **312** and **412** controlling the movements of the trap-door with the control members of these distributors.

In the case of the undercarriage distributor **13**, these members are a cam **14** and a crank-arm **15** which connects the cam to the trap-door **16**. For the distributor **312**, these members are a roller **61** and a cam **5** keyed on the arm **4** of the strut, and for the distributor **412** these members are the locking arm **9** of the hook **8**. The distributor **312** is actuated by the position of the undercarriage when it reaches or leaves its down position, and the distributor **412** is actuated by the locking of the undercarriage in the up position when this locking is effected or released.

There will now be described with reference to FIG.2, the internal construction of the two trap-door distributors **312** and **412**. The distributor **312** has a slide-valve **313** provided with three grooves **314**, **315** and **316**. Its body is provided, on one side with two passages, which are the passage **318** connected to the lifting conduit **102**, and the passage **319** connected to the lowering conduit **101**, and on the other side with two passages, the passage **321** connected to the chamber **233** for opening the trap-door jack and the passage **322** connected to the closure chamber **232**. It is further provided with a narrow passage **323** and with two clapper-valves **324** and **325** for the passage **323**, valve **324** controlling communication to the lifting conduit **102** and valve **325** controlling communication to the lowering conduit **101**, and with two narrow passages **326** and **327** going to the distributor **412**.

In the position shown in FIG. **2** and having the reference **116**, which corresponds to the undercarriage not down TNB, the slide-valve **313** is on the right. The groove **314** couples together the passages **321** and **326** and the groove **316** joins together the passages **323** and **327**. In the position shown in FIG.**4**, having the reference **117**, which corresponds to the undercarriage down TB, the slide-valve **313** is on the left; the groove **314** connects together the passages **318** and **321**, and the groove **315** connects together the passages **319** and **322**.

The distributor **412** has a slide-valve **413** provided with three grooves **414**, **415** and **416**. Its body is provided, on one side with two passages which are the passage **418** coupled to the lifting conduit **102** and the passage **419** connected to the lowering conduit **101**, and on the other side with two passages, which are the passage **421** coupled to the opening chamber **233** and the passage **422** connected to the closure chamber **232**. It is also provided with a narrow passage **423** and with two clapper-valves **424** and **425** opening towards the passage **423**, valve **424** controlling communication to the lifting conduit **102** and the valve **425** controlling communication to the lowering conduit **101**, and with two narrow passages **426** and **427** connected respectively to the passages **326** and **327** of the distributor **312**.

In the position having the reference **112** in FIG.2, which corresponds to the undercarriage locked in the up position TVH, the slide-valve **413** is on the right; the groove **414** connects together the passages **418** and **422** and the groove **415** joins together the passages **419** and **421**. In the position shown in FIG. **3** and having the reference **114**, which corresponds to the undercarriage up but not locked TNH, the slide-valve **413** is on the left; the groove **414** connects together the passages **422** and **427** and the groove **416** joins together the passages **423** and **426**.

FIG. **2** also shows the main selector **26**, which does not form part of the invention. This manually operated selector effects in its two end positions, which constitute a hydraulic reversing device, the lifting (position reference **111**) and the lowering (position reference **119**), with an intermediate neutral position.

There will now be described the operation of this construction according to the present invention. This operation is of course in accordance with that which has been briefly described above:

In the undercarriage-up locked position: the lifting conduit is fully connected to the closure chamber of the trap-door jack and the lowering conduit is fully connected to the opening chamber;

In the unlocked or intermediate position of the undercarriage: that of the two conduits for lifting and lowering which is under pressure supplies the opening chamber through reduced sections and spring clapper-valves, and the other of these two conduits is connected, also by reduced sections and spring clapper-valves, to the closure chamber;

In the undercarriage-down locked position: the lowering conduit is fully connected to the closure chamber, and the lifting conduit is fully connected to the opening chamber.

With reference to FIG. **2**, in the condition undercarriage-up locked (position **112**), the slide-valve **413** of the distributor **412** ensures the putting into communication of the opening chamber **233** of the trap-door jack **23** with the lowering circuit **101** and of the closure chamber **232** with the lifting circuit **102** through orifices of large size, permitting the passage of the flow-rate necessary for the actuation of the trap-door **16**. The opening or closure of the trap-door **16** is obtained depending on whether the main undercarriage selector **26** is on undercarriage-down (**119**) or undercarriage-up (**111**).

