

## MODULAR TROLLEY

### FIELD OF THE INVENTION

5           The present invention relates to a trolley for transportation of loads and in particular, the present invention relates to a modular trolley which allows combination with trollies of the same features to form trolley assembly to expand the transportation capacity.

### BACKGROUND OF THE INVENTION

10

Exhibition organizers often require large number of chairs, tables and/or other conference furniture to be frequently transported between premises e.g. from warehouse to/from conference rooms. Taking the transportation of conference chairs as an example, transportation is carried out by stacking the chairs on conventional trolley and moving the  
15   stacked chairs between different locations in an exhibition center. One limitation of using conventional trolley is the height of stacked chairs on the trolley, which must not exceed the height of the doors of the warehouses in which the chairs are stored. This limits the number of chairs which can be moved during one transportation cycle by using conventional trolley,

20

The present invention aims to provide a modular trolley solution which allows more loads such as conference chairs to be transported without needs of increasing the height of warehouse doors.

### SUMMARY OF THE INVENTION

25

Embodiments of present invention provides a modular trolley which allows increasing of the load-bearing and transportation capacity by combining two or more of such trollies together. In one embodiment, a modular trolley includes a chassis having a top side, a

bottom side opposite to the top side, a center portion and a periphery surrounding the center portion. A set of wheels are mounted to the bottom side of the chassis for movably supporting the chassis on a surface, e.g. a floor or ground. A first connection member is mounted to a first portion of the periphery, and a second connection member is moun  
5 second portion of the periphery. When a first one of such trolley and a second one of such trolley are brought together and with the second portion of the first one of such trolley positioned adjacent to the first portion of the second one of such trolley, the second connection member of the first one of such trolley is engaged to the first connection member  
10 such trolley to each other.

Other aspects and advantages of the present invention will become apparent from the following detailed description, illustrating by way of example the inventive concept of the present invention.

15

## BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are disclosed hereinafter with reference to the drawings, in which:

20

FIG. 1 is a perspective top view of a modular trolley according to one embodiment of the present invention.

FIG. 2 is a perspective bottom view of the trolley of Fig. 1 from another viewing angle.

25

FIG. 3 is an enlarged perspective partial view of Fig. 1.

FIG. 4 is an enlarged perspective partial view of Fig. 2.

FIG. 5 is a perspective view showing the first and second connections members used in the trolley of Fig. 1.

- 5    FIG. 6 is a perspective view showing two of the trolleys shown in Fig. 1a to be combined together.

FIG. 7 is a perspective view showing two of the trolleys shown in Fig. 1a after combined together.

10

FIG. 8 is an enlarged perspective partial view of Fig. 7.

FIG. 9 is a perspective view showing three of the trolleys shown in Fig. 1 after combined together along one dimension.

15

FIG. 10 is a perspective view showing four of the trolleys shown in Fig. 1a after combined together along two dimensions.

- FIG. 11 is a perspective top view of a modular trolley according to another embodiment of the present invention.
- 20

FIG. 12 is a cross sectional front view of Fig. 11 along A-A together with a stack of chairs carried on the trolley.

- 25    FIG. 13 is a perspective bottom view of Fig. 11.

FIG. 14 is a perspective top view showing four of the trolleys shown in Fig. 13 when stacked together.

FIG. 15 is an exploded perspective view of Fig. 14.

FIG. 16 is a perspective top view showing four of the trolleys shown in Fig. 13 to be combined together.

5

FIG. 17 is a perspective bottom view of Fig. 16.

FIG. 18 is a perspective top view showing four of the trolleys shown in Fig. 13 after combined together to form a trolley assembly.

10

FIG. 19 is a perspective bottom view of Fig. 18.

FIG. 20 is a cross sectional view of Fig. 19 along B-B.

15 FIG. 21 is a partial enlarged vie of Fig. 20.

FIG. 22 is a perspective view showing the trolley assembly of Fig. 18 and four stacks of chairs carried on the trolley assembly.

