CLAIMS

1. An inspection system for container (1) which is unloaded from a ship and is to be loaded by a crane (100) in a load space; the inspection system comprising:

a laser scanner (10) which scans an exterior shape of the container (1) by emitting a laser beam to the container to be loaded in the load space; and

a control device which receives scan data obtained by the laser scanner (10) and forms a three-dimensional image of a scanning target from the received data,

wherein when the crane (100) moves the container (1) upward to load the container (1) in the load space, the laser scanner (10) is configured to scan the exterior shape of the container (1) by sequentially emitting horizontal laser beams when the crane (100) moves the container (1) upward to a height at which the laser scanner (10) is installed, and receiving the reflected laser beams, and the control device forms a three-dimensional image related to a contour of the container (1) from the scan data received from the laser scanner (10) sequentially when the crane (100) moves the container (1) upward, determines an unreleased twistlock cone and creates an alarm signal when it is determined that there is an image of a portion protruding from a profile of a lower end of the container (1).

2. The inspection system of claim 1, wherein the control device determines an abnormality and creates the alarm signal when the profile of the lower end of the container (1) is tilted from horizontality at a predetermined angle or larger in the three-dimensional image related to the contour of the container (1).

3. The inspection system of claim 1, wherein the control device determines that a door of the container (1) is opened and creates an alarm signal when it is determined that there is an image of a portion protruding from a profile of a rear surface of the container (1) in the three-dimensional image related to the contour of the container (1).

4. The inspection system of any one of claims 1 to 3, wherein multiple laser scanners (10) are provided at a height higher than a height of a transporting vehicle (2, 3) for transporting the container (1) to a traveling path outside the load space, the laser scanners (10) are spaced apart from one another with a width larger than a length of

the container (1) and emit the horizontal laser beams within a predetermined angle toward the container (1) placed on the traveling path, and the laser scanners (10) are configured such that the container (1) is placed at a position at which the horizontal laser beams emitted from the multiple laser scanners (10) overlap one another.

5. A method for inspection of unloading a container (1) from a trailer (2) of a tractor (3) using sensors for sensing the container (1) and for sensing twistlocks, characterized in that:

the unloading is effected by a gantry crane (100), while the trailer (2) is parked along a side of the gantry crane (100);

the sensors are two laser scanners (10) which are installed at a height higher than a height of the tractor and spaced apart from one another with a width larger than a length of the container (1);

the laser scanners (10) emit horizontal laser beams within predetermined angles toward the outside of the gantry crane (100) and toward the container (1) while it is moved upward from the trailer (2) by the gantry crane (100), wherein the horizontal laser beams emitted from the two laser scanners (10) overlap one another across the horizontal extension of the container (1); and

wherein when the crane (100) moves the container (1) upward to load the container in a load space, the laser scanners (10) scan the exterior shape of the container by sequentially the emitting horizontal laser beams at the height at which the laser scanners (10) are installed, and receive the reflected laser beams, and the control device forms a three-dimensional image related to a contour of the container (1) from scan data received from the laser scanners (10) sequentially when the crane (100) moves the container (1) upward and creates an alarm signal when it is determined that there is an image of a portion protruding from a profile of a lower end of the container (10) or that the lower end of the container (10) is tilted from horizontality at a predetermined angle or larger in the three-dimensional image related to the contour of the container (1).

6. An apparatus for unloading a container (1) from a trailer (2) of a tractor (3), the apparatus comprising a frame, loading means, sensors for sensing the container (1) and for sensing twistlocks, and a control device which determines an abnormality, characterized in that:

the apparatus is a gantry crane (100) having posts (110);

the sensors are two laser scanners (10) which are mounted on the posts (110) at a height higher than a height of a roof of the tractor and spaced apart from one another with a width larger than the length of a 20-feet-container;

the laser scanners (10) emit horizontal laser beams within predetermined angles toward the outside of the gantry crane (100) and toward the container (1) while it is moved upward from the trailer (2) by the gantry crane (100), wherein the horizontal laser beams emitted from the two laser scanners (10) overlap one another across the horizontal extension of the container (1); and

the control device forms a three-dimensional image related to a contour of the container (1) from scan data received from the laser scanners (10) sequentially when the crane (100) moves the container (1) upward and creates an alarm signal when it is determined that there is an image of a portion protruding from a profile of a lower end of the container (10) or that the lower end of the container (1) is tilted from horizontality at a predetermined angle or larger in the three-dimensional image related to the contour of the container (1).

7. Inspection system, method or apparatus according to any one of the preceding claims, wherein two laser scanners (10) according to claim 1 or the two laser scanners (10) according to claim 5 or 6 are configured in a pair and installed on two lateral posts or on the two posts (110) of the crane (100), respectively, and above lower support frames (150) of the crane (100) with a maximum height difference of approximately 50 mm therebetween.

8. Inspection system, method or apparatus according to any one of the preceding claims, wherein, when the container (1) is moved upward, two laser scanners (10) according to claim 1 or the two laser scanners (10) according to claim 5 or 6 emit the horizontal laser beams and receive the reflected laser beams sequentially in predetermined time intervals, and scan data obtained at one time from the received laser beams are transmitted to the control device, which forms from the scan data line-shaped images of the container which are synthesized by being stacked vertically in the time sequence, such that a three-dimensional image of the container (10) is formed.