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A Transport and Storage Container

10 **Field of the invention**

The invention relates to a transport container system, particularly for the storage and transport of munitions and the like.

15 **Background of invention**

A transport container for the storage and transportation of munitions and the like are known. Existing ISO 1C series TEU (twenty-foot equivalent unit) containers are box structures with nominal length of 6058mm (+0mm/-6mm) and width of 2438mm (+0mm/-5mm).

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Generally, the inside space of the existing containers does not have any partitions. The cargo is stowed in the existing containers with dunnage, i.e. protective material used to separate the cargo from damage and transportation, e.g. mat, foam, fibreboard, etc. In some cases, securing of the cargo is also

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provided.

Summary of invention

The primary object of the invention is to provide an alternative transport / storage container system for storage and transportation of ammunition and the like

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overland and sea.

Another object of the invention is to provide a transport container which prevents cargo from incurring any deformation and/or damage on the way of sea and/or overland transportation.

- 5 Another object of the invention is to provide a transport container which could be conveniently stored when it is or not in use.

To achieve these objects mentioned above, the invention provides a transport storage container including,

- 10 a container with a top and side cover; and
a plurality of pallets to position inside the container;
wherein each pallet is positioned in a guided arrangement and is releasably locked in the container.

15 Individual container unit

A container unit is built to use standard corner fittings which would allow industrially available twist locks to secure the unit to compatible ISO 1C series 20' container transportation.

- 20 The container unit accommodates 10 units of pallets with 5 pallets in each row. The pallets in each container are arranged such that positioning and re-positioning could be carried out randomly and simultaneously from both sides using an industrial forklift truck.

- 25 The container unit is able to accommodate ten (10) units of fully loaded pallets without any permanent deformation of the structure based on gross combined mass of 12,500 kg. When fully loaded with ten (10) units of pallets, the overall height of the container is 1400 mm.

When two containers are arranged in 2 tiers in a transportation trailer, loading and unloading of the pallets accommodated thereon could be done by forklifts.

Each container unit could be lifted, stacked/ retrieved and transported/
5 transferred by MHE mounted with top-pick spreader and hoisting crane with lifting slings.

To provide lightning protection, the container unit additionally comprises a top cover made of selected materials.

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To prevent unauthorized tempering or accidental exposure, the container unit further comprises a lock and a protective cover installed on its longitudinal sides. Both locks and covers are easily installed with minimal efforts, e.g. by 2 persons in less than 5 minutes.

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Interlocking containers

Two or more containers could be arranged in a tier and detachably interlock with one another to form a sturdy container assembly without structural deformation
20 or damage. A 2-tiered container assembly weighs less than 3,000 kg when empty, and has a minimum carrying capacity of 22 metric tonnes.

A 2-tiered, fully loaded, container assembly could be lifted by hoisting crane with lifting slings and Material Handling Equipment (MHE) mounted with a top pick
25 spreader without structural deformation or damage.

A fully loaded 2-tiered container assembly uses standard corner fittings which would allow industrially available twist locks to secure the unit to compatible ISO 1C series 20' container transportation, and is suitable for both sea and overland
30 transportation. The container assembly is built to evenly distribute the load over all axles of the carrying vehicle. The centre of gravity of an empty and fully

loaded of such container assembly is 1219 mm and 1247 mm above the base of the MSCS, respectively.

5 The 2-tiered container assembly could be secured to a transport trailer quickly with minimal effort. For example, this could be done in 5 minutes by two operators.

10 The 2-tiered container assembly comprise the same footprint as that of an ISO 1C 20' series shipping container. This would allow interconnectivity with global Material Handling Equipment (MHE) and vehicle integrated loading hook system.

Pallets

A pallet of the invention comprises:

- 15 a. munitions loading envelope;
b. a forklift pocket; and
c. a locking mechanism to secure the pallet to the base of a container unit;

20 The pallet uniformly distributes payload of 1200kg and comprises munitions loading envelope (excluding the pallet thickness) of 1100mm (length) x 1000mm (depth) x 1100mm (height) when secured to a base of a container unit. To enable it to be lifted by a forklift, the pallet further comprises a fork lift pocket of 85 mm thick and 280 to 300 mm wide. (4-way pallet)

25 The pallet with 1200kg payload is able to interconnect in vertical stacking to a maximum height of four units when static and two units when loaded for transportation.

30 The pallet detachably connects to the base of a container unit by means of a locking mechanism without need for additional tools or equipment. Additionally,

the locking device is able to take the forces on it during locking, unlocking and transportation over rough terrain, and is easily operated, e.g. by 1 person.

