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SAFETY DEVICE FOR A CONTAINER DISPOSED IN THE INTERIOR OF AN AIRCRAFT

The invention relates to a device for personal protection in the case of overstressing of the "overhead stowage compartments" disposed in the interior of aeroplanes, more particularly above the passengers, and to a container for the aircraft industry having a device of the kind specified.

In the aircraft industry particular emphasis is placed on the optimum mechanical design for safety of the structural components used. This also includes the permanent or merely temporary attachments of structural members or groups thereof in the interior of aeroplanes, more particularly the attachment of containers, trolleys or the suspension of overhead stowage compartments from the fuselage. The structural members loaded with the passengers' luggage are mechanically designed for two situations. One situation is normal regular flying operations, during which the constructural members withstand certain stresses, for example, by air squalls, without damage; for example, 60,000 flying hours - i.e., for example, 60,000 start-and-landing flying cycles. If the aeroplane is shaken by an air squall, the inertia of the luggage causes a certain stressing, for example, six times terrestrial acceleration. This is the usual kind of stressing taking place, for example, at the tail or nose of aeroplanes. The second kind of stressing takes place in an emergency, for example, a crash. In that case the constructional members must withstand approximately 1.5 times the stressing occurring during flying operations. It is permissible for the constructional members themselves to be destroyed, but the passengers must suffer no injuries as a result. Overhead storage containers produced to present-day specifications are designed, for example, for static loads of 9g (9 times terrestrial acceleration) in the forward and 8.5g in the downward direction. At the present day, suspension

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systems constructed with a technically justifiable weight are of course designed to withstand such loadings.

Nowadays, aeroplane cabins have to take more and more increasingly heavy items of hand baggage, for example, suitcases, laptops, photographic and video equipment, etc. The result is high actual utilisation (high specific weight) of baggage stowage compartments, so that the permissible weight often represents merely a theoretical limit. In an emergency, for example, an emergency landing the items of baggage may turn into dangerous projectiles. In that case the luggage storage compartments or the containers themselves may remain undamaged, but their suspensions are damaged and the compartments drop onto the passengers. Other containers used on board aeroplanes are also being utilised specifically to an ever increasing extent such as, for example, trolleys taking refreshments and beverages to the passengers.

It is an object of the invention to provide measures to prevent overhead storage compartment containers dropping onto the passengers' heads during a crash, emergency landing or other dangerous situation in which the containers drop down, if necessary also to decelerate the dropping of the containers and to cancel out for a very long period the energy generated thereby. Hitherto such measures have not been customary. It is the aim of the invention to enhance passenger safety by raising the loading limits from the previous 9 times terrestrial acceleration (9g) to, for example 16g, without the need to construct heavier aeroplanes.

Consequently, containers with higher permissible loadings adapted to the present day behaviour of passengers and increased demands call for specially improved retaining systems, which must be completely

newly developed, since the conventional systems are at the limit of their development. This not only leads to higher development costs but also to increased expenditure in production and assembly and also an undesirable increase in the weight of the suspension systems.

An object of the invention is to provide a device which ensures the maximum possible passenger safety in emergency situations when the containers, mainly overhead storage compartments used inside the aeroplane become overloaded or overstressed. Another object is to provide a container which also ensures such safety.

The problems to which the invention relates are solved by the features of the characterising parts of Claims 1, 7 and 8, individually or in any combination. Advantageous embodiments are disclosed in the dependent subclaims.

In emergency situations, such as emergency landings or emergency situations in flight, the construction according to the invention ensures maximum passenger safety by sharing out the task between the conventional container suspension and the safety device.

Any manner of fixing the container, even merely a temporary attachment to any place on the fuselage, is considered to be a suspension. A conventional suspension is free from forces and clearance, while the force deflecting element of the safety device can be attached to existing or newly created points of suspension on the fuselage, a freedom of movement of up to a few millimetres being permitted. The force deflecting element deflects the inertia forces of the base plate, side walls or doors of the container into the supporting construction of the aeroplane. The number of force deflecting elements and the points of attachment can be adapted to the maximum acceleration occurring.