With reference to FIG. **3** which corresponds to the position between the undercarriage-up locked position and the undercarriage-down position, that is to say the condition encountered during almost the whole of the undercarriage operation, the slide-valve **313** (in position **116**) and the slide-valve **413** (in position **114**) put into communication the opening chamber **233** of the jack **23** of the trap-door **16** through conduits and passages **326**, **426**, **423** of small size, with that of the two conduits for lowering **101** and lifting **102** which is under pressure, by means of the two non-return clapper-valves **424** or **425**, the function of which is on the one hand to prevent leakage between the high-pressure circuit and the return, and on the other hand to ensure the hydraulic locking of the trap-door in the open position, in order to provide against any risk of re-closure of the trap-door in the event of a drop in pressure in the lifting or lowering circuit during the movement of the undercarriage.

Similarly, in this "undercarriage in movement" position, the closure chamber **232** of the jack **23** of the trap-door **16** is kept in communication by orifices and conduits of small size with that of the lifting and lowering conduits which is connected to the return, through the non-return valves **324** and **325**, the purpose of which is to prevent leakage between the high-pressure circuit and the return. This connection of the closure chamber **232** to the return is necessary in order to prevent this chamber from being put under pressure by the effect of leakages from the distribution slide-valves, this pressure being liable to cause the closure of the trap-door and would effectively cause this in the event of a fluid-tightness failure of the clapper-valves **424** or **425**.

In addition, this maintenance under pressure of the opening chamber and to the return of the closure chamber enables the trap-door to complete its opening movement in the case where, as shown in FIG. **1**; the undercarriage distributor is actuated by the open trap-door position.

In this case in fact, the undercarriage distributor is actuated before the trap-door has completed its opening movement. As the undercarriage becomes released at the top or when leaving the down position it causes the double trap-door distributor **312–412** to be put into the "undercarriage in movement" position and it is necessary for this position to permit the trap-door to complete its opening movement, especially in order to ensure the full opening of the undercarriage distributor **13** and to avoid wire-drawing of the flow for operating the undercarriage through this distributor.

It will be noted that when the undercarriage distributor is controlled by the open trap-door lock (and not by the position), it is not necessary to maintain the pressure in the opening chamber, since there is no further movement of the trap-door after the undercarriage has been released or has moved (as is described later with reference to FIG. **6**).

This maintenance of pressure in the opening chamber and of the return of the closure chamber is effected through the two distributors, and necessitates two conduits of small size between these distributors.

This is due to the fact that it is essential that there shall be no leakage at any moment between the high and low-pressure circuits, apart from the small laminary leakages inherent in the use of slide-valve distributors. A direct connection to the return of the closure chamber or a direct application of pressure to the opening chamber only passing through a single distributor would result in a leakage between the high and low-pressure circuits during certain other phases of the operation.

FIG. 4 corresponds to the undercarriage-down position. In this position, the slide-valve 313 of the distributor 312 in the position 117 effects communication between the opening chamber 233 of the jack 23 of the trap-door 16 with the lifting circuit 102, and of the closure chamber 232 with the lowering circuit 191 through orifices of large size permitting the passage of the flow-rate necessary for the operation of the trap-door.

Opening or closure of the trap-door is thus obtained depending on whether the main undercarriage selector is on the undercarriage-up or undercarriage-down position.

In the above description, the slide-valve 313 is controlled by the position of the undercarriage (down or not down) and the slide-valve 413 is controlled by the locking of the undercarriage-up (locked or not locked). If the arrangement of the undercarriage permits this, it is possible to control the distributor 312 by the down locking, without this changing in any way the principle of the operation or the arrangement of the distributors described above. Similarly, it is possible to control the distributor 412 by the undercarriage-up position. In principle it is preferable to control the distributors by the locking whenever this is possible, each operation only being effected when the preceding operation is completely ended.

There will now be described another arrangement, instead of the clapper-valves described above, for ensuring the reduced supply in the intermediate position. The system of clapper-valves permitting the maintenance of pressure in the trap-door opening chamber and the holding on the return of the closure chamber during the undercarriage operations is in this case replaced by a piping system coupled to the constant-pressure circuit and provided with a non-return valve in order to ensure hydraulic locking, and by another conduit connected to the return.

This arrangement may be preferred if the arrangement of the hydraulic circuits of the aircraft permits such a connection without leading to excessive lengths of conduits, and will now be described with reference to FIG. 5. This figure shows the intermediate position (as in FIG. 3 There can be seen two distributors 512 and 612 which correspond to the distributors 312 and 412 with the elimination of the spring valves 324, 325, 424, 425; the passage 523 is directly connected to a return conduit 103, and the passage 623 is connected to a pressure intake conduit 104 through a non-return valve 27.

