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AUTOMATIC LOCKING DEVICE FOR UNDERCARRIAGE

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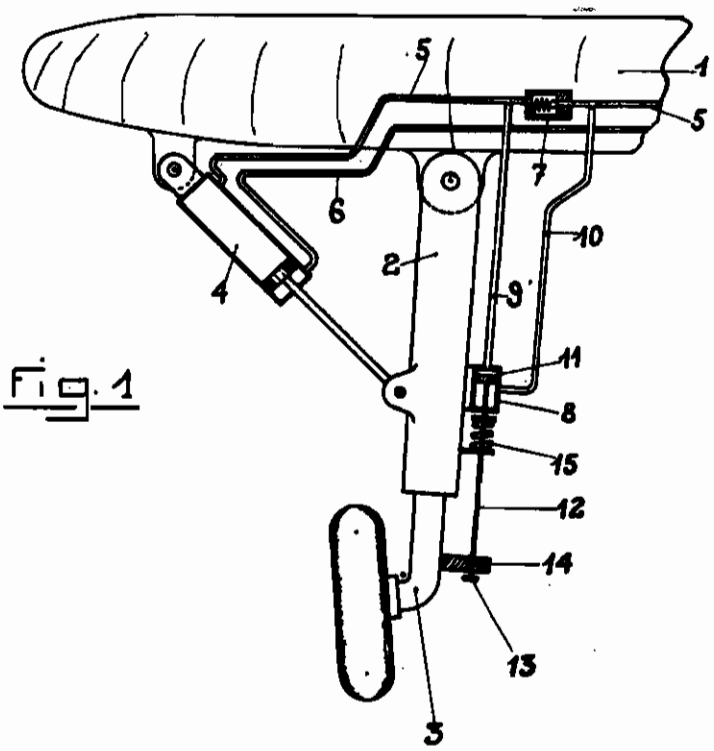
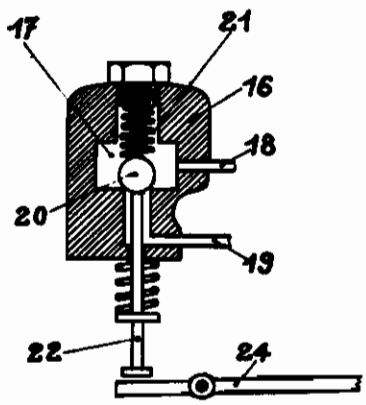


Fig. 1

Fig. 2



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AUTOMATIC LOCKING DEVICE FOR UNDERCARRIAGE

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The present invention relates to a method for the automatic locking of a retractable aeroplane undercarriage, as long as the aeroplane rests upon the ground, in order that it shall be impossible for the pilot to make any improper movement which would cause an undue lifting of the undercarriage, but permitting in all cases the lowering of the undercarriage.

The invention is more specially applicable to undercarriages which are lifted by jacks, and it consists in locking the feeding conduit of the jack for the lowering, forming the discharge conduit for the lifting, by means of a valve device controlled by the compression of the elastic jointed frame of the undercarriage, by the action of the weight of the aeroplane.

The accompanying drawing gives an example of realization.

Figure 1 represents diagrammatically the locking system, with the valve device controlled by the compression of the elastic frame.

Figure 2 represents a valve system permitting to avoid the use of the clack valve shown in Figure 1.

In Figure 1, an aeroplane 1 is provided with a retractable undercarriage, whose elastic frame comprises a stationary part 2 on which is mounted, in an elastic manner not represented in the drawings, a wheel journal 3. A hydraulic jack 4, supplied by two pipes 5 and 6, controls an undercarriage. A valve 7, which is mounted in the feeding pipe 5 used for the lowering of the undercarriage, allows the fluid to circulate in the direction for the admission to the jack, but prevents the circulation in the contrary direction.

A valve device 8, which is mounted on the stationary part of the elastic frame 2, is provided with two pipes 8 and 10, which connect it with the pipe 5. 9 is connected with the pipe 5 on the lower side of the valve, and 10 is connected on the upper side. The valve device comprises a slide-valve 11 actuated by a rod 12 which is provided with a stop 13 adapted for a contact made by a stop 14 secured to the journal of the wheel 3. When the undercarriage is lowered, the aeroplane being on the ground by the action of the compression of the system 2—3, the stops 13 and 14 are not in contact, and a reaction spring 15, used with the rod 12, holds the slide-valve 11 in place, and thus the pipes 9 and 10 are not in communication. When the aeroplane starts from the ground, the system 2, 3 expands, the stop 14 makes contact with the stop 12, thus actuating the rod 12, in spite of the contrary effect of the spring 15 and thus the pipes 9 and 10 are connected together. At this time, the fluid contained in the jack finds a way for discharge through the pipes 5, 9, 10, 5, thus short-circuiting the valve 7, and this path is stopped off when the aeroplane is on the ground, which prevents, in this case, the fluid contained in the jack from being discharged, thus causing the rise of the undercarriage.

It is evident that the embodiment described is not limitative, and that other embodiments, which only differ from the aforesaid by details of construction, are also comprised within the scope of the invention. Thus, instead of controlling the valve device by mechanical means, use may be made of an electro-mechanical device, an electric contact being closed for instance by the effect of compression of the elastic jointed frame, thus closing the operating circuit of a valve device.

Moreover, it is not always necessary, and this will depend upon the use in question, to provide an anti-return valve. In the above described embodiment, this valve only serves to prevent the discharge of the fluid from the jack, when in the lowered position, while permitting the admission of this fluid for the lowering, even in the case in which, for any reason, the valve 8 should remain in the closed position, which it should not have except when the jack is expanded and the aeroplane is on the ground.

It is further possible to conceive, for instance, a device as shown in Figure 2, in which the clack-valve and the valve device are combined in a single apparatus. In this embodiment, the combined apparatus comprises a body 16 in which is formed a chamber 17 communicating on the one hand with a pipe 18 (corresponding to the pipe 6 of Fig. 1, located between the clack-valve 7 and the jack) and on the other hand with a pipe 19 (corresponding to the part of the pipe 5 situated between the clack-valve and the distributor of fluid, in Fig. 1), a ball 20 controlled by a spring 21 is placed between the pipes 10 and 19. A rod 22, brought back by a spring 23, can impel the ball, by the action of a lever 24, operated by the movement of compression or expansion of the undercarriage.

When the undercarriage is compressed, the lever 24 is displaced in the direction of the arrow, and the spring brings back the rod 22. The ball 20 fits upon its seating; the supply circuit of the jack is cut off in the direction from the jack to the feeder, but is always open in the direction of the feeder to the jack. On the contrary, when the undercarriage has expanded, the aeroplane

having risen from the ground, the lever **24** raises the rod **22** and drives the ball **20** against the spring, and thus the fluid contained in the jack can be discharged in the direction of the jack to the feeder, and the undercarriage can be raised. Obviously, the control which acts by means of the spring in the device herein described may also be constructed in such manner as to act positively in either direction, according to the relative position of the parts forming the elastic jointed frame.

In like manner, the relative movement of the control with reference to the fixed part of the elastic frame may be transmitted to the valve device, which is situated at any point, by a flexible distant control device, or the like, in which case the closing device may be placed in the body of the jack itself, so as to prevent all danger of breaking a pipe. It is evident that this system is also applicable to the case in which several jacks are used for the control of an elastic jointed frame.

One may also add to the valve device a retarding device with dash-pot, or a relay with delayed action, which permits of maintaining the fastening for a certain time after the aeroplane has started up.

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