Each pallet is able to accommodate multi layers of munitions boxes. The munitions boxes are preferably secured by straps which passes over the top surface of the boxes at each layer. Such arrangement allows easy removal of upper layer box without loosening the securing of the lower layer boxes.

Each pallet weighs 30 kg when it is empty with a base thickness of 110 mm. When not in use, the pallet is able to be stacked flat. The pallet is most preferably made of spark-resistant and corrosion resistant material.

The pallet further comprises overhanging lips so that it could be lifted using two lifting loops.

The pallet is also able to receive a cage with a removable lid for storage and transportation of loose items while maintaining the overall dimensions, payload and storage capacity.

The weight of the pallet with an empty cage is 72 kg. The internal storage of the pallet with cage is 960 mm (length) x 1060mm (width) x 960mm (height). The cage would be able to store loose items of various sizes with the smallest size being 50mm x 50mm x 10mm. [by changing the size of the wire mesh, you can have smaller items]

To facilitate the movement of a pallet with a fully loaded cage, the pallet is further provided with four detachable caster wheels.

The cage panels are detachable so they would be able to be stacked away in a flat configuration. The whole assembly could be secured by a locking system.

The pallets could further be joined by an adapter to each other in the longitudinal direction to store long or odd-shaped cargo. The joined units, when loaded, are suitably strong to be lifted by a forklift. The joined pallets could then be disassembled quickly and easily, e.g. by 2 persons in less than 3 minutes.

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The above and further objects and advantageous features of the invention will be more apparent from the detailed description and accompanying drawings that follow.

10 **Brief description of drawings**

Figure 1 is the isometric view of an individual container unit of the present invention;

15 Figure 2 is the container unit of Figure 1, with a top cover;

Figure 3a is the part longitudinal section view of the container unit;

Figure 3b is the transverse end view of the container unit;

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Figure 4 is the isometric view of the container unit showing the locking mechanism;

Figure 5a is the isometric view of a pallet for use with the container unit of
25 Figures 1-4;

Figure 5a-1 is the pallet cut hole;

Figure 5a-2 is the pallet with an emboss to strengthen the surface;

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Figure 5b is the bottom view of the pallet in Figure 5a;

Figure 6 is the pallet with an empty cage mounted thereon;

5 Figure 7 is the pallet with caster wheels;

Figures 8-1 and 8-2 show two and three pallets interconnected to one another respectively;

10 Figure 9 is the pallet's locking mechanism in an unlock position;

Figure 10 is the locking mechanism in Figure 9 in a lock position;

Figure 11 is the locking mechanism in lock position with locking handle secured
15 in position;

Figure 12 is stainless steel rope secured on the cover locking which also acts as a secondary constraint to prevent the locking handle (14b) from moving upward

20 Figure 13 is the stainless steel rope secured with a padlock;

Figure 14 is the container unit with a side cover.

Figures 15a and 15b show alternative methods for linking the hook (14) to the
25 sliding pin (14b) of the locking mechanism wherein the engaging and disengaging work in a reserve sequence (push-in is locked, pull-out is unlocked)

Figure 16 shows 2 units of containers stacked and joined together using an intermediate twist lock.

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Figure 17 shows a modified intermediate twist lock.

Detailed description of preferred embodiments

- 5 Figure 1 is the isometric view of a container unit of the present invention, while Figure 2 is the container unit with a top cover to protect the housed pallets.

As shown in Figure 4, the container comprises a means to provide longitudinal strength to the container most preferably in the form of a main beam (1) which
 10 runs full length of the container unit, and a means to provide flexural strength to the container most preferably in the form of a square hollow section (2) provided in the middle of the top side of the container unit. The corners of the container unit have standard container fittings suitable for twist lock securing.

- 15 The size of the main beam (1) is driven by the requirement to restrict the deflection of a fully loaded container unit to less than 8mm. The beam also includes a weight-saving feature by means of a cut-out in the beam's design. The main beam (1) is designed to carry the cantilever track beams and functions to bear or carry all the load.

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Two square hollow sections (3) connect the underside of square hollow section (2) to main beam (1) renders the sturdiness of the container unit.

- 25 The container unit additionally comprises a means to provide torsional rigidity most preferably in the form of a horizontal bar (14) connecting the corners of the container unit in transverse direction at top and bottom. A vertical bar (5) connects corresponding top and bottom corner ends to provide rigidity to the box structure.

- 30 Additionally, an I-beam connection (6) connects the bottom longitudinal main beam (1) to top hollow section (4) at the location where the longitudinal span of

the main beam (1) is ended. Additional strengthening members (19) are provided in transverse direction in way of the I-beam connection (6).

5 The bottom part of the container is supported and strengthened by means of a C-section (7) along longitudinal direction shown in Figure 4. The C-section is arranged with open side facing outwards and terminates at the corners.