## 20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figs. 1 to 5, according to one embodiment of the present invention, a modular trolley 100 includes a generally planar shaped chassis 110 having a top side 102, a bottom side 104 opposite to top side 102, and a set of wheels 130 mounted at bottom side 104. Chassis 110 is capable of bearing a load on top side 102, and movable relative to a surface e.g. a floor or a ground, via the support of wheels 130, for movement and transportation of the load.

Chassis 110 has a center portion 112 on which the load maybe borne, and a periphery 120 surrounding center portion 112. At a first portion 1201 of periphery 120, there is mounted a first connection member 161. A second connection member 162 which can be

30

engaged to first connection member 161, is mounted at a second portion 1202 of periphery 120.

5 In the present embodiment, first connection member 161 is a locking rod assembly having a base plate 1612 and a locking rod 1614 fixed to base plate 1612. Base plate 1612 is mounted to bottom side 104 of chassis 110 at first periphery portion 1201 such that locking rod 1614 is positioned outside of periphery 120. Second connection member 162 is a clamping assembly having a base frame 1622, a latch 1624 coupled to base frame 1622, and an actuator 1626 coupled to base frame 1622 and latch 1624. Second connection member 10 162 is mounted within a notch 1212 formed on the second periphery portion 1202, with latch 1624 positioned inside periphery 120.

As shown in Figs. 6 to 8, when a first one of such trolley 100a and a second one of such trolley 100b of same structure as first trolley 100a are placed next to each other, the 15 second portion 1202 of first trolley 100a is positioned adjacent to the first portion 1201 of second trolley 100b. Movement of trolleys 100a and 100b toward each other along a locking direction 16, locking rod 1614 of first connection member 161 mounted on second trolley 100b enters into notch 1212 and is engaged with latch 1624 of second connection member 162 mounted on first trolley 100a. As such, first trolley 100a and second trolley 100b are 20 jointed together and locked to each other, along one dimension X-X as shown in Fig. 7.

By being locked to each other, first and second trolleys 100a and 100b form a trolley assembly 1002 of a doubled load and transportation capacity as individual trolley 100a or 100b. Using the trolley assembly 1002, more loads can be carried around within one 25 movement cycle, and by one operator, hence the transportation efficiency is increased without increasing the total height of the loads stacked on the chassis.

When first and second trolleys 100a and 100b are jointed and locked to form the trolley assembly 1002, first connection member 161 of first trolley 100a becomes the first 30 connection member 161 of the trolley assembly 1002, and second connection member 162 of second trolley 100b becomes the second connection member 162 of the trolley assembly 1002. As such, the trolley assembly 1002 can be further joined and locked with one or more

trolleys in a same manner, for example with trolley 100c of the same structure as first and second trolleys 100a, 100b, to form a larger trolley assembly 1004 along the same X-X dimension, as shown in Fig. 9.

5           When it is desired to separate the trolley assembly 1002 or 1004 into individual trolleys, for instance after the transportation is completed and for storage purpose, latch 1624 may be unlocked by activating the actuator 1626 such that locking rod 1614 is disengaged from latch 1624 to allow separation of the trolley assembly. The separated trolleys can be carried and stored individually, and ready for being combined again for next time use.

10           Referring to Fig. 1 again, chassis 110 of trolley 100 maybe rectangular shaped, and periphery 120 includes a first side 121, a second side 122 opposite and parallel to first side 121, a third side 123 bridging first and second sides 121, 122 at one end of chassis 110, and a fourth side 124 bridging first and second sides 121, 122 at another end of chassis 110, and  
15           opposite and parallel to third side 123.

          In addition to having first locking member 161 mounted to first side 121 and second connection member 162 mounted to second side 122, trolley 100 may further include a third connection member 163 and a fourth connection member 264 which can be engaged to third  
20           connection member 163. Third connection member 263 is mounted to third side 123, and fourth connection member 164 is mounted to fourth side 124.

          Third connection member 163 may be the same type and structure as the first connection member 161, and the fourth connection member 164 may be the same type and  
25           structure as the second connection member. Four trolleys 100a', 100b', 100c' and 100d' of the type having rectangular chassis and with first, second, third and fourth connection members mounted on the chassis in the manner illustrated above, may be joined and locked together, to form a trolley assembly 1006 of a double length and double width, e.g. along two dimensions X-X and Y-Y, as shown in Fig. 10.