It is also possible, according to the present invention, to provide mechanical locking of the open trap-door. With reference to FIG.6, in the closure chamber 232 of the trap-door jack 23, the rod 231 is provided with a dog 234 which can be locked on a shoulder 235 arranged inside the cylinder of the jack 23 by an auxiliary piston 236 under the action of a spring 237, in the absence of pressure at 232. If furthermore the undercarriage distributor is controlled by this open trap-door locking (as already stated), it is not necessary to maintain the pressure in the opening chamber of the trap-door jack during the operation of the undercarriage, but it is necessary to keep the closure chamber on the return in order to avoid any accidental release caused by this chamber being put under pressure, due to leakages of the slide-valve.

In this case there is employed, on the one hand a distributor 312 which corresponds to that described with reference to FIG. 2 (except that the passage 326 is eliminated), and on the other hand, a distributor 712 which does not comprise any pressure-holding device. The slide-valve 713 of distributor 712 is provided with two grooves 714 and 715. Its body is provided, on the one side with two passages which are the passage 718 connected to the lifting conduit 102 and the passage 719 connected to the lowering conduit 101, and on the other side with two passages, which are the passage 721 connected to the opening chamber 233 and the passage 722 connected to the closure chamber 232. It is further provided with a narrow passage 727 joined to the passage 327 of the distributor 312. The grooves 714 and 715 have the same function as the grooves 414 already described.

The present invention also relates to a further construction of the trap-door distributors, in which only the closure chamber of the trap-door jack is subjected alternately to the return and under pressure during the operation of the undercarriages, the opening chamber remaining constantly under pressure. This arrangement leads to slide-valves having simpler sequences, at the cost however of complication at the level of the undercarriage-up, undercarriage-down selector. The choice between this solution and that described above depends on the particular constructional configurations of each aircraft.

This construction will be described with reference to FIGS. 7, 8 and 9. As it is necessary in this case that the section of the opening chamber 233 of the trap-door jack 23 should be smaller than the section of the closure chamber 232, this jack is reversed with respect to the preceding constructions so that its rod 231 passes into the opening chamber 233, and of course, its point of attachment to the trap-door 16 is also reversed as shown.

The distributor 812 has a slide-valve 813 provided with a groove 814. Its body is provided on one side with a passage 818 connected to the lowering conduit 101, and on the other side with a passage 822 connected to the closure chamber 232. It is furthermore provided with a narrow passage 827 connected to the distributor 912.

In the position shown in FIG. 7 and having the reference 116, which corresponds to the undercarriage not down TNB, the slide-valve 813 is on the right; the groove 814 joins together the passages 822 and 827. In the position shown in FIG. 9 and having the reference 117, which corresponds to the undercarriage-down TB, the slide-valve 813 is on the left; the groove 814 joins together the passages 818 and 822. The distributor 912 has its slide-valve 913 provided with two grooves 914 and 915. Its body is provided on one side with two passages, which are the passage 918 connected to a return conduit 103 and the passage 919 connected to the lifting conduit 102, and on the other side with a passage 922 connected to the closure chamber 232. It is further provided with a narrow passage 927 connected to the passage 827 of the distributor 812.

In the position shown in FIG. 7 and having the reference 112 which corresponds to the undercarriage-up locked TVH, the slide-valve 913 is on the right; the groove 915 connects together the passages 922 and 919. In the position shown in FIG. 8 with the reference 114, which corresponds to the undercarriage-up not locked position TNH, the slide-valve 913 is on the left; the groove 914 joins together the passages 927 and 918. The opening chamber 233 of the jack 23 of the trap-door 16 is put under pressure as soon as the pilot effects a lifting or lowering operation, for example by means of a distributor 28, associated or incorporated with the main selector 26 "undercarriage-up (position reference 111) undercarriage-down (position reference 119)," as shown in FIGS. 7 to 9.

The arrangement of the slide-valves 813 and 913 of the distributors in FIG. 7 corresponds to the position undercarriage-up locked. In this condition, the slide-valve 913 of the distributor 912 ensures the putting into communication of the closure chamber 232 of the trap-door jack with the lifting circuit, permitting free evacuation of the liquid towards the return and therefore the opening of the trap-door 16 when the main selector 26 is on the undercarriage-down position 119, and the closure of the trap-door 16 by the effect of the lifting pressure when the pilot control is on the undercarriage-up position 111.

