Abstract Title: Loading deployable stores into aircraft

A method of loading a container 14 containing an item of equipment 11 into a deployment apparatus 10 which is operative to deploy the equipment 11 from a flying aircraft, in which the container 14 has a first end 16 and a second end 20, the deployment apparatus 10 including a mounting device 10 engageable with the first end 16 of the container 14, to mount the container 14 in a generally upright depending condition with the second end 20 being below the first end 16, the method including moving the container 14 towards the deployment apparatus 10 in a non-upright orientation, engaging the second end 20 of the container 14 with a receiving structure 15 of the deployment apparatus 10, and with the second end 20 engaged with the receiving structure 15, moving the first end 16 of the container 14 upwardly towards the mounting device 18 towards a generally upright orientation, and then operating an elevating device 22 of the receiving structure 15 to raise the container 14 to a position to permit the mounting device to be engaged with the first end 16 of the container 14.

The stores are preferably sonar buoys and loaded into a carousel where they are deployed from delivery position P2 via gas pressure acting on a piston 52. The carousel is preferably in a pressurised atmosphere sealed from the aircraft.
Title: Method of Loading a Container Containing Equipment

Description of Invention

This invention relates to a method of loading a container containing equipment and more particularly to a method of loading such a container in deployment apparatus which is operative to deploy the equipment from a flying aircraft.

Typically such equipment is provided in a container which is generally elongate, bulky and heavy. In one example of a typical deployment apparatus, this requires the container to be raised manually by operatives when generally upright, through an opening in the aircraft fuselage, from below the opening. Thus can be difficult to achieve.

According to a first aspect of the invention we provide a method of loading a container containing an item of equipment in a deployment apparatus which is operative to deploy the equipment from a flying aircraft, in which the container has a first end and a second end, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, the method including moving the container towards the deployment apparatus in a non-upright orientation, engaging the second end of the container with a receiving structure of the deployment apparatus, and with the second end engaged with the receiving structure, moving the first end of the container upwardly towards the mounting device towards a generally upright orientation, and then operating an elevating device of the receiving structure to raise the container to a position to permit the mounting device to be engaged with the first end of the container.

Thus by performing the method of the present invention, there is no need for operatives to lift the container containing the equipment into the deployment
apparatus up into the deployment apparatus from beneath the aircraft, but the
container may be more readily received into the fuselage of the aircraft in the
non-upright orientation and loaded into the deployment apparatus.

5 Preferably the elevating device is manually operated, for example by an
operative's foot, the device conveniently including a lever mechanism which
extends from an operating position, to below a floor of the deployment
apparatus, and upwardly though the floor into the receiving structure.

10 The deployment apparatus may include or be contained within a sealed
envelope within a pressurised region of the aircraft, such as a cabin, so that
when the item of equipment is deployed from the aircraft, typically though an
opening in a fuselage thereof, pressure is not lost from the pressurised region.
The operating position from which the lever of the elevating device extends, is
desirably external to the sealed envelope, there being a pressure seal
between the floor of the deployment apparatus and the lever mechanism, to
prevent or at least reduce pressure loss from the pressurised region during
deployment of the equipment.

20 The mounting device and the first end of the container may automatically
engage when the elevating device is operated to raise the container, but
alternatively, the container and the mounting device may include respective
first and second inter-engaging formations which are inter-engageable as the
raised container and mounting device are relatively rotated, to mount the
container in the depending condition.

25 The deployment apparatus may be of the kind in which the container
containing the equipment is moveable from a position in which the container is
received in the apparatus to a loaded position ready for deployment of the
equipment, in which case the method may include, after receiving the
container and engaging the mounting device with the first end of the container, moving the container to the loaded position ready for deployment.

Thus the deployment apparatus may receive a plurality of containers with equipment, each engaged with a respective mounting device, the containers being moveable severally from the position in which they are each received in the deployment apparatus, to the loaded position ready for deployment. Typically the containers are each moveable on a carousel including the respective mounting devices, from the receiving position to the loaded position.

Where there is provided a sealed envelope, this may include a closure at the receiving position which is openable to permit the container or containers to be received in the apparatus, and which is closeable to seal the envelope.

