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(54) DEVICE FOR THE ADJUSTMENT OF AN AIRBORNE LOAD

(71) We, R. ALKAN & CIE, of Rue du 8 Mai 1945, 94460 Valenton, France, a French Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:

This invention relates in general to devices for the adjustment of airborne loads and has specific reference to the application of devices of this kind to load release or launching devices of the type now in current use on various aircraft types, which devices have a pair of longitudinally-spaced load-engaging hooks.

When the use of an airborne load requires a high degree of precision with respect to an aircraft reference axis, devices for adjusting the orientation of the load must be used.

More particularly, the present invention is directed to provide a satisfactory solution to the problem of adjusting airborne loads comprising anchoring members either of the so-called "saddle" type or of the standard ring type. As a rule, these loads are suspended by means of so-called release or ejector devices comprising a launching or ejection mechanism having characteristics consistent with the specific nature and conditions of use of the airborne load. The definition of such mechanisms is obtained only at the cost of extended calculations and practical tests both on the ground and under various flying conditions and if in certain cases a bearing adjustment device is to be incorporated in this mechanism it is obviously essential to preserve the previously adjusted initial mechanism.

It is the primary object of the present invention to meet this requirement by incorporating in a release or ejector mechanism a device capable of adjusting the position of the load supporting hooks of the release device, in a transverse direction, i.e. a direction transverse to the longitudinal median plane of the mechanism, without modifying the release mechanism proper, notably the means actuating said hooks. The device according to the present invention is also designed to permit the suspension of loads equipped either with so-called "saddles" or with standard rings, so that this adjustment device will preserve the advantageous feature of utilizing indifferently both types of suspension means with a release or ejector device of the type disclosed in the British Patent Application No. 45570/76 Serial Number 1561276 filed on 2nd November 1976 by the same Applicants.

According to the present invention we provide in a system for releasably suspending loads from an aircraft comprising a release or ejector mechanism within a housing structure carried by the aircraft for actuating parts of said system engaging the load, a device for effecting adjustment of the airborne load comprising a transversely shiftable block in one end of said housing structure for supporting the corresponding end of said mechanism and corresponding parts engaging the load.

To promote further understanding of the invention embodiments thereof will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section showing one end portion of a release device according to the present invention, equipped with anchoring or suspension and positioning means for suspended load equipped with "saddle" type members;

Figure 2 is a vertical longitudinal section with one part shown in perspective, illustrating one end of a release device similar to the device shown in Figure 1 but provided with suspension, positioning and locking means designed for carrying loads equipped with standard suspension rings;

Figure 3 illustrates in vertical longitudinal section one end of the release device of which adjustments are obtained by means of a transverse screw;

Figure 4 illustrates in cross-sectional

view taken along a vertical plane containing the axis of the transverse adjustment screw the portion of the release device shown in Figure 3, the section being taken along the line IV-IV of Figure 3;

Figure 5 is a side view of a centering stud with a sliding member in longitudinal section for centering with a minimal clearance a suspended load equipped with saddle type members; and

Figure 6 is a horizontal section showing the sliding member from above.

In the Figures 1 to 4 of the drawing, the reference numeral 1 designates diagrammatically the housing or frame structure of the release or launching device. The double hook adapted to engage the "saddle" member or "suspension ring" on the load is visible at 2 in Figures 1 to 3, the reference numeral 3 designating the effort scaling-down knee-action usually associated with the hook.

In the Figure 1, the reference numeral 4 designates a supporting block comprising at 5 the pivot pin of hook 2 and at 6 the pivot pin of knee-action 3. This knee-action 3 is connected to the other component elements of the release and wedging mechanism through means not within the scope of the present invention and therefore omitted from the present specification. The supporting block 4 also comprises a bore 7 in which a member 8 is adapted to rotate while being held against any axial movement by a set screw 9. The lower cylindrical portion 10 of member 8 constitutes the male centering stud usually employed in conjunction with the aforesaid saddle members. The upper and likewise cylindrical portion 11 of member 8 is eccentric in relation to the lower portion 10 and comprises a hexagonal-sectioned drivable upper extension 12 (or any other equivalent element adapted to be conveniently rotated) under which a screw-threaded portion 13 of said member 8 is adapted to be engaged by a lock nut 14. The eccentric cylindrical portion 11 of member 8 is adapted to rotate in the corresponding bore formed in a socket 15 movable in a longitudinal slot 16 of the frame or housing 1 of the release device.

