

# **FAILURE PROTECTION DEVICE AND METHOD FOR LOCK OF SPREADER FOR CONTAINER**

## **CROSS-REFERENCE TO RELATED APPLICATION**

**[0001]** The application claims a priority of Chinese Patent Application No. 202111340123.6, filed on November 12, 2021, and entitled “FAILURE PROTECTION DEVICE AND METHOD FOR LOCK OF SPREADER FOR CONTAINER”, the disclosure of which is hereby incorporated by reference in its entirety.

## **TECHNICAL FIELD**

**[0002]** The disclosure relates to the technical field of logistics transportation, and in particular to a failure protection device and a method for a lock of a spreader for a container.

## **BACKGROUND**

**[0003]** In the field of logistics, containers, with their standardized advantages, are widely applied to global ships, ports, routes, highways, transfer stations, bridges, tunnels, multimodal transport and other supporting logistics systems. Therefore, many apparatuses are involved in a handling of the containers, for example, a stacker, a front crane, a gantry crane, a bridge crane, a quay crane, a yard crane, a freight electric multiple unit (EMU) and so on.

**[0004]** However, at present, most of the apparatuses for the handling of the containers are provided with spin locks corresponding to lock holes at four corners located at a top of the containers. By rotating and locking the spin locks, a connection for the apparatuses with the containers is achieved, so that a hoisting and falling of the containers is completed. Once the spin locks fail, the containers will fall, resulting in a damage to the containers and the apparatuses and safety accidents.

## **SUMMARY**

**[0005]** The disclosure provides a failure protection device and a method for a lock of a spreader for a container, aiming to solve technical problems in the existing art at least to some extent, that falling of containers causing a damage to containers and apparatuses and safety accidents.

**[0006]** In one aspect, the disclosure provides a failure protection device for a lock of a spreader for a container, adapted to hoist the container through the spreader, including: a driving member, disposed on the spreader and having an output end that is capable of moving back and forth; a connecting rod, having a first end and a second end opposite to each other, wherein the first end of the connecting

rod is connected to the output end of the driving member; a first support, disposed on the spreader and below the driving member; and a lock member, one end of which is movably connected to the first support, a middle portion of which is rotatably connected to the second end of the connecting rod, and another end of which is provided with a lock hook that is capable of being inserted into a lock hole on the container.

**[0007]** In another aspect, the disclosure provides a failure protection method for a lock of a spreader for a container, based on the failure protection device for the lock of the spreader for the container above-mentioned, including: driving, by the driving member and through the connecting rod, the lock member to turn over upwards, and the lock hook of the lock member to turn over upwards, to make the failure protection device at an unlock position; assembling a container to the spreader; driving, by the driving member through the connecting rod, the lock member to turn over downwards for a first stroke; in the first stroke, the lock hook of the lock member turns over downwards, so that the rotating shaft is rotated in the first through hole of the lock member relative to the first through hole, thus the lock hook is inserted into the lock hole on the container, to make the failure protection device at an lock position; and driving, by the driving member through the connecting rod, the lock member to turn over and move downwards for a second stroke, or through a dead weight of the lock member, the lock hook of the lock member turns over and moves downwards for a second stroke, so that the rotating shaft is relatively rotated into the second through hole for locking the lock member, to make the failure protection device in a lock protection station.

**[0008]** According to the failure protection device for the lock of the spreader for the container provided by the disclosure, the driving member on the spreader is controlled to act, to drive the connecting rod to move, and one end of the locking member is driven to rotate around the first support, so that the lock hook at the other end of the locking member is inserted into the lock hole on the container. Therefore, an apparatus for a handling of the container can be prevented from falling due to a failure of the lock, thereby well protecting the operation safety, reducing economic losses and casualties, and having a good practical value.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** FIG. 1 is an installation schematic diagram of a failure protection device for a lock of a spreader for a container according to some embodiments of the disclosure;

**[0010]** FIG. 2 is a structural schematic view of a lock member in FIG. 1;

**[0011]** FIG. 3 is a structural schematic view of a rotating shaft in FIG. 1;

**[0012]** FIG. 4 is a flow chart of a failure protection method for a lock of a spreader for a container according to some embodiments of the disclosure;

**[0013]** FIG. 5 is a state schematic view of the failure protection device shown in FIG. 1 at an unlock position;

**[0014]** FIG. 6 is a state schematic view of the failure protection device shown in FIG. 1 at a lock position; and

**[0015]** FIG. 7 is a state schematic view of the failure protection device shown in FIG. 1 at a lock protection position.

