which is cooperatively connected with a trough device for receiving balls that fall from the netting. The trough is disposed to feed the balls to the robot serving device. The disclosures in the above described patents are incorporated by reference herein.

While many of the devices previously known to the art are functional and useful, they sometimes are susceptible to jamming when returned balls are captured and collected and fed into the mechanism for recycling the ball to the robot server.

It is desirable, therefore, to have a sophisticated server device for sequentially serving a plurality of balls to the player employing a relatively simple, inexpensive design, which addresses the ball jamming problem and which can be offered at reasonable price points to the customer.

SUMMARY OF THE DISCLOSURE

According to an aspect of the invention~~Briefly stated~~, a robot server assembly for serving table tennis balls has a back panel having an upper end and a lower end, said back panel having a first side wall and a spaced apart second side wall, said side walls being perpendicular to said back panel; a ball feed collector plate at the lower end of the back panel and configured to collect table tennis balls and direct them toward the lower end of the back panel; a ball pickup mechanism at the lower end of the back panel and orientated toward the ball feed collector plate, said ball pickup mechanism having a rotatably mounted pickup wheel and a ball feed motor operatively connected to the pickup wheel, said pickup wheel having a plurality of ball pickup structures extending from the pickup wheel toward the collector plate; a ball guide at the upper end of the back panel, said ball guide having a open bottom and an open front; a front cover attached to the back panel having a substantially U-shaped cross-section, said front cover and said side walls of the back panel defining a ball passage, said passage having a first open end in communication with the open bottom of the ball guide and a second open end in communication with the ball pickup mechanism; a pivot guide pivotally mounted at the open front of the ball guide and having a passageway in communication with said open front; a serving head assembly attached to the pivot guide and comprising at least one discharge wheel and a discharge tube in communication with the pivot guide passageway; and an oscillator at the top of the ball guide and operatively connected to the pivot guide, said oscillator having a servo and pivot pin arranged to move the pivot guide and the attached serving head assembly in a side-to-side pattern when the servo is actuated. The robot server assembly also has~~having~~ a back panel with a rounded ball collector mounting section at the bottom. A ball feed collector plate extends outwardly from the bottom of back panel. A ball pickup mechanism is operatively positioned between with the ball collector mounting section and the ball feed collector plate. There is an upper ball guide at the upper end of the back panel. A front cover is attached to the front surface of the back panel and extends from the bottom of the ball guide to ball pickup mechanism defining an enclosed ball passageway. An oscillator is mounted to the top of the back panel above the upper ball guide and a serving head assembly is attached to the oscillator through a pivot guide.

According to another aspect of the invention, a robot server assembly for serving table tennis balls is provided. The robot server assembly comprises an elongated back panel and having an upper end and a lower end, a first side wall and a spaced apart second side wall, said side walls being perpendicular to said back panel; a ball feed collector plate at the lower end of the back panel, said collector plate having raised a perimeter lip and positioned at an angle relative to the longitudinal axis of the back panel so as to collect table tennis balls and direct them toward the lower end of the back panel; a ball pickup mechanism at the lower end of the back panel and orientated toward the ball feed collector plate, said ball pickup mechanism comprising a rotatably mounted pickup wheel with a plurality of ball pickup structures thereon outwardly extending toward the ball feed collector plate, at least one of said ball pickup structures being a resilient finger, and at least one of said ball pickup structures being a spring; a gear drive assembly and a ball feed motor operatively associated with the pickup wheel, a ball guide at the upper end of the back panel, said ball guide defining an open bottom and an open front, said ball guide comprising a central ball guide having a wishbone configuration; a substantially transparent front cover attached to the back panel having a substantially U-shaped cross-section, said front cover and said side walls of the back panel defining a ball passage, said passage having a first open end in communication with the open bottom of the ball guide and a second open end in communication with the ball pickup mechanism; a pivot guide mounted at the open front of the ball guide and having a passageway in communication with the open front of the ball guide, said pivot guide being pivotally mounted so as to be movable in a side-to-side pattern; a serving head assembly pivotally attached to the pivot guide so as to be moveable in an up and down manner, said serving head assembly comprising at least one discharge wheel and a discharge tube in communication with the pivot guide passageway; and an oscillator at the top of the ball guide and operatively connected to the pivot guide, said oscillator having a servo and pivot pin arranged to move the pivot guide and the attached serving head assembly in a side-to-side pattern when the servo is actuated.

In one embodiment~~aspect~~, the front cover has a substantially U-shaped cross-sectional configuration to eliminate angles and corners and facilitates ball movement through the ball feed passage thereby reducing jamming.

In one embodiment~~aspect~~, the front cover can be substantially transparent to the extent it allows viewing of balls moving within the ball feed passage.

In one embodiment~~aspect~~, the serving head assembly comprises a discharge wheel and a discharge tube. In one embodiment~~aspect of the invention~~, the discharge tube has a fluted bore.

In one aspect the serving head assembly comprises a pair of opposed discharge

wheels having replaceable friction material. One or more discharge wheels may operatively extend into the bore of the fluted discharge tube.

In one embodiment~~aspect~~, the ball collector plate has a contoured configuration that reduces ball hang up, gathering and jamming and is angled relative to the longitudinal axis of the robot to facilitate ball feed and pickup.

Another embodiment~~aspect~~ of the ball pickup mechanism comprises a rotatable pickup wheel having a plurality of resilient pickup fingers that enhance ball pickup by the ball pickup mechanism. In another aspect, the pickup wheel comprises a plurality of ball feed springs of varying lengths and configurations that enhance ball pickup by the ball pickup mechanism.

Another embodiment~~aspect~~ of the disclosure is a ball guide design that prevents hang-up of the table tennis balls at the juncture where they enter the serving head.

Yet another embodiment~~aspect~~ of the disclosure is a robot server assembly that can be expanded to accept a net assembly or trough assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a perspective view of an embodiment of a robot server assembly constructed in accordance with the present disclosure;

FIG. 2 is a front elevational view of an embodiment of Fig. 1;

Fig. 3 is a side elevational view there of;

FIG. 4 is an isometric view of the lower section of the robot server assembly, sans ball pickup mechanism, illustrating the ball tray and opening to the ball pickup mechanism;

FIG. 5 is an exploded view of a ball pickup mechanism;

FIG. 6 is a rear perspective view of the of the front cover;

FIG. 7 is a front perspective view of the upper end of the ball feed passage, sans front cover, with the upper ball guide removed therefrom;

Fig. 8 is a top plan view of an alternative embodiment of a ball guide;

FIG. 9 is a exploded, topm perspective view of the oscillator of the assembly of Fig. 1;

Fig. 10. is an exploded view of the serving head;