If desired, a container is deployed from the aircraft with the equipment is contains, for example by releasing the engagement of the mounting device and the first end of the container when the container is at the loaded position. However preferably, the equipment is deployed from its container, in which case the container from which the equipment has been deployed, would require removal from the apparatus after use, so that this may be replaced with a container containing further equipment to be deployed.

In one example, the container includes a piston which prior to deployment, is located at or towards the first end of the container, the piston being moveable axially of the container towards the second end, to urge the equipment to be deployed from the second end of the container. For example, pressurised gas, e.g. air, may be introduced into the container at the first end this to move the piston. A storage vessel for the pressurised gas may be located within the sealed envelope where provided. Thus the method may include, upon engaging the first end of the container with the mounting device, making a
connection between the inside of the container and a source of pressurised gas, via a valve.

At the second end of the container, there may be a capping, which may require to be removed from the first end of the container prior to deploying the equipment from the container, but in a preferred embodiment, the capping is frangible and thus becomes at least partially detached from the remainder of the container by the equipment being urged into contact therewith by the piston.

According to a second aspect of the invention we provide a method of deploying equipment from a pressurised region of a flying aircraft subsequent to loading a container containing the equipment into a deployment apparatus in the aircraft, the container having a first end and a second end, and including a piston which prior to deployment, is located at or towards the first end of the container, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, the method including providing the deployment apparatus within a sealed envelope the interior of which is pressure isolated from the pressurised region, applying to the interior of the container pressurised air to move the piston axially of the container towards the second end to urge the equipment to be deployed from the second end of the container.

According to a third aspect of the invention we provide in combination, a deployment apparatus and a container containing equipment to be deployed from a flying aircraft, the container having a first end and a second end, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, the deployment apparatus including a receiving structure for receiving a second end of the
container with the container in a non-upright orientation, and the receiving structure including an elevating device, which, when operated, subsequent to the first end of the container being moved upwardly towards the mounting device, raises the container to a position to permit the mounting device to engage the first end of the container.

According to a fourth aspect of the present invention we provide an aircraft including in combination, a deployment apparatus and a container containing equipment to be deployed from a pressurised region of the flying aircraft, the container having a first end and a second end and including a piston which prior to deployment, is located at or towards the first end of the container, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, and there being a sealed envelope in which the deployment apparatus and container are provided, the interior of the sealed envelope being pressure isolated from the pressurised region, and there being a source of pressurised air and means to apply the pressurised air to the interior of the container to move the piston axially of the container towards the second end to urge the equipment to be deployed from the second end of the container.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:-

FIGURE 1 is an illustrative partly sectional, side view of a deployment apparatus for use in the method of the invention;
FIGURE 2 is a fragmentary illustrative view of part of the apparatus of figure 1.
Referring to the drawings, there is shown a deployment apparatus 10 for deploying from a flying aircraft, equipment, such as one or more Sonobuoys, the position of one of which is indicated at 11.

5  The Sonobuoys or other items of equipment 11, are provided in respective containers 14a, 14b, which are elongate and generally cylindrical in this example. The containers 14 typically are hollow plastic pipes, but the combined container 14 and equipment 11 contained therein, is heavy and difficult manually to handle.

10  In the present example, a plurality of containers 14 are received by the deployment apparatus 10, and each is moveable from a receiving position P1 in which the container is received in the deployment apparatus 10, for example the position where container 14a is indicated, and a loaded position P2, indicated where container 14b is located, from where the equipment 11 may be deployed from the apparatus 14, downwardly through an opening in the aircraft’s fuselage.

In use, the or each container 14 in the deployment apparatus 10, is in a generally upright condition, with a first end 16 of the container 14 in engagement with a respective mounting device 18, whereby the container 14 depends from its mounting device 18.