Other features and advantages of the invention will

be explained in greater detail in the following description of an embodiment thereof, referring to the accompanying drawings, which show:

Fig 1 a diagrammatic side elevation of two containers of a row of overhead stowage compartments,

Fig. 1a a section, taken along the line 1a-1a in Fig. 1,

Fig. 1b a variant of the embodiment shown in Fig. 1 having only one belt,

Fig. 2 a detail of a belt portion designed to cancel out kinetic energy,

Fig. 3 a section of a variant attachment of the safety device according to the invention to the fuselage,

Fig. 4a an end view of the passenger compartment of an aeroplane during normal flying operation, overhead stowage compartment containers shown in the left-hand part A having the safety device according to the invention, those in the right-hand part D having no such device, and

Fig. 4b the view shown in Fig. 4a after loading due to an emergency, for example, a crash.

Fig. 1 shows two overhead stowage compartment containers 2, a row of which is provided on both sides of the passenger compartment substantially along its entire length.

Fig. 1a shows a portion of a fuselage 1 to which the overhead stowage compartment container 2 according to the invention is suspended secured. The inherently, due to its mechanical construction, highly stable base plate 2a of the containers 2 is reinforced by longitudinally extending struts 3 which usually take the form of aluminium sections and can also carry the oxygen supply and further lines or additional units. Secured preferably to the base plate 2a rigidly or, for example,

releasably by screwed connection, bayonet-type connections or the like are two belts 4 which secure the passengers against the container 2 dropping down in an emergency, after the breakage or failure of the conventional suspension systems. The number and construction of the belts can be adapted to the maximum acceleration to be intercepted.

As shown in Fig. 1b, it is possible to use only one belt 4. The belts 4 extend along the container wall, being deflected around corners or rounded portions of the container 2, from the reinforced base plate 2a (advantageously from the mechanically most stable portion of the container) to a place of attachment 5. At the place of attachment 5 the storage component containers 2 are also suspended via the conventional attaching straps or bolts. The flexibility of the force deflecting element is particularly important for deflections around corners or rounded portions of the container 2, to enable the length to be changed in as unimpeded and space saving a manner as possible. The places of attachment 5 are suspended via supporting elements 6 from points of articulation 7 on the fuselage 1.

In the embodiment of the belt 4 shown in Fig. 2, the more particular tear-resistant, force-deflecting belt 4 has a suspension plate 41 attached to a sewn strap of the belt. The belt 4 is suspended with only slight freedom of movement from the place of attachment 5 of the storage compartment 2 or from a separate place of attachment for the safety device according to the invention. If a tensile loading limit determined by the materials and structure of the belt is exceeded, a preferably irreversible change in the length of the belt cancels out kinetic energy and, similarly to a safety belt in motor vehicles, prevents the containers 2 from

dropping onto the passengers' heads (see Fig. 4b part B). Instead of a belt 4 of changeable length, it is also possible to use at least two component parts of the force deflecting element of constant length which are coupled via a connecting device and enable the length to be changed with the cancelling-out of energy. As a result, the containers can withstand loadings up to 16 times and 20 times terrestrial acceleration (16g to 20g), without the stowage compartment having to be designed mechanically for such stressing in the zone of its points of suspension, something which would moreover substantially increase its weight. Under such loadings conventional attaching and suspension systems would certainly tear away or fail. To distribute the loading of the storage compartment container 2 over a longer period of time in an emergency, thus also reducing via the associated reduction of acceleration the force acting on the places of attachment 5, the force deflecting element 4 has a device 42 for cancelling out kinetic energy. In the embodiment illustrated this device is formed, for example, by a S-shaped or Z-shaped superimposed belt portion which is fixed in this configuration by seams 43. The seams 43 are designed to tear open under a predetermined loading, thereby enabling the operative portion of the belt 4 to be lengthened (see Fig. 4b, part A). In an emergency such a lengthening of the belt 4 and the associated lowering of the stowage compartment container 2 by approximately 2 to 3cm can be tolerated. A bore 44 in the suspension plate 41 is used for suspension from or connection to the points of articulation 7 on the fuselage 1. Instead of the or each belt 4, the stowage compartment container 2 can also be wrapped in a UD fabric and be provided with suitable straps for suspension from the fuselage. The safety device according to the invention increases the

weight of the stowage compartment containers by only approximately 3 to 4% while a similar reinforcement of the places of attachment and the suspension devices would cause a weight increase of approximately 20%.