With this arrangement, a controlled rotation of member 8, after releasing the lock nut 14, will permit a properly guided transverse movement of block 4 on either side of the longitudinal median plane of the release structure 1 and at the same time the socket 15 can only move longitudinally in the slot 16. This movement of block 4 may be a rectilinear movement of translation guided by a packing strip 17 rigid with the block 4 at right angles to the longitudinal median plane of the ejector and adapted to slide in a corresponding slideway or groove 18 formed in the release structure 1. The adjustment movement of this block 4 may also be a circular movement about a vertical axis lying in the median plane of the ejector and in this case this movement is guided by a packing strip and a matching arcuate groove both centered to the vertical axis of rotation of this adjustment movement. The adjustment rotation of member 8 is obtained by using a standard spanner engaging the hexagonal upper extension 12 of member 8.

Thus, the adjustment movement accomplished by this block 4 will produce a simultaneous transverse shifting of the lower cylindrical portion 10 of member 8, of hook 2 and of knee-action 3 in relation to the corresponding elements disposed at the opposite end (not shown) of the release, and it is clear that the amplitude of this shifting movement and therefore the desired adjustment depends upon the angle through which the upper hexagonal extension 12 of member 8 is rotated. When this rotational adjustment is completed, the assembly is locked in the selected position while taking up any play by simply tightening the nut 14.

Figure 2 illustrates the same release structure but equipped with a member 20 substituted for the members of Figure 1; this member 20 is centered in bore 7 of supporting block 4 and comprises on the one hand a pair of symmetrical lateral load-stabilising arms 21 (of which one is shown in perspective in the Figure) and on the other hand a single hook 22 corresponding to the standard ring provided on a load suspended from a pair of rings adjacent its opposite longitudinal ends. This member 20 will thus correspond to the similar member disclosed with reference to Figure 2 of the British Patent Application No. 45 570/76 Serial Number 1561276 filed on 2nd November 1976 by the same Applicants, mentioned in the preamble of the present application, but comprises an internally screw-threaded portion 23 adapted to be engaged by the lower screw-threaded cylindrical portion 24 of eccentric member 25 of which the upper portion designated by the reference numeral 11 as in the case of member 8 in Figure 1 is rotatably mounted in the bore of socket 15. The eccentric member 25 is also provided at its upper end with a hexagonal drivable extension 12 underlying which is a threaded portion 13 receiving a lock nut 14, so that by properly releasing this nut 14 the portion 11 of the eccentric member can be rotated together with the screw-threaded portion 24 in the matching tapped hole 23 of member 20.

Of course, the mode of operation of this device during an adjustment is the same

as the one described hereinabove in connection with member 8 with reference to Figure 1, i.e. when the operator rotates the drivable hexagonal extension 12, the supporting block 4 and therefore the elements solid therewith are shifted transversely. The assembly is also locked by tightening the nut 14 when the desired adjustment is obtained.

If the access to the upper portion of the eccentric member is difficult or impossible, this invention provides a different arrangement for controlling the transverse movement of translation of block 4, for example by means of a horizontal transverse screw to which access can be had from one side of the release mechanism, as shown in Figures 3 and 4. In these Figures, the release frame structure or housing is also shown at 1 but has formed through one side wall a tapped hole 33 along a transverse horizontal axis 31 which is engaged by a screw 32 retained in the adjustable supporting block 30 by means of a pair of stop members 34. It will be readily understood that rotating the screw 32 through any suitable means, for example a standard spanner, will produce a transverse movement of supporting block 30 corresponding to the block 4 of Figures 1 and 2, this block also carrying the pivot pins of hook 2 and knee-action 3, respectively. In this case, the adjustable supporting block 30 is locked by tightening the screw 35 consisting for example of a standard recessed or socketed hexagonal head 36. This screw 35 having a vertical axis engages the nut 37 solid with the frame structure or housing 1 of the release device and its operation does not require any access to the upper portion of the device.

In the case of loads equipped with a pair of saddle type members which are spaced by a determined distance in the longitudinal direction, each saddle comprises a cylindrical cavity for receiving a centering stud or the release or load supporting device. When, according to the present invention, one of the centering studs is offset from the median longitudinal plane of the load supporting device by a linear translation which is perpendicular to such plane as indicated in reference to Figure 1, the distance between the axes of the two centering studs increases and does no longer correspond with the distance between the axes of the cavities of the load saddles. Between the studs and the cavities, it is possible to provide a clearance allowing acceptance of the difference between the distance of the stud axes and the distance of the cavity axes but such clearance goes against the desired precision for the position of the load. Therefore, the present invention comprises a particular arrangement of one of the two studs such as 10 allowing such stud to have its lower end received into the corresponding cavity with a minimal clearance while the advantage of the load adjustment in azimuth is maintained.