In the present example, the deployment apparatus 10 has a carousel so that eight containers 14 may be received in the apparatus 10 and mounted by respective mounting devices 18 in depending generally upright conditions, in a circular array, the carousel including the or each mounting device 18, and being rotatable about a generally upright axis A of rotation, so that the containers 14 may each severally be brought to the position P2 occupied in the drawing by container 14b, from where the equipment 11 contained in the respective container 14 may be deployed.
The deployment apparatus 10 includes a container receiving structure 15 located at the receiving position P1 occupied by container 14a in the drawing. The receiving structure 15 includes a container receiving part 21 which surrounds an opening 17, the receiving structure 15 further including an upwardly extending container support part 19 of part circular configuration, which surrounds part of the container receiving part 21. In accordance with the invention, a container 14 may be received in the deployment apparatus 10 in a non-upright orientation, by engaging a second end 20 of the container 14 axially opposite to the first end 16, with the receiving structure 15. Location of the second end 20 of the container 14 with respect to the container receiving part 21 is facilitated by the upwardly extending container support part 19.

With the second end 20 of the container 14 thus supported and located, the first end 16 of the container 14 may be upwardly moved towards the mounting structure 16. In figure 1, container 14a is shown in a position between the non-upright orientation in which the second end 20 is engaged with the receiving structure 15, and a fully upright orientation, where the first end 16 of the container 14a will be positioned in this example, immediately below the mounting device 16.

The container 14a is then raised to bring the mounting device 16 and first end 16 of the container 14a to positions where they may be brought into engagement.

In accordance with the invention, the receiving structure 15 includes an elevating device 22. This includes in this example, a foot engagable pedal 23, which acts through a lever mechanism 24, to raise or lower an elevating member 25 which correspondingly rises and falls through the opening 17 of the receiving structure 15, to engage with a circular capping 27 at the first end 20 of the container 14a. The lever mechanism 24 includes a first part 28 which
is pivoted about a generally horizontal axle 29, and a second part 30 which is
pivoted to the first part for relative movement about a generally horizontal axis
C, and extends generally vertically to the elevating member 25. The second
part 30 of the lever 24 of the elevating device 22 passes through a floor 31 of
the deployment apparatus 10, through a pressure seal, for a purpose
hereinafter explained. In figure 1, the lever mechanism 24 is shown in both an
initial position prior to raising the container 14a, and an actuated position in
which the pedal 23 is depressed to raise the container 14a.

Thus, when the container 14a is in a generally upright orientation at the
receiving position P1, the container 14a may be raised by depressing the
pedal 23 of the elevating device 22, to bring the first end 16 of the container
14a and the mounting device 18 to relative positions where they are
engageable. When they are engaged, the pedal 23 may, with spring
assistance as required, be released, and the elevating member 25 will then
disengage the capping 27, leaving the container 14a suspended from the
mounting device 18, depending in a generally upright condition, clear of the
container receiving part 21.

If desired, when not required, the pedal 23 and first lever part 28 at least of the
lever mechanism 24 may be moved, e.g. when the deployment apparatus 10
is fully loaded, to a clear position below the floor 31 of the apparatus 31.

As illustrated in the drawings, if desired, a latch arrangement 32 may be
provided to constrain the container 14 from lateral swinging movement, which
latch 32 may automatically engage as the container 14a is moved towards the
generally upright, or may be manually engaged, as may be required.

The container 14a in this example, has at the first end 16 thereof, first inter-
engaging formations 35 provided by part-circumferentially extending grooves.
In the present example, the grooves 35 extend around a part or parts only of
the periphery of the container. The mounting device 18 includes a plurality of second inter-engaging formations 33 which are adapted to be received in the grooves 35 to mount the container 14a, when the inter-engaging formations 33, 35 are relatively rotated, in the manner of a bayonet fitting. In the present example, once the container 14a is raised, the second inter-engaging formations 33 are rotated about the axis of the container 14a to bring the first and second inter-engaging formations 33 and 35 into inter-engagement. The second inter-engaging formations 33 may be rotated manually or may be driven by, for example, pneumatics, electrics or another power source.

In another example, the second formations 33 may be spring biased, and may be arranged automatically to snap interengage in a groove 35 as the container 14a is raised by the elevating device 22, or may be manually engageable, or moved by a solenoid actuator or the like as required.

In each case, when received in the deployment apparatus 10, the container 14a is mounted at the first end 16 thereof by the mounting device 18. By rotating the carousel, the container 14a may be moved, about rotational axis A, to the loaded position P2 at which the equipment 11 may be deployed. In one example, the carousel may be rotated by an electric motor acting through a suitable transmission, but may be rotated manually, or otherwise as required.