The container unit is further provided with standard corner fittings (8) so it could be lifted.

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Figure 3a is a part longitudinal cross-section view of the container unit, and Figure 3b is the transverse end view of the container unit. Figure 3a shows a rectangular hollow section provided along the length of the container unit which connects the corners of the container unit. Also shown is the vertical bar (5) to
15 connect corresponding top and bottom corner ends to provide rigidity to the box structure.

As shown, the container unit comprises a means to support a pallet most preferably in the form of a track beam (10). A guide rail (11) is provided so the
20 each pallet is separated from its adjacent neighbor. An SUS plate (10a) is riveted onto the track beam (10) to prevent wear and tear on the latter.

Stoppers (12) are provided at one end and/or both of track beam (10) to retain the pallet at the correct position and to prevent the pallets from interfering with
25 the with the center partition of the container unit. The pallets are then blocked from sliding out through the open end of the container unit by means of vertical stubs (13) which could be switched into engage-disengage position. A stopper (13) juts out between the center two-track beams when the locking mechanism engages the pallet.

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A lock comprising a hook and a locking handle is installed in the container's base unit to secure the pallets therein. Most preferably the hook is a form of pull-engage / push –disengage hook (14) to positively secure the pallet. The hook is engaged and disengaged by pivotal movement contributed by the applied horizontal force. The hook is actuated by a locking handle (14b) which turns in vertical position to effect the hook in an engaged position. Once the hook engages the pallet, the locking handle (14b) slides through the sliding pin (14c) and drops into a pre cut slot hole in the C-section (7) to secure or support the engaged position. Other forms of connecting the horizontal bar (14a) of the locking mechanism are shown in Figure 15a and 15b.

Figure 5a shows isometric view of the pallet from the top which has a flat surface for stowing, while Figure 5a-1 shows the pallets with holes cut on the top plate as a weight saving feature. To strengthen the top, the top surface could be embossed as shown in Figure 5a-2. Figure 5b is the isometric view of the pallet showing locking bar (100) , ribbed structure for to render frame support and overhang lips at two edges perpendicular to direction of stowage to allow passing lifting loops. Each pallet is positioned in a container unit with a clearance of 60mm and 35mm in vertical and horizontal direction to allow a forklift to perform pick and place operation of the pallets. To facilitate the pallet to slide into the desired position, the guide rail (11) is bent to the shape/profile.

Figure 6 shows a pallet with a cage mounted thereon for accommodation and transportation of loose items while maintaining the overall dimensions, payload and storage capacity. Hinged side doors are provided for opening the storage cage. These could be secured after stowing the cargo snap-fit and lock mechanism. The weight of a pallet with an empty cage mounted thereon is kept minimal such as 72kg.

Figure 7 shows a pallet provided with 4 detachable caster wheels installed at the bottom of the pallet. Most preferably the cage has one side cover which can be

easily removed (e.g. by 1 operator) to render quick and convenient loading of items. The cage could be opened from the front followed by the top.

Figures 8-1 and 8-2 show two or more pallets could be releasably joined for longer or odd-shaped cargo. The joined pallets are suitably sturdy to be lifted by a forklift. The joined pallets could be disassembled quickly and easily, i.e. by 2 persons in less than 3 minutes.

Figure 9 shows the locking mechanism in an unlocked position. At this position, the hinge of linked flat bar attached to the handle of the locking mechanism passes through the slot in C-channel (7) and the locking hook (14) rests on the bottom.

Figure 10 shows the locking mechanism in lock-position wherein the locking hook (14) is raised. The sliding pin (14c) is pulled out of the slot of the locking handle (14b)

Figure 11 shows that to positively secure the locking mechanism, the handle of locking mechanism is rotated upwards and the other far end of this handle engages into a horizontal slot in the flange of C-channel (17).

Figures 12, 13 and 14 show the side cover arrangement for the container unit. Most preferably, the side cover is formed by corrugated sheet metal and slides upwards into the inverted "U" door frame (16) and is then lowered onto the C-channel (7). A stainless steel rope is passed through the holes on the vertical angle bars (17A) on the lower side of the side cover.

After passing the stainless steel rope through all the securing holes, it is pulled to tighten followed by securing the overlapping steel plates at the end using a padlock. This will prevent removal of the side covers until the padlock is opened.

The location of the stainless steel rope is also determined based on the length of flat bar attached to locking mechanism handle. At the secured position of the stainless steel rope, the locking mechanism handle is prevented from jumping out by the wire rope. This provides an additional positive securing to the locking mechanism when it is subjected to vertical movement during transportation.