30           According to another embodiment, as shown in Figs. 11, 12 and 13, a trolley 200 includes a rectangular chassis 210 having a top side 202, a bottom side 204 opposite to top

side 202, and a set of wheels 230 mounted at bottom side 204 for movably supporting chassis 210 on a surface e.g. a floor, a ground, etc.

Chassis 210 has a center portion 212 and a periphery of four side edges 221, 222, 223 and 224 surrounding center portion 212. First, second, third and fourth connection members 261, 262, 263 and 264 are mounted to first, second, third and fourth side edges 221, 222, 223 and 224, respectively. First and third connection members 261 and 263 may be the type of locking pin assembly the same as that described in the previous embodiment. Second and fourth connection members 262 and 264 maybe the type of complementary clamping assembly, lockable to corresponding first and third connection members 261, 263 in the same manner as that described in the previous embodiment.

Trolley 200 includes a set of base blocks 240 each being disposed at a corner portion of bottom side 204 of chassis 210, and between the bottom side 204 of chassis 210 and one of the set of wheels 230. The set of base blocks 240 protrudes downwardly from the bottom side 204 of chassis 210. Base blocks 240 define an outer contour 2402 as shown in Fig. 13 by double-dotted dash lines, which envelops the set of blocks 240.

Extending upwardly (Z+ direction in Fig. 11) from each side edges 221, 222, 223 and 224 there are formed a first sidewall 251, a second sidewall 252, a third sidewall 253 and a fourth sidewall 254, respectively. The four sidewalls 251, 252, 253 and 254 and chassis 210 form a recess within which a load, such as a stack of chairs 12 can be received and secured for transportation, as shown in Fig. 12. The sidewalls increase the strength and rigidity of chassis 210, and also serve to prevent slippage of the load off the trolley.

25

Each of the four sidewalls 251, 252, 253 and 254 has a height slightly greater than the overall height of the wheel 230 and a corresponding base block 240. Preferably, the recess is configured to define an inner contour 2502 the same shape and dimension as the outer contour 2402. When two or more trolleys are stacked together, as shown in Figs. 14 and 15, the set of base blocks 240 and wheels 230 of an upper trolley are received into the space formed by the sidewalls of an underneath trolley. In addition, the set of blocks 240 of the upper trolley is tightly fit between the sidewalls of the underneath trolley, hence relative

30

movement between the stacked trolleys along a direction (X or Y direction) parallel to the chassis, is prevented. Storage of the trolleys can therefore be in a more organized manner, and better management and optimization of warehouse space and operation can be achieved.

5            Preferably, trolley 200 further includes first, second, third and fourth guiding members each being mounted to the chassis, to assist easy and correct positioning of two or more trolleys during the joining operation. The first guiding members may include first sidewall 251 and a first ridge 271 projected outwardly along a direction perpendicular to first  
10            sidewall 251. The second guiding member may include second sidewall 252a and a first slot 272 formed on second sidewall 252. First slot 272 preferably has a complementary shape and dimension with respect to first ridge 271, and positioned in alignment with first ridge 271 along a direction perpendicular to first and third sidewalls 251, 252.

15            The third guiding member may include a second ridge 273 projected outwardly along a direction perpendicular to third sidewall 253. The fourth guiding member may include a second slot 274 formed on fourth sidewall 254. Second slot 274 preferably has a complementary shape and dimension with respect to second ridge 273, and positioned in alignment with second ridge 273, along a direction perpendicular to third and fourth sidewalls 253, 254.

20            Preferably, first ridge 271 is positioned in alignment with first connection member 261 along a direction perpendicular to chassis 210, i.e. along Z-Z direction depicted in Fig. 11, and first slot 272 is positioned in alignment with second connection member 262 along a direction perpendicular to chassis 210, i.e. along Z-Z direction depicted in Fig. 11. Likewise,  
25            second ridge 273 is positioned in alignment with third connection member 263 along a direction perpendicular to chassis 210, i.e. along Z-Z direction depicted in Fig. 11, and second slot 274 is positioned in alignment with fourth connection member 264 along a direction perpendicular to chassis 210, i.e. along Z-Z direction depicted in Fig. 11.

