Claims

1. An autonomous moving transfer robot, comprising:

a main body comprising a base (11) and a vertical plate (12) fixed to the base (11) and extending upwards in a vertical direction;

a running mechanism (2) comprising driving wheels and driven wheels mounted on the base (11);

an operation mechanism comprising two manipulators each comprising a mechanical arm (3) having a proximal end connected to the vertical plate (12) and a gripper (4) pivotally connected to a distal end of the mechanical arm (3), the mechanical arm (3) being configured to allow the gripper (4) to reach a desired position, the two manipulators driving the two grippers (4) to move towards or away from each other to grip or release a target object (400); wherein the mechanical arm (3) comprises a telescopic arm (31), a rotary arm (32) and a driving device which is electrically connected with the control system, the rotary arm (32) comprises a plurality of arm sections hinged in sequence, and has a proximal end hinged to a distal end of the telescopic arm (31) and a distal end pivotally connected to the gripper (4), the driving device comprises: a first driving device (331) for driving the telescopic arm (31) to move in a transverse direction and a second driving device (332) for driving the arm sections to rotate about respective hinge shafts thereof, wherein the respective hinge shafts of the arm sections are parallel to each other and parallel to the transverse direction;

a load bearing mechanism comprising a plurality of board-like bearers (5) for bearing the target object (400), the plurality of bearers (5) being all fixed to a same side, either a front side or a rear side, of the vertical plate (12) and spaced apart in the vertical direction; and

a control system for controlling walking/stopping and steering of the running mechanism and controlling movement of the manipulators.

2. The autonomous moving transfer robot according to claim 1, characterized by comprising the base (11), and two driving wheels (21) and at least two driven wheels mounted on the base (11), wherein the driving wheel (21) has a central rotation axis and is hinged to the base (11), and a resilient member is arranged between the base (11) and the driving wheel (21), and has a first end pressing against the base (11) and a second end, opposite to the first end, pressing against the driving wheel (21) such that the driving wheel (21) is rotatable about a pivot axis parallel to the central rotation axis to move up and down relative to the base (11);

the driving wheel (21) comprises a mounting bracket (211), a driving motor (212) fixed to the mounting bracket (211), and a driving wheel roller (213) fixed to an output shaft of the driving motor (212), the driving motor (212) is electrically connected with the control system and is used for driving the driving wheel roller (213) to rotate about an axis of an output shaft of the driving

motor (212), the mounting bracket (211) is connected, via a pivot shaft (214), to a hinge receiver (110) fixed to the base (11), the second end of the resilient member presses against the mounting bracket (211), and the resilient member is configured to be a spring plunger (22) fixed to the base (11) and having a head pressing against the mounting bracket (211) to serve as the second end; each driving wheel (21) is correspondingly provided with two spring plungers (22);

the pivot shaft (214) is configured to be a pin having one end terminally stopped by the mounting bracket (211) and the other end stopped by the hinge receiver (110) via a stopper, and the stopper is configured to be a hoop (215);

the central rotation axes of the two driving wheels (21) are collinear, and a driven wheel group comprises two pairs of driven wheels, wherein in the direction of the central rotation axis, one pair of driven wheels is disposed on one side of the driving wheels (21) and the other pair of driven wheels is disposed on the other side of the driving wheels (21); the two pairs of driven wheels are symmetrically arranged about the central rotation axis.

3. The autonomous moving transfer robot according to claim 1 or 2, characterized in that the driven wheels are configured to be mecanum wheels (23).

4. The autonomous moving transfer robot according to claim 1, characterized in that,

the first driving device (331) is configured to be a motor, and the telescopic arm (31) is connected with an output shaft of the motor through a transmission so as to allow rotational motion of the output shaft to be converted into linear motion of the telescopic arm (31) in the transverse direction, the motor is a hollow shaft motor, and the transmission is configured to be a lead screw transmission comprising a lead screw (341) and a nut coorperating with each other, the lead screw (341) is fixed by a fixing seat (342), the nut is fixed to a hollow output shaft of the hollow shaft motor, the hollow shaft motor is fixedly connected to the telescopic arm (31), the hollow shaft motor is fixed to a first fixing plate (351), the telescopic arm (31) is fixed to a second fixing plate (352), and the first fixing plate (351) and the second fixing plate (352) are both fixed to a sliding block (361) which cooperates with guide rods (362) extending in the transverse direction and arranged on euipment where the mechanical arm (3) is provided;