FIG. 8 shows the intermediate condition between the undercarriage-up locked position and the undercarriage-down position, that is to say the condition encountered during the undercarriage operations. In this condition, the closure chamber 232 of the trap-door jack is maintained on the return 103 by orifices 827, 927 and a conduit of small size through the distributors 812 and 912, preventing an increase of pressure in this chamber 232 due to leakages in the slide-valve, which would cause the re-closing of the trap-door. The

passage through the two distributors for this connection to the return is made essential by the necessity of preventing leakages between the high and low pressure in all the phases of the sequence, as has already been indicated.

FIG. 9 shows the undercarriage-down position, in which the slide-valve 813 ensures the putting into communication of the closure chamber 232 with the lowering circuit 101, permitting free circulation of the liquid towards the return 103, and therefore the opening of the trap-door 16 when the main selector is in the undercarriage-up position 111, and the closure of the trap-door by the effect of the lowering pressure when the main selector is in the undercarriage-down position 119.

It should be noted that the return conduit 103 terminating at the distributor 912 may be replaced by the clapper-valve system 324, 325 shown on the distributor 312 of FIG. 2.

In the construction which has just been described, the pressure is continuously maintained in the opening chamber 233 of the jack 23 of the trap-door 16 and therefore when the latter is open, but since the liquid circulates in both directions in the conduit supplying the opening chamber 233, it is not possible to ensure hydraulic locking by a simple non-return clapper-valve. This construction is thus preferably applied to a system comprising a mechanical locking of the trap-door in the open position, for example by a lock with a dog 234 inside the jack 23 as shown in FIGS. 8 and 9, but it is not necessary for the undercarriage distributor to be controlled by the trap-door lock since the pressure is maintained in the opening chamber 233.

This construction can also be applied to a device without mechanical locking of the open door by ensuring hydraulic locking by means of a non-return clapper-valve having its opening actuated by the re-closure pressure, this being a conventional solution in hydraulic circuits.

Also, there may be no need for locking, either mechanical or hydraulic, if the difference in pressure between the high-pressure circuit and the low-pressure circuit at the level of the undercarriages during the operation of these latter, maintains a value sufficient to hold the trap-door open irrespective of the external forces which may act on it.

To sum-up, the control system of the trap-door from a double distributor of which one element is associated with the locking or position, undercarriage-up, and the other element is associated with the position or locking undercarriage-down, of which various alternatives have been described above, makes it possible to ensure automatically:

The opening of the trap-door before each operation of the undercarriage;

The closure of the trap-door after each actuation of the undercarriage.

In addition, during the operation of the undercarriage:

If there is no mechanical locking of the open trap-door (the undercarriage distributor being then operated by the open trap-door position), the trap-door opening chamber is kept in communication with the high-pressure circuit and furthermore is hydraulically locked, the trap-door closure chamber is maintained in communication with the low-pressure circuit in order to ensure the end of the opening movement of the trap-door and the full opening of the undercarriage distributor, and the maintenance of the trap-door in the open position in spite of external actions and fluctuations of pressure in the high and low-pressure circuits of the undercarriages during their operation (FIG. 2 to 4 with the alternative of FIG. 5).

If there is mechanical locking of the open trap-door and if the undercarriage distributor is operated by this mechanical locking, the opening chamber is left at any convenient pressure and the closure chamber is maintained on the return, in order to prevent the release and re-closure of the trap-door due to the effect of slide-valve leakages (FIG. 6).

On the above assumption (mechanical locking of the open trap-door, undercarriage distributor operated by this locking) or with the same assumption, with the undercarriage distributor controlled by the open trap-door position, or in the first assumption (no mechanical locking of the open trap-door) but either with the addition of a non-return valve controlled so as to ensure hydraulic locking of the open trap-door, or a dimensioning of the sections of the trap-door jack permitting the latter to be held open in spite of external forces during the actuation of the undercarriages, the solution shown in FIGS. 7, 8 and 9 can be employed, which ensures the connecting to return of the closure chamber of the trap-door jack and the maintenance of pressure in the opening chamber.

In all these alternative solutions, there does not exist at any moment a leakage between the high-pressure circuit and the low-pressure circuit, other than the laminary leakages due to the use of the distribution circuits.