30            Trolley 200 may include a strengthening frame 282 mounted to second sidewall 252 and surrounding first slot 272, to increase the strength of first slot 272. Trolley 200 may also include a partition wall 255 which is positioned between first sidewall 251 and second

sidewall 252, and parallel to third and fourth sidewalls 253, 254. Partition wall 255 divides chassis 210 into a main region 214a and an auxiliary region 214b. Main region 214a may be used for receiving chairs stacked thereon. Auxiliary region 214b is reserved as a counter balance in situations where the stacked chairs are shifted horizontally with more chairs stacked, as shown in Fig. 12 for example. In such situations, the chairs 12 are placed on the main region 214a with the horizontal-shifting direction facing auxiliary region 214b.

In use, two or more trolleys 200 may be combined together to form a larger trolley assembly. Shown in Figs. 16 to 22 as an example, four trolleys 200a, 200b, 200c and 200c of same structure as trolley 200 described above, are arranged along the same orientation, and placed next to each other such that the first slot 272 of first trolley 200a is in alignment along a direction perpendicular to first and second sidewalls 251, 252, with the first ridge 271 of second trolley 200b. The first and second trolleys 200a, 200b are then moved toward each other such that first ridge 271 of second trolley 200b is inserted into first slot 272 of first trolley 200a. Positional relationship and accuracy between first and second trolleys 200a and 200b are achieved by which, first connection member 261 of second trolley 200b is in alignment with second connection member 262 of first trolley 200a. Movement of first and second trolleys 200a and 200b toward each other will then cause the first and second trolleys 200a and 200b to join and lock to each other. Following the alignment and locking operation described above, trolleys 200a, 200b, 200c and 200b can be combined into a trolley assembly 2002 of an overall chassis dimension doubled along both the X-X and Y-Y dimension, as shown in Fig. 18, i.e. a trolley assembly of a loading and transportation capacity 4 times as that of an individual trolley is formed. When in use, the combined trolley 2002 is capable of carrying and movement together four stacks of chairs 20a, 20b, 20c and 20d, as shown in Fig. 22.

Although embodiments of the present invention have been illustrated in conjunction with the accompanying drawings and described in the foregoing detailed description, it should be appreciated that the present invention is not limited to the embodiments disclosed. Therefore, the present invention should be understood to be capable of numerous rearrangements, modifications, alternatives and substitutions without departing from the spirit of the invention as set forth and recited by the following claims.

## CLAIMS

1. A modular trolley comprising:

a chassis having a bottom side, a top side opposite to the top side, a center portion  
5 and a periphery surrounding the center portion;

a set of wheels mounted to the bottom side of the chassis for movably supporting  
the chassis on a surface;

a first connection member mounted to a first portion of the periphery;

10 a second connection member engagable to the first connection member of another  
modular trolley of same structure as the modular trolley, the second  
connection member being mounted to a second portion of the periphery  
wherein the second connection member being engagable to the first connection  
member of another modular trolley of same structure as the modular trolley  
along a locking direction,

15 wherein the trolley comprising a first guiding member mounted to the chassis and  
adjacent to the first connection member and a second guiding member  
engagable to the first guiding member of the another modular trolley of same  
structure as the modular trolley along the locking direction, the second guiding  
member being mounted to the chassis and adjacent to the second connection  
20 member..

2. The modular trolley as recited in claim 1, wherein when a first one of such trolley and  
a second one of such trolley are brought together with the second portion of the first  
one of such trolley positioned adjacent to the first portion of the second one of such  
25 trolley, the second connection member of the first one of such trolley is engaged to  
the first connection member of the second one of such trolley to lock the first one of  
such trolley and the second one of such trolley to each other.

