



(11)

EP 4 817 701 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(51) International Patent Classification (IPC):
A63B 69/40 (2006.01) **A63B 69/38** (2006.01)

(21) Application number: **26734047.9**

(52) Cooperative Patent Classification (CPC):
A63B 69/38; A63B 69/40

(22) Date of filing: **20.01.2026**

(86) International application number:
PCT/CN2026/073571

(87) International publication number:
WO 2026/153557 (23.07.2026 Gazette 2026/30)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

(71) Applicant: **Shenzhen Enhanced Power Technology Co., Ltd.**
Shenzhen, Guangdong 518000 (CN)

(72) Inventor: **ZHU, Hanqi**
Shenzhen, Guangdong 518000 (CN)

(74) Representative: **Metida**
Gyneju str. 16
01109 Vilnius (LT)

(30) Priority: **20.01.2025 CN 202520133036 U**

(54) **TENNIS BALL LAUNCHING APPARATUS AND TENNIS BALL MACHINE HAVING SAME**

(57) A tennis ball serving device and a tennis ball machine having same are provided. The device includes a fixed seat, a rotary bracket rotatably connected to the fixed seat through a first rotating shaft, and a ball serving mechanism rotatably connected to the rotary bracket through a second rotating shaft. The tennis ball serving device further includes a first driving member that drives the rotary bracket to rotate relative to the fixed seat through the first rotating shaft, and a second driving member that drives the ball serving mechanism to rotate relative to the rotary bracket through the second rotating shaft. The first rotating shaft and the second rotating shaft have different rotation directions. The tennis ball serving device provided in the present disclosure can achieve a multi-dimensional ball serving manner through a two-shaft rotating structural design, and can simulate various ball serving and hitting situations, thus meeting different types of tennis training needs. The overall structure of the device is simple and not complicated, and the device is easily used and has good stability and reliability.

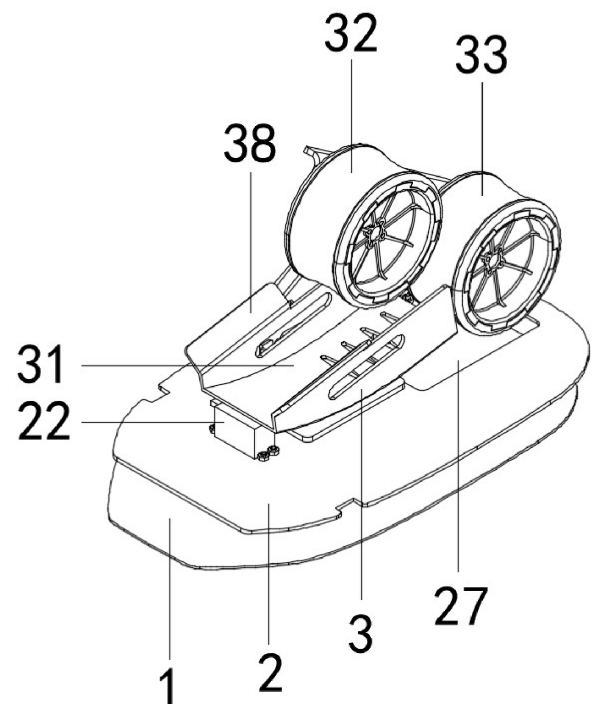


FIG. 1

Description

TECHNICAL FIELD

[0001] The present disclosure belongs to the technical field of tennis training devices, and specifically to a tennis ball serving device and a tennis ball machine having same.

BACKGROUND

[0002] Tennis is one of the ball sports. With the population and development of the tennis sport, needs of users for tennis training are also growing. In tennis training, a ball return skill is an important part. As a tennis training device, a tennis ball machine adopts a mechanical arm or rotating wheel design, so that it can eject a tennis ball to a designated position at a fixed angle and speed, and a user can conduct ball return training individually.

[0003] However, most of existing tennis ball serving equipment is mainly designed mechanically and usually relies on a single rotating shaft to control a ball serving direction and angle. Although the equipment can adjust a ball serving angle and speed, it cannot flexibly simulate various different ball serving manners, and can only provide ball serving in a single angle or a single manner. The diversity of motion trajectories and hitting manners cannot meet a complex need in actual training.

[0004] Although some high-end tennis ball machines have rich functions, they often have complex structures and high costs, and are difficultly operated. As a result, a user experience is easily affected, and adjustment and maintenance are relatively cumbersome.

SUMMARY

[0005] To overcome the defects in the prior art, the present disclosure provides a tennis ball serving device, including a fixed seat, a rotary bracket rotatably connected to the fixed seat through a first rotating shaft, and a ball serving mechanism rotatably connected to the rotary bracket through a second rotating shaft.

[0006] The tennis ball serving device further includes a first driving member that drives the rotary bracket to rotate relative to the fixed seat through the first rotating shaft, and a second driving member that drives the ball serving mechanism to rotate relative to the rotary bracket through the second rotating shaft.