For the above result, it is provided, according to the present invention, that one of the centering studs 10 comprises an additional cylindrical member adapted to slide longitudinally in order to come straight above the corresponding cavity and to be received therein with a minimal clearance. It will be appreciated that one of the centering studs remains in one piece and maintains the load longitudinally as well as transversely whereas the other stud, provided with the additional sliding member, maintains the load only in the transverse direction owing to the possibility of the longitudinal sliding, but however the longitudinal transverse movements of the load as well as its rotational movement about a vertical axis are made impossible. The centering stud equipped with the sliding member according to the above complementary arrangement will be preferably that stud which is not transversely offset according to the main feature of the invention.

According to a particular feature of the above arrangement, the insertion of the stud with a sliding cylindrical member into the corresponding cavity and its removal without any jamming are made easier by a rounded toric shape of the sliding member.

The above additional arrangement is also advantageous for maintaining the load without any excessive clearance by accepting the differences between the spacing of the cavity axes and the spacing of the studs which are due either to the manufacturing tolerances of the load and load supporting device or to important changes of temperature applied to aircraft and having different effects upon the load and the load supporting device.

An example of the above arrangement is shown in Figures 5 and 6.

In Figure 5, the centering stud 10 may be the lower portion of a member 58 which is similar to the member 8 of Figure 1 but is not eccentric with respect to the upper part 11 with a screw-threaded portion 13 for securing the stud in the load supporting device. The lower part of the stud 10 comprises a prismatic reduced portion 50 with lateral sides 51 which are parallel to the longitudinal load axis and its low end 52 is screw-threaded for receiving a nut 53 which is adapted to retain the sliding toric member 54 according to the present arrangement. The member 54 is adapted for being inserted into a cavity 55 of the load 56 to be fixed in the desired position.

The member 54 has an elongated aperture 57 in the longitudinal direction having parallel sides 59 between which the part 50 extends.

It will be appreciated that the centering stud shown on Figure 5 is preferably that stud which is not offset transversely, in such a manner that the upper part 11 is shown without being eccentric relatively to the lower part of the stud 10. The stud is locked in such a direction that the sides 51 be parallel to the longitudinal axis of the complete device.

The simplicity of the device allows to understand its operation immediately. The toric member 54 enters into the cavity 55 with a minimal clearance and has a circular contact therewith, while taking its required position with respect to the stud 10 since it can slide along the lateral parallel sides of the reduced part 50 of the stud. The contact between the stud part 50 and the sliding member 54 is ensured by the plane surfaces 51 and 59 which are relatively large, being thus not very subject to a caulking effect and being easily obtainable.

It will be readily understood that the various forms of embodiment described hereinabove should not be construed as limiting the scope of the present invention since various modifications and changes may be brought thereto without departing from the basic principles of the invention as set forth in the appended claims.

WHAT WE CLAIM IS:

1. In a system for releasably suspending loads from an aircraft comprising a release or ejector mechanism within a housing structure carried by the aircraft for actuating parts of said system engaging the load, a device for effecting adjustment of the airborne load comprising a transversely shiftable block in one end of said housing structure for supporting the corresponding end of said mechanism and corresponding parts engaging the load.

2. A system as recited in Claim 1, wherein said parts engaging the load comprise a suspension hook operated by the mechanism and associated with a knee-action device both of which are pivotally mounted on a supporting block adapted to be shifted transversely to the longitudinal median plane of the release structure.

3. A system as recited in Claim 2, wherein said supporting block also carries load-stabilising members associated therewith.

4. A system as recited in Claim 2, wherein said supporting block comprises a vertical bore adapted to receive either a centering cylindrical stud adapted to be inserted in the cavity of a load saddle or an assembly comprising an additional hook and load-stabilising arms when the airborne load is equipped with standard rings.

5. A system as recited in Claim 2, comprising means for transversely shifting said supporting block with respect to the housing structure.

6. A system as recited in Claim 1 including means comprising at each end of said structure a centering stud to be inserted in a corresponding cavity in a saddle carried by the load equipped with two longitudinally spaced saddles, one centering stud being provided with a longitudinally slidable member adapted for being inserted into the corresponding saddle cavity in such manner that the movement of said slidable member permits the easy insertion of both centering studs in the corresponding cavities with a minimal clearance even in the case of differences between the longitudinal spacing of the stud axes and the longitudinal spacing of the cavity axes.

7. A system as recited in Claim 6, wherein the sliding member has a toric shape the external diameter of which corresponds with the internal diameter of the saddle cavity for an easy insertion of said sliding member into said cavity with a minimal clearance.