Fig. 3 shows in section a detail of the invention at the place of attachment 5. The place of attachment 5 takes the form of a strap which is disposed on the fuselage 1. A bush 21 is inserted in the side wall of the stowage compartment 2 in conventional manner and without any specially reinforced construction and is glued or connected in some other manner to said wall. The baggage stowage compartment 2 is suspended from the fuselage 1 via a pin which extends through an opening in the strap 5 and the bush 21. The belt 4 is also attached to the strap 5, the pin 8 also extending through the opening 44. In an extreme case of stressing the bush 21 will tear open, while the highly stably constructed and located strap 5 remains intact and therefore the belt 4 also holds. In any case, after the belt 4 has been lengthened by the device for cancelling out kinetic energy, it retains the stowage compartment container 2 securely above the passengers' heads (see Fig. 4a, part A). If the strap 5 is not very stably constructed, additional places of attachment can also be provided for the safety device according to the invention and the safety device part of the container 2; there is a relatively considerable freedom as regards the arrangement and number of such places of attachment.

Of course, if required different constructional changes can be made within the scope of the invention. For example, the number of struts 3 and their arrangement can be altered to meet requirements.

CLAIMS

1. A safety device for containers disposed in the interior of aeroplanes, characterised by at least one connecting member to the container (2) and at least one connecting member (41) to the fuselage (1), the connecting members being connected to one another via at least one force deflecting element (4).

2. A device according to Claim 1, characterised in that the force deflecting element (4) is flexible.

3. A device according to Claims 1 or 2, characterised in that the length of the force deflecting element (4) can be changed within given limits and preferably irreversibly if a predetermined tensile loading is exceeded.

4. A device according to one of Claims 1 to 3, characterised in that the force deflecting element (4) has at least one device (42) to cancel out kinetic energy.

5. A device according to one of Claims 1 to 4, characterised in that the force deflecting element (4) is formed by at least one belt.

6. A device according to Claim 5, characterised in that in at least one place on the belt, the belt is formed into loops and fixed in that form with seams (43) intended to burst.

7. A container for the aircraft industry having a device according to one of Claims 1 to 6 releasably attached thereto.

8. A container for the aircraft industry, characterised by a force deflecting element (4) which is attached fixed to the container (1) and has a connecting member (41) for attachment to the fuselage (1).

9. A container according to Claim 8, characterised in that the force deflecting element (4) is disposed on the most rigid portion of the container.

10. A container according to one of Claims 8 or 9,

characterised in that the force deflecting element (4) is flexible.

11. A container according to one of Claims 8 to 10, characterised in that the length of the force deflecting element (4) can be changed within given limits and preferably irreversibly if a predetermined tensile loading is exceeded.

12. A container according to one of Claims 8 to 11, characterised in that the force deflecting element (4) has at least one device (42) to cancel out kinetic energy.

13. A container according to one of Claims 8 to 12, characterised in that the force deflecting element (4) is formed by at least one belt.

14. A device (sic) according to Claim 13, characterised in that at least one place on the belt, the belt is formed into loops and fixed in that form with seams (43) intended to burst.

15. A container according to one of Claims 8 to 12, characterised in that the force deflecting element (4) takes the form of a UD fabric having attachings traps for connection to the fuselage (12).

16. A container according to one of Claims 7 to 15 in the form of an overhead storage compartment.

17. A container according to Claim 16, characterised in that the force deflecting element (4) is attached to the base plate (2a).

18. A container according to one of Claims 7 to 15 in the form of a trolley.