30 3. The modular trolley as recited in claim 1, wherein

the first guiding member includes a first sidewall extending upwardly from the first portion of the periphery and a ridge extending outwardly from the first sidewall;

the second guiding member includes a second sidewall extending upwardly from the second portion of the periphery and a slot formed on the second sidewall; the first and second sidewalls are parallel to each other, and the ridge and the slot are aligned along a direction perpendicular to the first and second sidewalls.

- 10 4. The modular trolley as recited in claim 3, wherein the ridge is in alignment with the first connection member along a direction perpendicular to the chassis.
5. The modular trolley as recited in claim 3, wherein the slot is in alignment with the second connection member along a direction perpendicular to the chassis.
- 15 6. The modular trolley as recited in claim 3, further comprising a strengthening frame mounted to the second sidewall and surrounding the slot.
7. The modular trolley as recited in claim 3, further comprising a partition wall  
20 positioned between the first sidewall and the second sidewall, wherein the partition wall divides the chassis into a main region and an auxiliary region.
8. The modular trolley as recited in claim 1, wherein the first connection member is a locking rod assembly comprising a base plate and a locking rod coupled to the base  
25 plate, and the second connection member is a clamping assembly comprising a base frame, a latch coupled to the base frame operable to engage with the locking rod, and an actuator configured to unlock the latch.
9. The modular trolley as recited in claim 1, further comprising:  
30 a set of sidewalls extending upwardly from the periphery, the sidewalls form a recess surrounded therein;

a set of base blocks extending downwardly from the bottom side of the chassis,  
each base block being disposed between the chassis and one of the set of  
wheels,

wherein when a first one of such trolley is stacked onto a second one of such  
5 trolley, the set of base blocks and set of wheels of the first one of such trolley  
are received into the recess of the second one of such trolley.

10. The modular trolley as recited in claim 9, wherein the set of base blocks define an  
outer contour enveloping the base blocks, the recess define an inner contour shaped  
10 and dimensioned the same as the outer contour such that when the first one of such  
trolley is stacked onto the second one of such trolley, each base block of the first one  
of such trolley is in contact with two of the sidewalls of the second one of such trolley  
to prevent relative movement of the first and second one of such trolleys along a  
direction parallel to the chassis.

11. The modular trolley as recited in claim 1, wherein the chassis is rectangular shaped  
and the periphery includes a first side, a second side opposite to and parallel to the  
first side, a third side bridging the first and second sides at one end of the chassis, and  
a fourth side bridging the first and second sides at another end of the chassis and  
15 parallel to the third side, wherein the first portion is located at the first side to which  
the first connection member is mounted, and the second portion is located at the  
20 second side to which the second connection member is mounted.

12. The modular trolley as recited in claim 11, further comprising a third connection  
25 member mounted to the third side of the periphery, and a fourth connection member  
engagable to the third connection member of another modular trolley of same  
structure as the modular trolley, the forth connection member mounted to the fourth  
side of the periphery.

13. The trolley as recited in claim 12, wherein the third connection member is the same as  
30 the first connection member, and the fourth connection member is the same as the  
second connection member.

14. A trolley assembly comprising:

a first trolley and a second trolley each including:

a chassis having a top side, a bottom side opposite to the top side, a center  
portion and a periphery surrounding the center portion;

a set of wheels mounted at the bottom side of the chassis for movably  
supporting the chassis on a surface;

a first connection member mounted to a first portion of the periphery;

a second connection member engagable to the first connection member of the  
other trolley along a locking direction, the second connection member  
being mounted to a second portion of the periphery;

a first guiding member mounted to the chassis and adjacent to the first  
connection member, and

a second guiding member engagable to the first guiding member of the other  
trolley along the locking direction, the second guiding member being  
mounted to the chassis and adjacent to the second connection member,

wherein the first guiding member of the second trolley is engaged to the second  
guiding member of the first trolley,

wherein the second portion of the first trolley is positioned adjacent to the first  
portion of the second trolley, and

wherein the second connection member of the first trolley is engaged to the first  
connection member of the second trolley to lock the first and second trolley to  
each other.

15. The trolley assembly as recited in claim 14, further comprising an actuator coupled to  
one of the first and second connection members for unlocking the first and second  
connection members from each other.