[0007] The first rotating shaft and the second rotating shaft have different rotation directions.

[0008] Further, a groove is formed in a position of the rotary bracket corresponding to the ball serving mechanism, and a width of a cross section of the groove in the rotation direction of the second rotating shaft is greater than a width of a cross section of the ball serving mechanism in the rotation direction of the second rotating shaft, so that the ball serving mechanism is able to pass through the groove when rotating relative to the rotary bracket

through the second rotating shaft.

[0009] Preferably, the first driving member includes a first driving motor. The first driving motor drives the rotary bracket to rotate relative to the fixed seat through the first rotating shaft within an angle range of -180° to $+180^{\circ}$.

[0010] The second driving member includes a second driving motor. An initial ball serving angle of the ball serving mechanism is between a horizontal direction and a vertical direction. The second driving motor drives the ball serving mechanism to rotate relative to the rotary bracket through the second rotating shaft within an angle range of -45° to $+45^{\circ}$.

[0011] Preferably, a plurality of auxiliary wheels are arranged between the fixed seat and the rotary bracket, and the auxiliary wheels are connected to the first driving member to be driven by the first driving member to cause the rotary bracket to rotate relative to the fixed seat through the first rotating shaft.

[0012] Further, the fixed seat is arranged below the rotary bracket, and the auxiliary wheels are arranged on one side of the rotary bracket close to the fixed seat and abuts against the fixed seat.

[0013] Specifically, the ball serving mechanism includes a guide rail. Two ends of the guide rail are respectively a ball feeding end and a ball serving end. A ball serving wheel is arranged at the ball serving end of the guide rail.

[0014] Further, barrier plates protrude from two sides of the guide rail, and an inner side of the guide rail is recessed downward to form a ball guide path for guiding a tennis ball movement trajectory.

[0015] Specifically, the ball serving wheel includes a first rotating wheel and a second rotating wheel. The ball serving mechanism further includes a rotating wheel mounting plate fixedly connected to the guide rail. A middle portion of the rotating wheel mounting plate is fixedly connected to the guide rail.

[0016] The first rotating wheel and the second rotating wheel are respectively arranged at two ends of the rotating wheel mounting plate. A gap which is not greater than a diameter of a tennis ball is provided between the first rotating wheel and the second rotating wheel.

[0017] Preferably, the rotation direction of the first rotating shaft is perpendicular to the rotation direction of the second rotating shaft.

[0018] The present disclosure further provides a tennis ball machine, including the foregoing tennis ball serving device.

[0019] The present disclosure at least has the following beneficial effects:

[0020] According to the tennis ball serving device provided in the present disclosure, the ball serving mechanism can move in two different directions relative to the fixed seat through the first rotating shaft and the second rotating shaft that are independent of each other, thereby flexibly adjusting a ball serving angle of the device, achieving diversified ball serving manners, and simulating different ball serving trajectories. This can help a user

conduct diversified and more targeted training. The device is simple in overall structure, portable, easily operated, and widely applicable.

[0021] Further, the tennis ball serving device provided in the present disclosure can effectively avoid interference between the ball serving mechanism and the rotary bracket during rotation by providing the groove on the rotary bracket, thereby increasing the degree of freedom of motion of the ball serving mechanism, avoiding mechanical conflicts, and ensuring motion smoothness. The two driving motors can achieve rotation within a wide angle range. The arrangement of the auxiliary wheels can reduce friction and instability during the rotation of the rotary bracket, enhance a response speed and accuracy of the rotary bracket, and ensure that the rotary bracket rotates is steadier during rotation. Meanwhile, the auxiliary wheels can play a role in supporting the rotary bracket, making the overall structure of the device more stable.

[0022] The combination of the guide rail and the ball serving wheel in the ball serving mechanism helps to guide a tennis ball to flow along a set trajectory and ensure that the tennis ball can be stably ejected. The barrier plates on the two sides of the guide rail can prevent the tennis ball from deviating from a predetermined rail, thereby ensuring that the tennis ball always moves along the guide rail. The recessed ball path on the inner side can better control a movement path of the tennis ball and prevent the tennis ball from deviating from the guide rail. The design of the first rotating wheel and the second rotating wheel can control a motion trajectory and motion speed of the tennis ball through a precise gap. The rotation direction of the first rotating shaft is perpendicular to the rotation direction of the second rotating shaft. This can reduce mutual interference and more accurately control the rotation of the rotary bracket and the ball serving mechanism, thereby enhancing the motion accuracy and the response speed.

[0023] Therefore, the present disclosure provides a tennis ball serving device and a tennis ball machine having same. The tennis ball serving device provided in the present disclosure can achieve a multi-dimensional ball serving manner through a two-shaft rotating structural design, and can simulate various ball serving and hitting situations, thus meeting different types of tennis training needs. The overall structure of the device is simple and not complicated, and the device is easily used and has good stability and reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] For clearer descriptions of the technical solutions according to the embodiments of the present disclosure, the drawings required to be used in the description of the embodiments are briefly introduced below. It is apparent that the drawings in the description below are only some embodiments of the present disclosure, and it is apparent for those skilled in the art that other drawings

can be acquired according to the drawings without creative efforts.