the second driving device (332) is a hollow shaft motor, the rotary arm (32) comprises a first arm section (321) and a second arm section (322), and the first arm section (321) has a proximal end hinged to the telescopic arm (31) via a hollow shaft motor, and a distal end hinged to a proximal end of the second arm section (322) via a second driving device (332);

the arm sections extend in a direction perpendicular to the transverse direction, and are hollow; and the telescopic arm (31) extends in the transverse direction and are hollow;

the driving device further comprises a third driving device (333) for driving the gripper (4) to rotate about a pivot shaft thereof which is arranged parallel to the transverse direction, the third driving device (333) is a hollow shaft motor provided at the distal end of the rotary arm (32), and a hollow shaft of the hollow shaft motor is configured to be connected to the gripper (4).

5. The autonomous moving transfer robot according to claim 1, characterized in that the gripper (4) comprises a gripper main body (41) and a resilient clamping member, the gripper main body (41) is provided with a support table (411) for the target object (400) and a boss (412) above the support table (411), the resilient clamping member has a proximal end fixedly connected to the boss (412) and a distal end, opposite to the proximal end, for pressing against the target object (400) so as to cooperate with the supporting table (411) to releasably grip the target object (400);
the resilient clamping member comprises a first resilient clamping member (421) having a first proximal end (4211) fixed to the boss (412) and a first distal end (4212), opposite to the first proximal end (4211), extending over the support table (411) to form an resilient clamp, a clamping space for the target object (400) is defined between the resilient clamp and the support table (411), and the resilient clamp provides the target object (400) with a resilient clamping force towards the support table (411); a terminal (4213) of the first distal end (4212) is bent in a direction away from the support table (411) for guiding the target object (400) into the clamping space;
the support table (411) is provided with a first cushion (431) made of elastic material, and two first cushions (431) are provided and are spaced apart in the clamping space;
the resilient clamping member comprises a second resilient clamping member (422), the gripper main body (41) is provided with a trench groove (413) between the support table (411) and the boss (412), the second resilient clamping member (422) is arranged in the trench groove (413), and has a second proximal end (4221) fixed to a side wall of the boss (412) and a second distal end (4222), opposite to the second proximal end (4221), for pressing against the target object (400) so as to provide the target object (400) with an outward resilient clamping force, an end portion of the second distal end (4222) is folded with the fold faces outward, a side wall of the boss (412) is connected with a second cushion (432) made of elastic material, and two second cushions (432) are provided and are spaced apart on the side wall of the boss (412);
the gripper (4) comprises a locating element (44) for aligning with a mark on the target object (400), the locating element (44) is retractably connected to the boss (412), an alignment sensor is provided on an end portion of the locating element (44) and is electrically connected with the control system, and when the end portion of the locating element (44) is aligned with the mark, the alignment sensor sends a validating signal, otherwise sends an alarm signal; a proximity sensor (45) is provided on the boss (412) and is electrically connected with the control system, and when

the locating element (44) is retracted and approaches the proximity sensor (45), the proximity sensor (45) sends a possition confirmation signal;

the gripper (4) further comprises a closure plate (46) fixedly connected to the boss (412) above the boss (412), the gripper (4) is provided with a first signal light source (47) for indicating that the target object (400) is in the gripping position, the first signal light source (47) is electrically connected with the control system and is arranged within the closure plate (46), and the closure plate (46) is made of translucent material;

the gripper (4) further comprises a connecting block (48) to be pivotally connected with the mechanical arm of the autonomous moving transfer robot, and the gripper main body (41) is fixedly connected to the connecting block (48);

a photographing camera (491) is arranged on a front side of one of the two grippers (4) of the two manipulators and is electrically connected with the control system, and a flash lamp (492) is arranged on a front side of the other of the two grippers (4) of the two manipulators and is electrically connected to the control system.

