CLAIMS

1. An assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) configured to allow formation of a nested pallet assembly (1000; 1000*) of at least two pallet modules (10; 20; 30; 40; 10*; 20*; 30*) selected from the assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*), which nested pallet assembly (1000; 1000*) is configured to act as a self-supporting platform allowing the handling and transportation of goods, each pallet module (10; 20; 30; 40; 10*; 20*; 30*) comprising:

- a main structural body (100; 200; 300; 400; 100*; 200*; 300*) exhibiting a generally quadrilateral peripheral border (100A; 200A; 300A; 400A; 100A*; 200A*; 300A*) with first to fourth lateral sides (101-104; 201-204; 301-304; 401-404; 101*-104*; 201*-204*; 301*-304*) extending between upper and lower sides (100B, 100C; 200B, 200C; 300B, 300C; 400B, 400C; 100B*, 100C*; 200B*, 200C*; 300B*, 300C*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*);

- a mating system (110, 120, 130, 140; 210, 220, 230, 240; 310, 320, 330, 340; 410, 420, 430, 440; 110*, 120*, 130*, 140*; 210*, 220*, 230*, 240*; 310*, 320*, 330*, 340*) provided on the first to fourth lateral sides (101-104; 201-204; 301-304; 401-404; 101*-104*; 201*-204*; 301*-304*of the main structural body (100; 200; 300; 400; 100*; 200*; 300*) configured to allow nesting of the pallet module (10; 20; 30; 40; 10*; 20*; 30*) within a corresponding part of the mating system (110, 120, 130, 140; 210, 220, 230, 240; 310, 320, 330, 340; 410, 420, 430, 440; 110*, 120*, 130*, 140*; 210*, 220*, 230*, 240*; 310*, 320*, 330*, 340*) of another pallet module (10; 20; 30; 40; 10*; 20*; 30*) of the assortment;

- a securing system (51-54) configured to allow the pallet module (10; 20; 30; 40; 10*; 20*; 30*) to be secured to or released from another pallet module (10; 20; 30; 40; 10*; 20*; 30*) of the assortment; and

- a foot structure (90; 90*) disposed on the lower side (100C; 200C; 300C; 400C; 100C*; 200C*; 300C*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*),

characterized in that the pallet modules (10; 20; 30; 40; 10*; 20*; 30*) are produced in at least two different sizes and in that said assortment of pallet

modules (10; 20; 30; 40; 10*; 20*; 30*) includes a unit-size pallet module (10; 40; 10*) whose main structural body (100; 400; 100*) exhibits a unit size and at least one larger-size pallet module (20; 30; 20*; 30*) whose main structural body (200; 300; 200*; 300*) exhibits a length (L2; L3) corresponding to an integer multiple of a length (L1) of the main structural body (100; 400; 100*) of the unit-size pallet module (10; 40; 10*), the unit-size pallet module (10; 40; 10*) and each larger-size pallet module (20; 30; 20*; 30*) being combinable with one another.

2. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 1, wherein the length (L2; L3) of the main structural body (200; 300; 200*; 300*) of each larger-size pallet module (20; 30; 20*; 30*) is at least twice the length (L1) of the main structural body (100; 400; 100*) of the unit-size pallet module (10; 40; 10*).

3. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 1 or 2, wherein the peripheral border (100A; 400A; 100A*) of the main structural body (100; 400; 100*) of the unit-size pallet module (10; 40; 10*) exhibits a square shape.

4. The assortment of pallet modules (10*; 20*; 30*) according to claim 3, wherein the peripheral border (200A*; 300A*) of the main structural body (200*; 300*) of each larger-size pallet module (20*; 30*) exhibits a square shape.

5. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, including at least two types of larger-size pallet modules (20; 30; 20*; 30*), namely a medium-size pallet module (30; 20*) and a large-size pallet module (20; 30*).

6. The assortment of pallet modules (10*; 20*; 30*) according to claim 5, wherein the peripheral border (200A*) of the main structural body (200*) of the medium-size pallet module (20*) exhibits a length (L2) that is twice the length (L1) of the main structural body (100*) of the unit-size pallet module (10*),

and wherein the peripheral border (300A*) of the main structural body (300*) of the large-size pallet module (30*) exhibits a length (L3) that is at least three times the length (L1) of the main structural body (100*) of the unit-size pallet module (10*).

7. The assortment of pallet modules (10*; 20*; 30*) according to claim 6, wherein the peripheral border (300A*) of the main structural body (300*) of the large-size pallet module (30*) exhibits a length (L3) that is four times the length (L1) of the main structural body (100*) of the unit-size pallet module (10*).

8. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the length (L1) of the main structural body (100; 400; 100*) of the unit-size pallet module (10; 40; 10*) is comprised within a range of 150 to 300 mm.

9. The assortment of pallet modules (10*; 20*; 30*) according to claim 8, wherein the length (L1) of the main structural body (100*) of the unit-size pallet module (10*) is selected to be of 180-192 mm, 239-256 mm or 272-288 mm.