It will be appreciated that the elevating device 22 of the receiving structure 15 will remain at the receiving position P1 for use in raising any next container 14 received in the deployment apparatus 10, but that the container receiving part 21 and upwardly extending container support part 19 will rotate with the carousel, and another (next) such container receiving part 21 and upwardly extending container support part 19 will be moved by the carousel to the receiving position P1, for receiving the second end 20 of the next container 14.
It will be appreciated that particularly when deploying equipment 11 from an aircraft flying at height, because it is necessary to provide an opening in the aircraft's fuselage for the equipment 11 to pass through, where the deployment apparatus 10 is provided in a pressurised cabin or other region, pressure could be lost though the fuselage opening.

To avoid this, the deployment apparatus 10 is provided in an envelope the outline of which is indicated by dotted lines at 40 in figure 1, which envelope 40 may be sealed to isolate the interior thereof from the cabin or other pressurised region.

At the receiving position P1, there is provided a closure 42 which in the present example is a door (not shown in figure 2), which may be closed over or in a receiving opening 43 through which the containers 14 are received in the deployment apparatus 10, to seal the envelope 40 when the or all of the containers 14 to be loaded, are received by the apparatus 10. The door 42 may be hinged or slid open and closed, or may be otherwise removable and replaceable with respect to the opening 43.

At the loaded position P2 from where the equipment 11 is to be deployed, the floor 31 of the deployment apparatus 10 has an opening 45 which is aligned with a corresponding opening provided in the aircraft's fuselage. The opening 45 of the deployment apparatus 10 is closed by a closure plate 46 which may be moved clear of the opening 45 when it is desired to deploy equipment 11, or if desired, the opening 45 of the fuselage may be closeable until it is desired to deploy equipment 11, or indeed, both openings could be closeable or permanently open. In the latter case, the pressure sealing with the cabin or other pressurised region in which the deployment apparatus 10 is provided, may be achieved solely by the envelope 40.
Whereas the whole container 14b and contained equipment 11 could be deployed from the deployment apparatus 10, e.g. by releasing the mounting device 18 at the loaded position P2, in this example, the equipment 11 is deployed from the container 14b, and the empty container 14b is removable from the deployment apparatus 10 e.g. when it is desired to replenish the apparatus 10 with equipment to be deployed, by moving the empty containers 14 severally to the receiving position P1. This replenishment may be achieved whilst the aircraft continues to fly (provided that the opening 45 through the floor 31 and/or through the fuselage are closeable) or on the ground as required.

The deployment apparatus 10 shown, includes a storage vessel 50 for storing pressurised gas, preferably compressed air. The vessel 50 is connected by conduits and valves (not shown) to each of the mounting devices 18, and when a container 14 is raised by the operation of the elevating device 22 into its generally upright depending condition, a connection is made via a gas inlet 55 to the interior of the container 14 to the source of pressurised gas 50, via a deployment control valve of the mounting device 16.

Within each container 14 there is provided a piston 52 which, prior to deployment, is positioned at or adjacent to the first end 16 of the container 14, with the equipment 11 between the piston 52 and the capping 27 at the second end 20.

When it is desired to deploy the equipment 11 in the container 14b at the loaded position P2, the deployment control valve of the mounting device 16 at the loaded position P2 is opened, whereby pressurised gas is communicated to the container 14b via the gas inlet 55 of the container 14b, to act upon the piston 52 and drive the piston 52 towards the second end 20 of the container 14b. The piston 52 will thus urge the equipment 11 from the container 14b.
In one example, some means are provided to remove the capping 27 at the second end 20 of the container 14b to permit the equipment 11 to be moved through the opening 45 in the deployment apparatus 10 floor 31, but in a preferred arrangement, the capping 27 is frangible, and becomes at least partially detached from the remainder of the container 14b as the urged equipment 11 strikes the capping 27, thereby to allow the equipment 11 to be deployed.

After its equipment 11 has been deployed, the equipmentless container 14b is then moved away from the loaded position P2 on the carousel, towards the receiving position P1 from where the spent container 14 may then be removed from the apparatus 10 (when closure 42 is opened), using the elevating device 25 if required, in a reverse sequence to that used for receiving containers 14 containing equipment 11.