6. The autonomous moving transfer robot according to claim 1, characterized in that the bearer (5) comprises:

a board-like main body (51) having a bearing surface for bearing the target object (400),

a positioning structure (52) fixed on the bearing surface to mate with a positioning slot of the target object (400) to limit movement of the target object (400) on the board-like main body (51),

an RFID antenna (53) electrically connected with the control system and fixed to the board-like main body (51) for reading a serial number of the target object (400), and

a target object detection device (54) electrically connected with the control system and fixed to the board-like main body (51) for detecting whether a target object (400) is placed on the bearer (5) or not;

the positioning structure (52) is configured to be three positioning columns arranged to form a triangular shape, the target object detection device (54) comprises a detection partion protruding from the bearing surface, and when the positioning slot of the target object (400) mates with the positioning structure (52), the detection partion is capable of retracting into the board-like main body (51) under the action of gravity of the target object (400), and the target object detection device (54) sends an acknowledgement signal to indicate that there is a target object (400) is placed onto the bearing surface;

the RFID antenna (53) is disposed adjacent to the target object detection device (54) to facilitate wiring;

the target object detection device (54) is configured to be a photosensor;

the board-like main body (51) comprises a main board (511), a sandwiched board (512) and a cover board (513) which are sequentially connected in an overlapping manner, and the sandwiched board (512) has an opening (5121) formed therein,

a second signal light source (55) is arranged in the opening (5121) and electrically connected with the control system, and the second signal light source (55) is capable of emitting light of multiple colors each indicating one working condition; the cover board (513) and the sandwiched board (512) are both made of translucent or transparent material to transmit light; an emergency stop button (56) is arranged on the cover board (513) and electrically connected with the control system; the second signal light source (55) is configured to be bar-shaped, and four second signal light sources (55) are arranged in the opening (5121) and emit light towards the front, rear, left and right, respectively; and the cover board (513) and the sandwiched board (512) are both made of organic glass material;

the bearer (5) is provided with a binocular camera (57) electrically connected with the control system, and the binocular camera (57) is fixed to the board-like main body (51); the bearer (5) is provided with a third obstacle avoidance sensor (58) electrically connected with the control system, and the third obstacle avoidance sensor (58) is fixed to the board-like main body (51); two third obstacle avoidance sensors (58) are provided, and the binocular camera (57) is located between the two obstacle avoidance sensors (58).

7. The autonomous moving transfer robot according to claim 1, characterized in that the base (11) is provided with two distance detection devices (113) which are arranged on front and/or rear sides of the autonomous moving transfer robot and spaced apart in the transverse direction of the autonomous moving transfer robot for detecting a distance between the autonomous moving transfer robot and a shelf, the control system is electrically connected with the distance detection device (113)to control the running mechanism (2) according to a distance signal from the distance detection device (113) so as to align the autonomous moving transfer robot with a shelf for storing the target object (400),

the distance detection device (113) is configured to be an infrared sensor.

8. The autonomous moving transfer robot according to claim 1, characterized in that a first obstacle avoidance sensor (114a) for detecting surrounding obstacles is provided on both front and rear sides of the base (11) and is electrically connected with the control system, and the control system controls the running mechanism (2) to stop moving and gives an alarm after receiving a danger signal sent by the first obstacle avoidance sensor (114a),

a second obstacle avoidance sensor (114b) is provided on left and/or right sides of the first

obstacle avoidance sensor (114a),

the first obstacle avoidance sensor (114a) comprises two infrared sensors disposed, respectively, on the front and rear sides of the autonomous moving transfer robot,

the base (11) is provided with two anti-collision strips (115) extending around outside the base (11) respectively;

a collision sensor is arranged in the anti-collision strip (115) and is electrically connected with the control system, and the control system controls the running mechanism (2) to stop moving and gives an alarm after receiving a danger signal sent by the collision sensor.

9. The autonomous moving transfer robot according to claim 1, characterized in that the main body comprises a casing (13) enclosing a closed space with the vertical plate (12), an operation screen (14) is arranged on the casing and tilts to facilitate man-machine interaction operation, and the operation screen (14) is included in the control system.

10. The autonomous moving transfer robot according to claim 1, characterized in that a bottom camera (116) is arranged on a lower surface of the base (11) and electrically connected with the control system, and ground distance detection devices are arranged at four corners of the base (11) and are electrically connected with the control system.