8. A system as claimed in Claim 7, wherein the sliding member has an elongated aperture with parallel longitudinal sides in contact with external longitudinal sides of a prismatic part of the centering stud adapted to pass through said aperture.

9. A system for releasably suspending loads from an aircraft, substantially as herein described with reference to, and as shown in Figure 1, Figure 2 or Figures 3 and 4 with or without Figures 5 and 6 of the accompanying drawings.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig:1

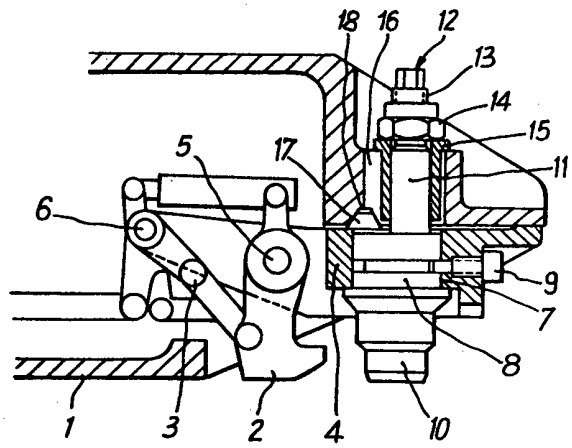


Fig:2

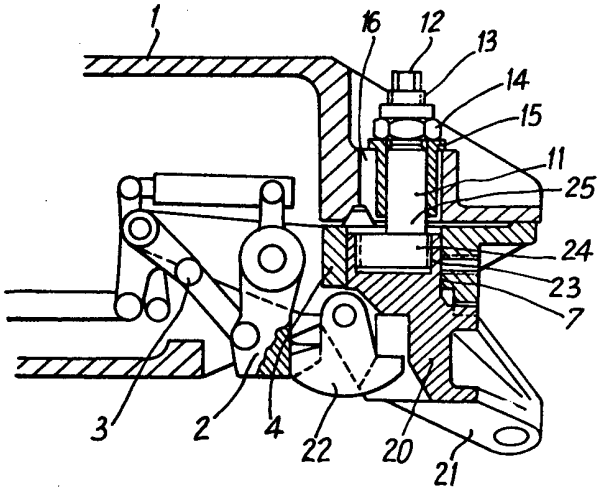


Fig:3

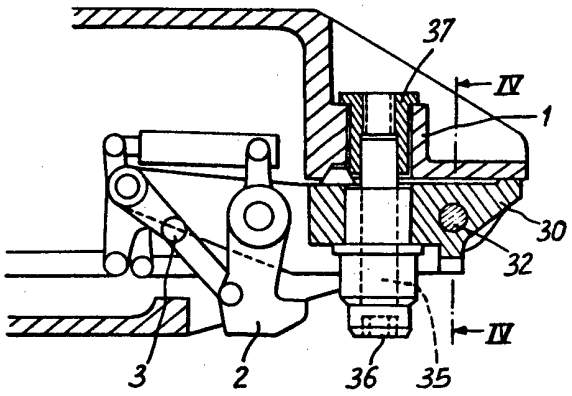
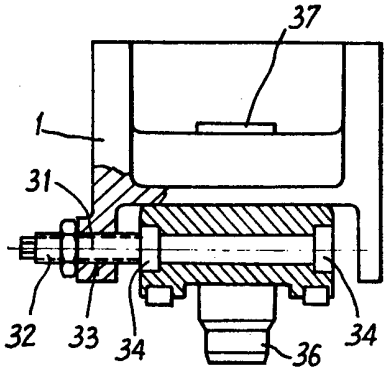


Fig:4



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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

Fig.5

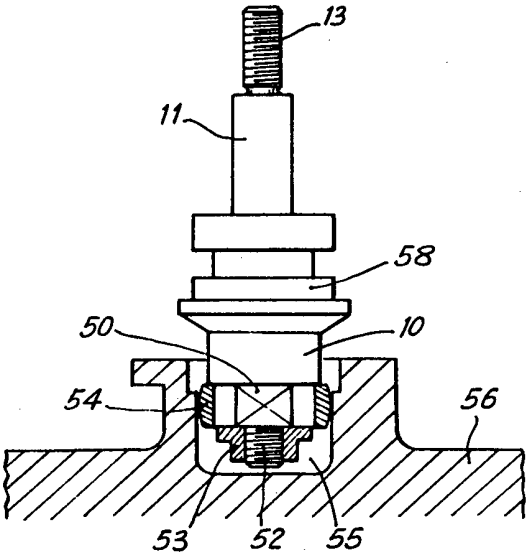

Fig.6