Various modifications may be made without departing from the scope of the invention.

For example, the storage vessel 50 for pressurised gas need not be provided in the deployment apparatus 10, but may be stowed elsewhere, or a supply of pressurised gas to deploy the equipment 11 as described may be obtained from another source, such as from pressurised air derived from a gas turbine engine powering the aircraft.

Instead of a plurality of containers 14 being provided in a circular array on a carousel, a plurality of containers 14 may otherwise be provided, e.g. in a linear or other array, which permits containers 14 severally to be moved to a loaded position from where equipment 11 may be deployed, or a single container 14 only may be provided, in which case the receiving and loaded positions P1, P2 may be at the same position.
A sealed envelope 40 need not be provided in an aircraft which only flies at low heights, such as a helicopter, where loss of pressurisation issues do not arise.

Alternatively, other arrangements for preserving pressure within a pressurised region of an aircraft during deployment of equipment 11 may be provided.

The receiving structure 15 described is only exemplary. Other structures for supporting and locating the second end 20 of a container 14 whilst the container 14 is moved to a generally upright orientation may be used. The lever mechanism 24 of the elevating device 22 need not include the two lever parts 28, 30 as described, but may include a single lever part only, although the arrangement described is preferred because the second lever part 30 is moved generally vertically when the pedal 23 is depressed, making pressure sealing with the floor 31 more straightforward.

In another arrangement, in place of the foot operated lever mechanism 24, another preferably manually, but possibly powered elevating device 22 may be used. However the foot operated elevating device 22 described, has been found to enable significant mechanical advantage to be realised, enough easily to raise a container 14 and its equipment 11 weighing 40 pounds or more.

In another example, instead of providing for the equipment 11 to be deployed using pressurised gas acting on a piston 52, the piston 52 may be moved to urge the equipment from the container 14b by an explosive charge, or the equipment 11 may simply be allowed to pass from the container 11 under gravity.
The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.
CLAIMS

1. A method of loading a container containing an item of equipment in a deployment apparatus which is operative to deploy the equipment from a flying aircraft, in which the container has a first end and a second end, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, the method including moving the container towards the deployment apparatus in a non-upright orientation, engaging the second end of the container with a receiving structure of the deployment apparatus, and with the second end engaged with the receiving structure, moving the first end of the container upwardly towards the mounting device towards a generally upright orientation, and then operating an elevating device of the receiving structure to raise the container to a position to permit the mounting device to be engaged with the first end of the container.

2. A method according to claim 1 wherein the container is moved towards the deployment apparatus for loading in the non-upright orientation, from within the fuselage of the aircraft.

3. A method according to claim 1 or claim 2 wherein the elevating device is manually operated.

4. A method according to claim 3 wherein the elevating device is operated by an operative's foot.

5. A method according to claim 3 or claim 4 wherein the elevating device includes a lever mechanism which extends from an operating position, to below a floor of the deployment apparatus, and upwardly though the floor into the receiving structure.
6. A method according to any one of the preceding claims in which the deployment apparatus includes or is contained within a sealed envelope within a pressurised region of the aircraft.

7. A method according to claim 6 where dependant on claim 5 wherein the operating position from which the lever of the elevating device extends, is external to the envelope, there being a pressure seal between the floor of the deployment apparatus and the lever mechanism, to prevent or at least reduce pressure loss from the pressurised region during deployment of the equipment.

8. A method according to any one of the preceding claims wherein the mounting device and the first end of the container automatically engage when the elevating device is operated to raise the container.

9. A method according to any one of claims 1 to 7 wherein the container and the mounting device include respective first and second inter-engaging formations which are inter-engageable upon relative rotation of the raised container and mounting device to mount the container in a depending condition.

10. A method according to any one of the preceding claims wherein the container containing the equipment is moveable from a position in which the container is received in the apparatus to a loaded position ready for deployment of the equipment, the method including, after receiving the container and engaging the mounting device with the first end of the container, moving the container to the loaded position ready for deployment.