#### DETAILED DESCRIPTION

**[0016]** FIG. 1 is an installation schematic diagram of a failure protection device for a lock of a spreader for a container according to some embodiments of the disclosure. Referring to FIG. 1, according to some embodiments of the disclosure, the failure protection device for the lock of the spreader for the container is adapted to hoist the container by the spreader, and mainly includes a driving member 2, a connecting rod 3, a first support 4 and a lock member 5.

**[0017]** FIG. 2 is a structural schematic view of the lock member in FIG. 1. Referring to FIG. 1 and FIG. 2, the driving member 2 is disposed on the spreader 7 and has an output end that is capable of moving back and forth. The connecting rod 3 has a first end and a second end opposite to each other, and the first end of the connecting rod 3 is connected to the output end of the driving member 2. The first support 4 is disposed on the spreader 7 and below the driving member 2. For the lock member 5, one end is movably connected to the first support 4, a middle portion is rotatably connected to the second end of the connecting rod 3, and another end is provided with a lock hook 51 that is capable of being inserted into a lock hole 81 on the container 8.

**[0018]** In practice, the driving member 2 on the spreader 7 may be controlled to drive the connecting rod 3 to move, and then one end of the lock member 5 can be driven to rotate around the first support 4, to make the lock hook 51 at another end of the lock member 5 insert into the lock hole 81 on the container 8. Therefore, an apparatus for handling of the container can be prevented from falling due to a failure of the lock, thereby well protecting the operation safety, reducing economic losses and casualties, and having a good practical value.

**[0019]** Referring to FIG. 1, the failure protection device further includes a second support 1 fixedly arranged on the spreader 7, and the driving member 2 is fixedly disposed on the second support 1.

**[0020]** The driving member 2 is a power source of the whole failure protection device. The driving

member 2 may be a linear reciprocating mechanism such as an electric push rod, a hydraulic cylinder, an air cylinder and an electric cylinder and the like, and is not limited in the disclosure.

**[0021]** Referring to FIG. 1, the output end of the driving member 2 is capable of being extended and retracted back and forth along a vertical direction. By controlling an extension and retraction of the output end of the driving member 2, the lock member 5 may be driven to rotate around the first support 4 by the connecting rod 3, to make the lock hook 51 at another end of the lock member 5 act.

**[0022]** In other embodiments, the output end of the driving member 2 may also be capable of being extended and retracted back and forth along an oblique direction, which is not limited in the disclosure.

**[0023]** Referring to FIG. 1, in some embodiments, the first end of the connecting rod 3 may be rotatably connected to the output end of the driving member 2 through a pin shaft.

**[0024]** Referring to FIG. 1, the first support 4 may be fixed on an outer side wall of the spreader by means of assembly welding. A rotating shaft 6 may be fixedly disposed on the first support 4, and the one end of the lock member 5 is movably connected to the rotating shaft 6. When the output end of the driving member 2 is extended and retracted, the connecting rod 3 drives the lock member 5 to rotate around the rotating shaft 6 on the first support 4, to make the lock hook 51 at another end of the lock member 5 act.

**[0025]** FIG. 3 is a structural schematic diagram of the rotating shaft in FIG. 1. Referring to FIG. 3, two sides of a peripheral surface of the rotating shaft 6 are first planes. That is, a radial section of the rotating shaft 6 is a circle with two sides of the peripheral surface being cut.

**[0026]** Referring to FIG. 3, the first planes are disposed along a vertical direction. Certainly, the first planes may be disposed along other direction.

