the spreader to the container. Unlocking is accomplished by turning the locking pin back to its original position.

Rotation of the locking pins between locking and unlocking positions is usually accomplished via push rods driven by means of hydraulic cylinders. The push rods are hingedly connected to the locking pins and arranged for simultaneous rotation of locking pins operated in pairs. The rotational position of the locking pins is typically controlled by means of sensors or limit switches that control the operation of the cylinder.

A sensor controlled operation of the rotational movements of the locking pins may however involve a risk of inaccurate positioning of the locking pins in the locking and unlocking positions. Deposits of dirt, wear, and play in mountings or interference with the sensors or control signals are factors that in course of time may cause displacement of the end positions in locking and unlocking modes of the locking pins, which in turn may lead to less secure connections between the spreader and the shipping container.

SUMMARY OF THE INVENTION

The present invention aims to avoid this security risk. To that purpose, the present invention provides an arrangement wherein the locking and unlocking positions of the locking pins are positively and mechanically fixed.

More precisely, the present invention discloses a container-lifting spreader comprising locking pins that are insertable into seats formed at the corners of a shipping container and upon rotation about their longitudinal axes can be brought in locked engagement with the container, wherein the locking pins are in pairs associated with a common drive effecting simultaneous rotation of the locking pins between locking and unlocking positions, the drive comprising a reversible electric motor and a power transmission that comprises two push rods, each of which is in one end hinged to a locking pin and in the other end hinged to an operating lever included in the power transmission, and in such way that a driven movement of the operating lever is transferred via the push rods to rotational movements of the locking pins, and further wherein the power transmission comprises an input shaft driven by the motor and having an external thread, as well as an output shaft

supporting the operating lever and likewise having an external gear ring, the said shafts in threaded engagement forming an angle gear, the angle gear providing a self-locking mesh of threads such that rotation of the input shaft causes rotation of the output shaft and the operating lever, whereas the opposite is prevented by the self-locking mesh of gears, characterized in that fixed stops are arranged to mechanically limit the movement of the operating lever within an angular space, the fixed stops this way providing in cooperation with the self-locking angle gear absolute positioning of the locking pins in locking and unlocking rotational positions.

In an embodiment, there is provided a container-lifting spreader comprising locking pins for insertion in seats arranged in corners of a shipping container. By rotation about their longitudinal axes the locking pins can be brought in locking engagement with the container. The locking pins are in pairs associated with a common drive to be simultaneously rotated between locking and unlocking positions. The drive comprises a reversible motor and a power transmission including a pair of push rods, each of which is in one end hinged to a locking pin and the other end of which is hinged to an operating lever such that a driven motion of the operating lever is converted via the push rods to a rotary motion in the locking pins. The operating lever comprises an arm supported from a rotatable shaft and associated with fixed stops that limit mechanically the movement of the operating lever within an angular space that is determined through the angular

CLAIMS

1. A container-lifting spreader comprising locking pins (3,4) that are insertable into seats formed at the corners of a shipping container and upon rotation about their longitudinal axes can be brought in locked engagement with the container, wherein the locking pins are in pairs associated with a common drive (7) effecting simultaneous rotation of the locking pins between locking and unlocking positions, the drive comprising a reversible electric motor (10) and a power transmission that comprises two push rods (6), each of which is in one end hinged to a locking pin (3,4) and in the other end hinged to an operating lever (15) included in the power transmission, and in such way that a driven movement of the operating lever is transferred via the push rods to rotational movements of the locking pins, and further wherein the power transmission comprises an input shaft (18) driven by the motor and having an external thread (19), as well as an output shaft (14) supporting the operating lever and likewise having an external gear ring (20), the said shafts in threaded engagement forming an angle gear, the angle gear providing a self-locking mesh of threads such that rotation of the input shaft (18) causes rotation of the output shaft (14) and the operating lever (15), whereas the opposite is prevented by the self-locking mesh of gears, characterized in that fixed stops (16; 17) are arranged to mechanically limit the movement of the operating lever (15) within an angular space (α), the fixed stops this way providing in cooperation with the self-locking angle gear absolute positioning of the locking pins in locking and unlocking rotational positions.