What I claim is:

1. A control device for a retractable undercarriage and for a trap-door closing a housing for the undercarriage, the undercarriage and trap-door having actuating and locking members, and control members for connection and disconnection of the actuating and locking members with an undercarriage-lifting conduit, an undercarriage-lowering conduit and a return conduit, the lifting and lowering conduits being selectively placed under pressure, and the return conduit being at low pressure, said control device comprising a jack connected for actuating said trap-door and having opening and closing chambers, a first slide-valve distributor and a second slide-valve distributor cooperating to supply said jack, a first kinematic coupling controlled by the up position of the undercarriage and placing said first slide-valve in a characteristic undercarriage-up position and in a non-characteristic position, a second kinematic coupling controlled by the down position of the undercarriage and placing said second slide-valve in a characteristic undercarriage-down position and in a non-characteristic position, and mechano-hydraulic means for joining together, in said non-characteristic positions, the opening chamber of the trap-door jack and one of the conduits at high-pressure to effect hydraulic locking, and the closure chamber with the return conduit at low pressure.

2. A device as claimed in claim 1, in which said undercarriage comprises a locking device in the up position, said first kinematic coupling being controlled by said locking device.

3. A device as claimed in claim 1, in which each of said two distributors is provided with four outlets and with a passage, each of said two distributors in its characteristic position connecting the lifting conduit to a first outlet and the lowering conduit to a second outlet, and in its non-characteristic position connecting said first outlet to a third outlet and a fourth outlet to said passage, said first outlet of the first distributor being connected to said second outlet of said second distributor and to the closure chamber of the trap-door jack, said second outlet of the first distributor being connected to the first outlet of the second distributor and to the opening chamber of the trap-door jack, the third outlet of each distributor being connected to the fourth outlet of the other distributor, and said mechano-hydraulic means comprising, on the one hand in said first distributor, two spring clapper-valves supplying its passage, one from the lifting conduit and the other from the lowering conduit, and on the other hand in said second distributor, two spring clapper-valves, one supplying the lifting conduit and the other the lowering conduit from the passage of said distributor.

4. A device as claimed in claim 1, in which each of said two distributors is provided with five outlets, each of said two distributors in its characteristic position connecting the lifting conduit to a first outlet and the lowering conduit to a second outlet, and in its non-characteristic position, connecting 133 first outlet to a third outlet and a fourth outlet to a fifth outlet, said first outlet of said first distributor being connected to said second outlet of said second distributor and to the closure chamber of the trap-door jack, said second outlet of the first distributor being connected to the first outlet of the second

distributor and to the opening chamber of the trap-door jack, the third outlet of each distributor being connected to the fourth outlet of other other distributor, and said mechano-hydraulic means comprising, on the one hand a non-return valve supplied by a conduit under pressure and supplying the fifth outlet of said first distributor, and on the other hand a direct connection between the fifth outlet of said second distributor and a return conduit.

5. A device as claimed in claim 1, in which each of said two distributors is provided with three outlets, said first distributor in its characteristic position (undercarriage-up) connecting the lifting conduit to a first outlet and the lowering conduit to a second outlet, and in its non-characteristic position (undercarriage not up) connecting said first outlet to a third outlet, said second distributor in its characteristic position (undercarriage-down) connecting the lifting conduit to a first outlet and the lowering conduit to a second outlet, and in its non-characteristic position (undercarriage not down) connecting a third outlet to a passage, the first outlet of the first distributor being connected to the second outlet and to the closure chamber of the trap-door jack, the second outlet of the first distributor being connected to the first outlet of the second distributor and to the opening chamber of said trap-door jack, the third outlets of the two distributors being connected together, and said mechano-hydraulic means comprising on the one hand in said second distributor, two spring valves, one supplying the lifting conduit and the other the lowering conduit from the passage of said second distributor, and on the other hand the trap-door jack including a rod provided in the closure chamber with a dog adapted to lock in the open trap-door position on a shoulder by means of an auxiliary piston under the action of a spring in the absence of pressure in said closure chamber.

6. A device as claimed in claim 1, in which said mechano-hydraulic means provide, for the opening chamber of the trap-door jack, a section smaller than the section of its closure chamber.

7. A device as claimed in claim 1, in which each of said two distributors is provided with two outlets, said first distributor in its characteristic position connecting the lifting conduit to a first outlet, and in its non-characteristic position (undercarriage not up) connecting a second outlet to the return conduit, said second distributor in its characteristic position (undercarriage-down) connecting the lowering conduit to a first outlet, and in its non-characteristic position (undercarriage not down) connecting said first outlet to a second outlet, said first outlets being connected together and to the closure chamber of the trap-door jack, said second outlets being connected together, and mechano-hydraulic said means comprising a distributor coupled to the main undercarriage control selector and supplying under pressure during each operation, the opening chamber of the trap-door jack, said trap-door jack having a rod provided, in the closure chamber, with a dog adapted to lock in the open trap-door position, on a shoulder by means of an auxiliary piston under the action of a spring, in the absence of pressure in the closure chamber.

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