**[0027]** Referring to FIG. 2, the one end of the lock member 5 is provided with a first connecting hole 52, and the first connecting hole 52 includes a first through hole 521 and a second through hole 522 that are communicated. The rotating shaft 6 is movably connected in the first through hole 521. That is, the rotating shaft 6 may be rotated in the first through hole 521. The second through hole 522 has second planes which are opposite. When the rotating shaft 6 is located in the second through hole 522, the second planes are tightly attached to the first planes at a same side. The use of an arrangement of the first connecting hole 52 will be described below.

**[0028]** Referring to FIG. 2, the lock member 5 may be shaped in a special shape. The middle portion of the lock member 5, is disposed at a side of the lock member 5 where a connecting line between an end and another end of the lock member 5 faces the driving member 2.

**[0029]** Referring to FIG. 2, the middle portion of the lock member 5, is provided with a second connecting hole 53 for connecting the second end of the connecting rod 3. The second end of the connecting rod 3 may also be rotatably connected in the second connecting hole 53 through a pin shaft.

**[0030]** Referring to FIG. 2, the second connecting hole 53 has a waist shape, and a length direction of the waist shape is parallel to the first planes. That is, the second end of the connecting rod 3, while being rotated in the second connecting hole 53, may also be moved in the second connecting hole 53 along the length direction of the second connecting hole 53.

**[0031]** In some embodiments, the spreader 7 of each container is provided with at least two failure protection devices, and preferably provided with four failure protection devices, which are respectively disposed at both sides of the spreader 7 of the container in the length direction.

**[0032]** Based on the above-mentioned failure protection device for the lock of the spreader for the container, the disclosure also provides a failure protection method for the lock of the spreader for the container. FIG. 4 is a flow chart of the failure protection method for the lock of the spreader for the container according to some embodiments of the disclosure, which includes steps S1 to S4.

**[0033]** In step S1, the driving member 2 drives the lock member 5 to turn over upwards and the lock hook 51 of the lock member 5 to turn over upwards through the connecting rod 3, to make the failure protection device at an unlock position, as shown in FIG. 5.

**[0034]** As shown in FIG. 5, in step S1 of the disclosure, when the failure protection device is at the unlock position, the lock hook 51 of the lock member 5 is located above the lock hole 81 of the container 8.

**[0035]** In step S2, a container is assembled to the spreader. This is the existing art and will not be described herein.

**[0036]** In step S3, through the connecting rod 3, the driving member 2 drives the lock member 5 to turn over downwards for a first stroke. In the first stroke, the lock hook 51 of the lock member 5 turns over downwards, so that the rotating shaft (6) is rotated in the first through hole 521 of the lock member 5 relative to the first through hole 521, thus the lock hook 51 being inserted into the lock hole 81 on the container 8, to make the failure protection device at a lock position, as shown in FIG. 6.

**[0037]** In step S4, through the connecting rod 3, the driving member 2 drives the lock member 5 to turn over and move downwards for a second stroke, or through a dead weight of the lock member 5, the lock hook 51 of the lock member 5 turns over and moves downwards for a second stroke, so that

the rotating shaft 6 is relatively rotated into the second through hole 522 for locking the lock member 5, thus the turning over of the lock member 5 is limited, making the failure protection device in a lock protection station.

**[0038]** When the lock of the spreader of the container fails, the container falls downwards under the action of a gravity, and acts on the lock hook 51 of the lock member 5, thus the lock member 5 will remain motionless, so that the container is effectively prevented from falling, and the safety of the container is ensured.

**[0039]** Referring to FIG. 4 to FIG. 7, an action process that the lock hook 51 of the lock member 5 of the failure protection device moves from an unlock state to a lock protection state is described above. On the contrary, is an action process that the lock hook 51 of the lock member 5 of the failure protection device moves from the lock protection state to the unlock state, which will not be described in the disclosure herein.

**[0040]** The failure protective device and method of the lock of the spreader of the container provided by the disclosure are simple in action, and safe and reliable in operation. Therefore, the falling risk caused by the lock failure of an apparatus for handling of the container in the existing art is quickly and effectively solved; the operation safety is well ensured; and economic losses and casualties are reduced. Thus, the failure protective device and method have good practical value.

**[0041]** The above-mentioned embodiments are the preferred embodiments of the disclosure, merely used for convenience of explaining the disclosure, and do not limit the disclosure in any form. For any person has ordinary knowledge in the technical field, without departing from a scope of technical features provided by the disclosure, equivalent embodiments made partial changes or modifications by using technical content disclosed in the disclosure do not depart from the technical features of the disclosure, and are all still belong to the scope of the technical features of the disclosure.

## CLAIMS

1. A failure protection device for a lock of a spreader for a container, adapted to hoist the container through the spreader, characterized in that, comprising:

a driving member (2), disposed on the spreader (7) and having an output end that is capable of moving back and forth;

a connecting rod (3), having a first end and a second end opposite to each other, wherein the first end of the connecting rod (3) is connected to the output end of the driving member (2);

a first support (4), disposed on the spreader (7) and below the driving member (2); and

a lock member (5), one end of which is movably connected to the first support (4), a middle portion of which is rotatably connected to the second end of the connecting rod (3), and another end of which is provided with a lock hook (51) that is capable of being inserted into a lock hole (81) on the container (8).

2. The failure protection device for the lock of the spreader for the container according to claim 1, further comprising:

a second support (1), fixedly arranged on the hanger, wherein the driving member (2) is fixedly disposed on the second support (1).

3. The failure protection device for the lock of the spreader for the container according to claim 1, wherein the output end of the driving member (2) is capable of being extended and retracted back and forth along a vertical direction.

4. The failure protection device for the lock of the spreader for the container according to any one of claims 1-3, wherein, a rotating shaft (6) is fixedly disposed on the first support (4), and wherein the one end of the lock member (5) is movably connected to the rotating shaft (6).

5. The failure protection device for the lock of the spreader for the container according to claim 4, wherein,

two sides of a peripheral surface of the rotating shaft (6) are first planes; and

the one end of the lock member (5) is provided with a first connecting hole (52), the first connecting hole (52) comprising a first through hole (521) and a second through hole (522) that are communicated;

the rotating shaft (6) is movably connected in the first through hole (521);

the second through hole (522) has second planes which are opposite; and

when the rotating shaft (6) is located in the second through hole (522), the second planes are tightly attached to the first planes at a same side.

6. The failure protection device for the lock of the spreader for the container according to claim 5, wherein the first planes are disposed along a vertical direction.

7. The failure protection device for the lock of the spreader for the container according to claim 5, wherein the middle portion of the lock member (5), is disposed at a side where a connecting line between one end and the other end of the lock member (5) faces the driving member (2).

8. The failure protection device for the lock of the spreader for the container according to claim 7, wherein the middle portion of the lock member (5) is provided with a second connecting hole (53) for connecting the second end of the connecting rod (3).

9. The failure protection device for the lock of the spreader for the container according to claim 8, wherein the second connecting hole (53) has a waist shape, a length direction of the waist shape being parallel to the first planes.

10. A failure protection method for a lock of a spreader for a container, based on the failure protection device for the lock of the spreader for the container according to any one of claims 5-9, characterized in that, comprising:

driving, by the driving member (2) through the connecting rod (3), the lock member (5) to turn over upwards, and the lock hook (51) of the lock member (5) to turn over upwards, to make the failure protection device at an unlock position;

assembling a container to the spreader;

driving, by the driving member (2) through the connecting rod (3), the lock member (5) to turn downwards for a first stroke; in the first stroke, the lock hook (51) of the lock member (5) turns over downwards, so that the rotating shaft (6) is rotated in the first through hole (521) of the lock member (5) relative to the first through hole (521), thus the lock hook (51) being inserted into the lock hole (81) on the container (8), to make the failure protection device at an lock position; and

driving, by the driving member (2) through the connecting rod (3), the lock member (5) to turn over and move downwards for a second stroke, or through a dead weight of the lock member (5), the lock hook (51) of the lock member (5) turns over and moves downwards for a second stroke, so that the rotating shaft (6) is relatively rotated into the second through hole (522) for locking the lock member (5), to make the failure protection device in a lock protection station.