The container further uses different surface material or a combination thereof to prevent wear and tear of the main structure member. For example, a portion such as 2mm of the extended surface of the corner casting could be cut off and replaced with a 2mm stainless steel plate (welded). Other effective materials could also be employed.

Figures 15a and 15b show alternative methods for linking the hook (14) to the sliding pin (14b) of the locking mechanism wherein the engaging and disengaging work in a reverse sequence (push-in is locked, pull-out is unlocked).

Figure 16 shows 2 units of containers stacked and joined together using an intermediate twist lock.

Figure 17 shows a modified intermediate twist lock with an additional securing means. In this embodiment, the handle is modified from a straight member to two parts. One part replaces the original handle and the other is able to turn downwards after actuating the twist-lock. This gives additional locking to avoid people from unlocking or undoing the twist-lock. Any other effective means to interlock the containers together and protect the lock from opening (accidentally) could also be used.

The transport container discussed above addresses the strong demands of military operations as it pertains to the storage, handling, and transportation of munitions and the like. It provides an efficient storage, handling and

transportation of munitions and the like during rapid deployment operations. It requires minimal preparation for by very few individuals for a short period of time.

- Although the invention has been described above with regard to a most preferred embodiment, it will be readily understood to one of ordinary skill in the art that various changes and/or modifications may be made without departing from the spirit of the invention. In general, the invention is only intended to be limited by the properly construed of the following claims.
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Claims

1. A transport and storage container system comprising:
 - a container with a top and side covers;
 - a plurality of pallets to position inside the container; and
 - a plurality of locking means for detachably securing each of the plurality of pallets between an engaged position and a disengaged position inside the container, each of the plurality of locking means comprising a hook rotatably hinged at a first end of a horizontal bar located at an underside of each of the plurality of pallets, and a vertical stub located at a second end of the horizontal bar, each of the plurality of locking means further comprising a locking handle located external of the container, wherein the hook and the vertical stub are simultaneously engaged and disengaged by pivotal movement contributed by an applied linear actuation of the locking handle,
 - wherein each of the plurality of pallets are positioned and detachably locked to the container by a corresponding one of the plurality of locking means,
 - wherein each of the plurality of pallets comprises a locking bar to engage with the hook when in the engaged position,
 - wherein the hook and the vertical stub are switchable between the engaged position and the disengaged position to secure and further prevent the plurality of pallets from sliding out of the container.
2. The transport and storage container system of claim 1, wherein the locking means further comprises a sliding pin to secure the locking handle in an engaged position.
3. The transport and storage container system of claim 1, wherein the container further comprises:
 - a track beam to support the plurality of pallets inside the container;
 - a guide rail to separate each of the plurality of pallets from its adjacent neighbor; and
 - a stopper provided at the end of the track beam to prevent the plurality of pallets from interfering with the center partition of the container.

4. The transport and storage container system of claim 1, wherein the container further comprises:

- a main beam which runs a full length of the container to provide longitudinal strength;
- a square hollow section provided in the middle of the top side of the container; and
- a plurality of corners with standard container fittings suitable for twist lock securing.

5. The transport and storage container system of claim 5, wherein the container's main beam carries all cantilever track beams and includes a weight saving feature.

6. The transport and storage container system of claim 1, wherein the side covers are formed of corrugated sheet material installed on the longitudinal sides of the container.

7. The transport and storage container system of claim 1, wherein each of the plurality of pallets further comprises detachable caster wheels.

8. The transport and storage container system of claim 1, wherein the plurality of pallets further comprises a cage with detachable panels mounted thereon for storage and transportation of loose and small items.

9. The transport and storage container system of claim 1, wherein the plurality of pallets comprises a plurality of holes as a weight saving feature.

10. The transport and storage container system of claim 1, wherein the plurality of pallets further comprises wings for lifting means.

11. A method for transporting and storing pallets in a container, the method comprising the steps of:

- providing a container with a top and side covers;
- providing a plurality of pallets to position inside the container;
- providing a plurality of locking means for detachably securing each of the plurality of pallets between an engaged position and a disengaged position inside the container;

providing each of the plurality of locking means with a hook rotatably hinged at a first end of a horizontal bar located at an underside of each of the plurality of pallets;
providing a vertical stub located at a second end of the horizontal bar;
providing each of the plurality of locking means with a locking handle located external of the container;
engaging and disengaging the hook and the vertical stub simultaneously by a pivotal movement contributed by an applied linear actuation of the locking handle; and
providing each of the plurality of pallets with a locking bar to engage with the hook when in an engaged position,
wherein the hook and the vertical stub are switchable between the engaged position and the disengaged position to secure and further prevent the plurality of pallets from sliding out of the container.