11. A method according to claim 10 wherein the deployment apparatus receives a plurality of containers with equipment, each engaged with a
respective mounting device, the method including moving the containers severally from the position in which they are each received in the deployment apparatus, to the loaded position ready for deployment.

12. A method according to claim 11 wherein the containers are each moveable on a carousel including the or the respective mounting devices, from the receiving position to the loaded position.

13. A method according to claim 12 where appendent to claim 6, wherein there is provided a closure at the receiving position, the method including opening the closure to permit the container or containers to be received in the apparatus, and closing the closure to seal the envelope.

14. A method of deploying equipment from a flying aircraft subsequent to loading a container containing the equipment into the aircraft by a method according to any one of the preceding claims, the method including deploying the equipment from its container, the container including a piston which prior to deployment, is located at or towards the first end of the container, the method including moving the piston axially of the container towards the second end to urge the equipment to be deployed from the second end of the container.

15. A method according to claim 14 which includes introducing into the container pressurised gas to move the piston.

16. A method according to claim 14 or claim 15 where appendent to claim 6, which includes stowing a storage vessel for the pressurised gas within the sealed envelope.

17. A method according to claim 15 or claim 16 which includes, upon engaging the first end of the container with the mounting device, making a
connection between the inside of the container and a source of pressurised gas via a valve.

18. A method according to any one of claims 14 to 17 wherein at the second end of the container there is a frangible capping which becomes at least partially detached from the remainder of the container by the equipment being urged into contact therewith by the piston.

19. A method of deploying equipment from a pressurised region of a flying aircraft subsequent to loading a container containing the equipment into a deployment apparatus in the aircraft, the container having a first end and a second end, and including a piston which prior to deployment, is located at or towards the first end of the container, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, the method including providing the deployment apparatus within a sealed envelope the interior of which is pressure isolated from the pressurised region, applying to the interior of the container pressurised air to move the piston axially of the container towards the second end to urge the equipment to be deployed from the second end of the container.

20. A method of loading and/or deploying a container containing equipment from a flying aircraft substantially as hereinbefore described and/or as shown in the accompanying drawings.

21. In combination, a deployment apparatus and a container containing equipment to be deployed from a flying aircraft, the container having a first end and a second end, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the
first end, the deployment apparatus including a receiving structure for receiving a second end of the container with the container in a non-upright orientation, and the receiving structure including an elevating device, which, when operated, subsequent to the first end of the container being moved upwardly towards the mounting device, raises the container to a position to permit the mounting device to engage the first end of the container.

22. An aircraft including in combination, a deployment apparatus and a container containing equipment to be deployed from a pressurised region of the flying aircraft, the container having a first end and a second end and including a piston which prior to deployment, is located at or towards the first end of the container, the deployment apparatus including a mounting device engagable with the first end of the container, to mount the container in a generally upright depending condition with the second end being below the first end, and there being a sealed envelope in which the deployment apparatus and container are provided, the interior of the sealed envelope being pressure isolated from the pressurised region, and there being a source of pressurised air and means to apply the pressurised air to the interior of the container to move the piston axially of the container towards the second end to urge the equipment to be deployed from the second end of the container.

23. A combination according to any one of claims 21 or 22 having any of the features of the deployment apparatus specified in any one of method claims 1 to 19.

24. A combination of a deployment apparatus and container substantially as hereinbefore described and/or as shown in the accompanying drawings.

25. Any novel feature or novel combination of features described herein and/or as shown in the accompanying drawings.
**Application No:** GB0508020.5
**Examiner:** Mr Dave McMunn

**Claims searched:** 1-18,21
**Date of search:** 14 June 2005

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**Patents Act 1977: Search Report under Section 17**

**Documents considered to be relevant:**

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<tr>
<th>Category</th>
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<th>Identity of document and passage or figure of particular relevance</th>
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<td>A</td>
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<td>JP 2000053098 A KAWASAKI HEAVY IND. See Figs &amp; English abstract</td>
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<td>GB 2072814 A R. ALKAN &amp; CIE. See Figs</td>
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<td>EP 0361441 A UNITED TECHNOLOGIES. See Figs</td>
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**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>X</sup>:

B7W; F3C

Worldwide search of patent documents classified in the following areas of the IPC<sup>67</sup>:

B64D

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC.