CLAIMS

1. A lifting device, comprising a frame, a lifting drive mechanism, a lifting arm assembly and a sensing assembly, wherein:

the lifting drive mechanism includes a chain, a sprocket, a lifting motor and an electric control box, wherein the sprocket, the lifting motor and the electric control box are all arranged at a top portion of the frame, the chain is connected to the sprocket, which is connected to the lifting motor, and the electric control box is used to control and drive the lifting motor, which drives the chain to move up and down through the sprocket;

the lifting arm assembly is connected to a first end of the chain, and used to pick and place a hopper, and drive the hopper to move up and down following the chain; and

the sensing assembly includes:

a position sensing sheet, which is arranged on a top of the frame, for being detected by a sensor of a transport vehicle for positioning;

a descending position sensor and a descending limit sensor, which are located at respective lower positions of the frame, for detecting different descending positions of the lifting arm assembly; and

an ascending position sensor and an ascending limit sensor, which are located at respective upper positions of the frame, for detecting different ascending positions of the lifting arm assembly,

wherein the descending position sensor, the descending limit sensor, the ascending limit sensor and the ascending position sensor are all in signal communication with the electric control box, respectively.

2. The lifting device according to claim 1, characterized in that the electric control box is configured to:

control the lifting motor to stop when the descending position sensor senses the

lifting arm assembly descends to a predetermined ~~predetermine~~ position, and then control the lifting arm assembly to put down the hopper on a handling apparatus or take away the hopper from the handling apparatus, the handling apparatus being a distribution machine or a transfer station; and

control the lifting motor to stop immediately when the descending limit sensor senses the lifting arm assembly further descends after reaching the predetermined ~~predetermine~~ position.

3. The lifting device according to claim 1, characterized in that the electric control box is configured to:

control the lifting motor to stop when the ascending position sensor senses the lifting arm assembly ascends to a predetermined ~~predetermine~~ position, so that the transport vehicle puts down the hopper on the lifting arm assembly or takes away the hopper from the lifting arm assembly; and

control the lifting motor to stop immediately when the ascending limit sensor senses the lifting arm assembly further ascends after reaching the predetermined ~~predetermine~~ position.

4. The lifting device according to claim 1, characterized in that the lifting drive mechanism includes two chains and two sprockets arranged side by side, said two sprockets being connected to and driving said two chains respectively, and

the lifting arm assembly consists of two arms, which are connected to said two chains, respectively.

5. The lifting device according to claim 4, characterized in that each arm of the lifting arm assembly is provided with a V-shaped element, which is configured to receive a V-shaped member on the hopper, and snugly fit with a baffle on the hopper to restrict the hopper in position.

6. The lifting device according to claim 1, characterized in that the electric control box is provided therein with a frequency inverter for activating and deactivating the lifting motor, wherein the frequency inverter is in signal communication with an encoder arranged on a rear drive shaft of the lifting motor.

7. The lifting device according to claim 1, characterized in that a buffer assembly is arranged in a lower position of the frame, and a counterweight assembly is connected to a second end of the chain.

8. The lifting device according to claim 7, characterized in that the counterweight assembly includes a mounting bracket and a weighting block arranged on the mounting bracket; and

the buffer assembly includes four buffers, two of them being located at each side of the frame and under the lifting arm assembly and the counterweight assembly respectively, wherein each buffer is provided with a sensor in signal communication with the electric control box, for transmitting an alarm signal to the electric control box when the buffer descends to a preset position.

9. An operation method for lifting devices, comprising steps of:

driving a transport vehicle carrying a hopper full of concrete to a first lifting device;

detecting, by a sensor of the transport vehicle, a position sensing sheet of the first lifting device, and stopping the transport vehicle at a position of the first lifting device;

activating a lifting motor of the first lifting device, and lifting a lifting arm assembly thereof to take away the hopper full of concrete from the transport vehicle;

carrying, through a handling apparatus, an empty hopper to a position of a second lifting device;

lifting, by the second lifting device, the empty hopper to be taken away by the

transport vehicle;

moving a hopper placing device of the handling apparatus to a position under the hopper of the first lifting device, and placing, through the first lifting device, the hopper full of concrete in the hopper placing device of the handling apparatus; and

driving the transport vehicle to the position of the second lifting device, and taking away the empty hopper lifted by the second lifting device,

wherein the first and second lifting devices are each a lifting device according to claim 1, and the handling apparatus is a distribution machine or a transfer station.

10. The method according to claim 9, further comprising steps of:

returning, after the handling apparatus moves far from the first lifting device, the lifting arm assembly of the first lifting device to an origin position, which is in a middle of the frame; and

returning, after the transport vehicle moves far from the second lifting device, the lifting arm assembly of the second lifting device to an origin position, which is in a lower portion of the frame.