2. The spreader according to claim 1, characterized in that the fixed stops (16; 17) are formed as abutting faces on a heel (13) that projects from a gear housing (11), and against which the operating lever (15) is brought in contact in the locking and unlocking positions of the locking pins.

3. The spreader according to claim 2, characterized in that the operating lever (15) extends on opposite sides of the output shaft (14) that projects form the gear housing, and two heels (13), each having two abutting faces (16; 17), are located one on each opposite side of the output shaft (14) whereby the operating lever (15) simultaneously contacts one respective abutting face on each of said two heels.

4. The spreader according to any of the previous claims, characterized in that the abutting faces (16, 16; 17, 17) are arranged at an intermediate angular distance in the order of 75-150°, and at an angular distance of 85-95° at least.

5. The spreader according to any of claims 1-4, characterized in that a sliding clutch is incorporated in the self-locking angle gear to act between the output shaft (14) and the gear ring (20) supported on the shaft.

6. The spreader according to claim 5, characterized in that the sliding clutch holds the gear ring (20) non-rotationally to the output shaft (14) by friction.

7. The spreader according to claim 6, characterized in that the sliding clutch comprises a conical ring (21) slidably supported on the output shaft (14) and arranged to be adjustably pressed against a conical inner periphery of the gear ring (20).

CLAIMS

1. A container-lifting spreader comprising locking pins that are insertable into seats formed at the corners of a shipping container and upon rotation about their longitudinal axes can be brought in locked engagement with the container, wherein the locking pins are in pairs associated with a common drive effecting simultaneous rotation of the locking pins between locking and unlocking positions, the drive comprising a reversible electric motor and a power transmission that comprises two push rods, each of which is in one end hinged to a locking pin and in the other end hinged to an operating lever included in the power transmission, and in such way that a driven movement of the operating lever is transferred via the push rods to rotational movements of the locking pins, and further wherein the power transmission comprises an input shaft driven by the motor and having an external thread, as well as an output shaft supporting the operating lever and likewise having an external gear ring, the said shafts in threaded engagement forming an angle gear, the angle gear providing a self-locking mesh of threads such that rotation of the input shaft causes rotation of the output shaft and the operating lever, whereas the opposite is prevented by the self-locking mesh of gears, characterized in that fixed stops are arranged to mechanically limit the movement of the operating lever within an angular space, the fixed stops this way providing in cooperation with the self-locking angle gear absolute positioning of the locking pins in locking and unlocking rotational positions.

2. The spreader according to claim 1, characterized in that the fixed stops are formed as abutting faces on a heel that projects from a gear housing, and against which the operating lever is brought in contact in the locking and unlocking positions of the locking pins.

3. The spreader according to claim 2, characterized in that the operating lever extends on opposite sides of the output shaft that projects form the gear housing, and two heels, each having two abutting faces, are located one on each opposite side of the output shaft whereby the operating lever simultaneously contacts one respective abutting face on each of said two heels.

4. The spreader according to claim 3, characterized in that the abutting faces are arranged at an intermediate angular distance in the order of 75-150°, and at an angular distance of 85-95° at least.

5. The spreader according to claim 4, characterized in that a sliding clutch is incorporated in the self-locking angle gear to act between the output shaft and the gear ring supported on the shaft.

6. The spreader according to claim 2, characterized in that a sliding clutch is incorporated in the self-locking angle gear to act between the output shaft and the gear ring supported on the shaft.

7. The spreader according to claim 3, characterized in that a sliding clutch is incorporated in the self-locking angle gear to act between the output shaft and the gear ring supported on the shaft.

8. The spreader according to claim 1, characterized in that a sliding clutch is incorporated in the self-locking angle gear to act between the output shaft and the gear ring supported on the shaft.

9. The spreader according to claim 8, characterized in that the sliding clutch holds the gear ring non-rotationally to the output shaft by friction.

10. The spreader according to claim 9, characterized in that the sliding clutch comprises a conical ring slidably supported on the output shaft and arranged to be adjustably pressed against a conical inner periphery of the gear ring.