10. The assortment of pallet modules (10; 20; 30) according to claim 3, including at least two types of larger-size pallet modules (20; 30), namely a medium-size pallet module (30) and a large-size pallet module (20),

wherein the peripheral border (300A) of the main structural body (300) of the medium-size pallet module (30) exhibits a rectangular shape having a length (L3) equal to twice the length (L1) of the main structural body (100) of the unit-size pallet module (10) and a width (W3) which is less than twice the length (L1) of the main structural body (100) of the unit-size pallet module (10),

and wherein the peripheral border (200A) of the main structural body (200) of the large-size pallet module (20) exhibits a square shape having a length (L2) equal to twice the length (L1) of the main structural body (100) of the unit-size pallet module (10).

11. The assortment of pallet modules (10; 20; 30) according to claim 10, wherein the length (L1) of the main structural body (100) of the unit-size pallet module (10) is of approximately 300 mm.

12. The assortment of pallet modules (10; 20; 30) according to claim 11, wherein a size of the medium-size pallet module (30) corresponds to substantially a quarter of the size of a standard Euro-pallet, the length (L3) and width (W3) of the main structural body (300) of the medium-size pallet module (30) being of approximately 600 mm and 400 mm, respectively.

13. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the length (L1; L2; L3) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*) of the pallet modules (10; 20; 30; 40; 10*; 20*; 30*) is comprised within a range of 150 mm to 1’200 mm.

14. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the mating system (110, 120, 130, 140; 210, 220, 230, 240; 310, 320, 330, 340; 410, 420, 430, 440; 110*, 120*, 130*, 140*; 210*, 220*, 230*, 240*; 310*, 320*, 330*, 340*) of each pallet module (10; 20; 30; 40; 10*; 20*; 30*) includes:

- first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) extending outwardly from the peripheral border (100A; 200A; 300A; 400A; 100A*; 200A*; 300A*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*), along the first and second lateral sides (101, 102; 201, 202; 301, 302; 401, 402; 101*, 102*; 201*, 202*; 301*, 302*); and
- first and second lateral grooves (130, 140; 230, 240; 330, 340; 430, 440; 130*, 140*; 230*, 240*; 330*, 340*) extending inwardly from the peripheral border (100A; 200A; 300A; 400A; 100A*; 200A*; 300A*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*), along the third and fourth lateral sides (103, 104; 203, 204; 303, 304; 403, 404; 103*, 104*; 203*, 204*; 303*,

304*), the first and second lateral grooves (130, 140; 230, 240; 330, 340; 430, 440; 130*, 140*; 230*, 240*; 330*, 340*) being each configured to receive the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*), respectively, of another pallet module (10; 20; 30; 40; 10*; 20*; 30*) of the assortment, so that the first, respectively second lateral flange (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) of said other pallet module (10; 20; 30; 40; 10*; 20*; 30*) nests within the first, respectively second lateral groove (130, 140; 230, 240; 330, 340; 430, 440; 130*, 140*; 230*, 240*; 330*, 340*) to form the nested pallet assembly (1000; 1000*).

15. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 14, wherein each of the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) exhibits at least one positioning notch (110A, 120A; 210A, 220A; 310A, 320A; 410A, 420A; 110A*, 120A*; 210A*, 220A*; 310A*, 320A*) formed along an outer edge of the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*),

and wherein each of the first and second lateral grooves (130, 140; 230, 240; 330, 340; 430, 440; 130*, 140*; 230*, 240*; 330*, 340*) exhibits at least one protrusion (130A, 140A; 230A, 240A; 330A, 340A; 430A, 440A; 130A*, 140A*; 230A*, 240A*; 330A*, 340A*) configured to mate with the at least one positioning notch (110A, 120A; 210A, 220A; 310A, 320A; 410A, 420A; 110A*, 120A*; 210A*, 220A*; 310A*, 320A*) provided on the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) of another pallet module (10; 20; 30; 40; 10*; 20*; 30*) of the assortment.

16. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 14 or 15, wherein the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) are offset sideways with respect to the first and second lateral sides (101, 102; 201, 202; 301, 302; 401, 402; 101*, 102*; 201*, 202*; 301*, 302*).

17. The assortment of pallet modules (10; 20; 30; 10*; 20*; 30*) according to claim 16, wherein the first and second lateral flanges (110, 120; 210, 220; 310, 320; 110*, 120*; 210*, 220*; 310*, 320*) are joined together to form an L-shaped lateral flange.

18. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 14 to 17, wherein the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) are formed integrally with the main structural body (100; 200; 300; 400; 100*; 200*; 300*).

19. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 18, wherein the main structural body (100; 200; 300; 400; 100*; 200*; 300*) and the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) are made of a plastic or biopolymer material.

20. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 19, wherein the main structural body (100; 200; 300; 400; 100*; 200*; 300*) and the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) are made of high-density polyethylene (HDPE).

21. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 19, wherein the main structural body (100; 200; 300; 400; 100*; 200*; 300*) and the first and second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*) are made of a biopolymer material.

22. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 18 to 21, wherein each pallet module (10; 20; 30; 40; 10*; 20*; 30*) further comprises a plurality of reinforcing elements (161, 162;

261, 262; 361, 362; 461, 462; 161*, 162*; 261*, 262*; 361*, 362*) extending within the main structural body (100; 200; 300; 400; 100*; 200*; 300*) and the first and/or second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*).

23. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 22, wherein the reinforcing elements (161, 162; 261, 262; 361, 362; 461, 462; 161*, 162*; 261*, 262*; 361*, 362*) are made of a metal, of a metal alloy, or of a composite material.

24. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 23, wherein the reinforcing elements (161, 162; 261, 262; 361, 362; 461, 462; 161*, 162*; 261*, 262*; 361*, 362*) are made of aluminium.

25. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 22 to 24, wherein the reinforcing elements (161, 162; 261, 262; 361, 362; 461, 462; 161*, 162*; 261*, 262*; 361*, 362*) are longitudinal rod elements extending between upper and lower surfaces of the main structural body (100; 200; 300; 400; 100*; 200*; 300*) and of the first and/or second lateral flanges (110, 120; 210, 220; 310, 320; 410, 420; 110*, 120*; 210*, 220*; 310*, 320*).

26. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the securing system (51-54) of each pallet module (10; 20; 30; 40; 10*; 20*; 30*) includes:

- first and second toggle latch components (51, 52) arranged in the vicinity of the first and second lateral sides (101, 102; 201, 202; 301, 302; 401, 402; 101*, 102*; 201*, 202*; 301*, 302*), respectively; and
- third and fourth toggle latch components (53, 54) arranged in the vicinity of the third and fourth lateral sides (103, 104; 203, 204; 303, 304; 403, 404; 103*, 104*; 203*, 204*; 303*, 304*), respectively,

the first and second toggle latch components (51, 52) being each configured to cooperate and interlock with the third and fourth toggle latch components (53, 54), respectively, of another pallet module (10; 20; 30; 40; 10*; 20*; 30*) of the assortment, to form releasable toggle latches (500) allowing the pallet module (10; 20; 30; 40; 10*; 20*; 30*) to be secured to or released from said other pallet module (10; 20; 30; 40; 10*; 20*; 30*).

27. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 26, wherein the first to fourth toggle latch components (51-54) are provided on the upper side (100B; 200B; 300B; 400B; 100B*; 200B*; 300B*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*) at least partly within recesses (151-154; 251-254; 351-354; 451-454; 151*-154*; 251*-254*; 351*-354*) formed below an upper surface of the upper side (100B; 200B; 300B; 400B; 100B*; 200B*; 300B*) of the main structural body (100; 200; 300; 400; 100*; 200*; 300*).

28. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the unit size of the unit-size pallet module (10; 40; 10*) is selected such that a total width of a pallet assembly, equalling to an integer number of times a width (L1) of the unit-size pallet module (10; 40; 10*), fits within a width of a door opening of a standard rail/sea shipping container and can occupy more than 95%, preferably more than 98%, of the width of said door opening, wherein the width of the door opening of the standard rail/sea shipping container is of approximately 2.33 meters, or 92 inches.

29. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 28, wherein the total width of the pallet assembly fitting within the width of the door opening of the standard rail/sea shipping container equals to eight times the width (L1) of the unit-size pallet module (10; 40; 10*).

30. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 1 to 27, wherein the unit size of the unit-size pallet module (10; 40; 10*) is selected such that a total width of a pallet assembly, equalling to an integer number of times a width (L1) of the unit-size pallet module (10; 40; 10*), fits within a width of a door opening of a standard truck shipping container and can occupy more than 95%, preferably more than 98%, of the width of said door opening, wherein the width of the door opening of the standard truck shipping container is of approximately 2.5 meters, or 98 inches.

31. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to claim 30, wherein the total width of the pallet assembly fitting within the width of the door opening of the standard truck shipping container equals to twelve times the width (L1) of the unit-size pallet module (10; 40; 10*).

32. The assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, wherein the pallet modules (10; 20; 30; 40; 10*; 20*; 30*) are configured to be compatible with and enable the Physical Internet (PI) global logistics model, each pallet module (10; 20; 30; 40; 10*; 20*; 30*) including a smart tag providing identification and traceability of the pallet module.

33. A pallet assembly (1000; 1000*) configured to act as a self-supporting platform allowing the handling and transportation of goods, which pallet assembly (1000; 1000*) is built of multiple pallet modules (10; 20; 30; 40; 10*; 20*; 30*) selected from the assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of the preceding claims, which pallet modules (10; 20; 30; 40; 10*; 20*; 30*) are nested within and interlocked with one another.

34. Use of the assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 1 to 32 or of the pallet assembly (1000; 1000*) according to claim 33 for freight logistics, warehousing, transport and/or shipment purposes.

35. Use of the assortment of pallet modules (10; 20; 30; 40; 10*; 20*; 30*) according to any one of claims 1 to 32 or of the pallet assembly (1000; 1000*) according to claim 33 for intralogistics purposes.