FIG. 1 is a schematic diagram of an overall structure of a tennis ball serving device provided in Embodiment 1;

FIG. 2 is a schematic diagram of a structure of a tennis ball serving device in another angle;

FIG. 3 is a schematic diagram of a structure of the tennis ball serving device in FIG. 2 after a rotary bracket rotates;

FIG. 4 is a side view of a tennis ball serving device; and

FIG. 5 is a schematic diagram of a structure of the tennis ball serving device in FIG. 3 after a ball serving mechanism rotates.

[0025] Reference numerals:

1: fixed seat; 2: rotary bracket; 3: ball serving mechanism; 11: first rotating shaft; 21: second rotating shaft; 22: first driving motor; 23: second driving motor; 24: bottom frame; 25: side frame; 26: auxiliary wheel; 27: groove; 31: guide rail; 32: first rotating wheel; 33: second rotating wheel; 34: connecting rod; 35: rotating wheel mounting plate; 36: third rotating shaft; 37: fourth rotating shaft; and 38: barrier plate.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0026] The technical solutions in embodiments of the present disclosure are clearly and completely described in the following with reference to the accompanying drawings in the embodiments of the present disclosure. Apparently, the described embodiments are merely some rather than all of the embodiments of the present disclosure. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of the present disclosure without making creative efforts shall fall within the protection scope of the present disclosure.

[0027] Various embodiments of the present disclosure will be described in more detail hereinafter. The present disclosure can have various embodiments, and can make modifications and changes on the embodiments. However, it should be understood that there is no intention to limit the various embodiments of the present disclosure to specific embodiments disclosed herein. Instead, the present disclosure shall be construed to cover all modifications, equivalents, and/or alternatives falling within the spirit and scope of the various embodiments of the present disclosure.

[0028] In the following text, the term "include" or "may include" that may be used in various embodiments of the present disclosure indicate the presence of an invented function, operation, or element, and does not limit the addition of one or more functions, operations, or elements. In addition, the terms "include", "have", and their cognates that can be used in the various embodiments of

the present disclosure are only intended to represent specific features, digits, steps, operations, elements, components, or combinations of the aforementioned terms, and should not be understood as first excluding the existence of one or more other features, digits, steps, operations, elements, assemblies, or combinations of the aforementioned terms, or the possibility of adding one or more features, digits, steps, operations, elements, assemblies, or combinations of the aforementioned terms.

[0029] In the various embodiments of the present disclosure, the expression "or" or "at least one of A and/or B" includes any combination or all combinations of the listed words. For example, the expression "A or B" or "at least one of A and/or B" may include A, may include B, or may include both A and B.

[0030] The expressions (such as "first" and "second") used in the various embodiments of the present disclosure may modify various constituent elements in the various embodiments, but may not limit the corresponding constituent elements. For example, the above expressions do not limit the order and/or importance of the elements. The above expressions are only used for the purpose of distinguishing one element from other elements. For example, a first user device and a second user device indicate different user devices, even though both of them are user devices. For example, without departing from the scope of the various embodiments of the present disclosure, a first element can be referred to as a second element. Similarly, the second element can also be referred to as the first element.

[0031] It should be noted that in the present disclosure, unless otherwise specified and defined, the terms such as "mount", "connect", and "fix" should be broadly understood, for example, fixed connection, detachable connection, integrated connection, mechanical connection, electrical connection, direct connection, indirect connection through an intermediate medium, or communication between interiors of two elements. A person of ordinary skill in the art may understand specific meanings of the foregoing terms in present disclosure according to specific situations.

[0032] In the present disclosure, a person of ordinary skill in the art should understand that terms indicating orientation or positional relationships herein indicate orientations or positional relationships shown in the accompanying drawings and are used only for ease and brevity of illustration and description of the present application, rather than indicating or implying that the mentioned apparatus or element needs to have a particular orientation or needs to be constructed and operated in a particular orientation. Therefore, such terms should not be construed as limiting of the present application.

[0033] The terms used in the various embodiments of the present disclosure are merely for the purpose of describing specific embodiments and are not intended to limit the various embodiments of the present disclosure. As used herein, a singular form also includes a plural form, unless the context indicates otherwise. Un-

less otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by a person of ordinary skill in the art to which the various embodiments of the present disclosure belong. The terms (such as those limited in commonly used dictionaries) will be interpreted as having the same contextual meaning as in the relevant technical field and will not be interpreted as having idealized or overly formal meanings unless clearly defined in the various embodiments of the present disclosure.

Embodiment 1

[0034] Referring to FIG. 1 to FIG. 5, this embodiment provides a tennis ball serving device, including a fixed seat 1, a rotary bracket 2 rotatably connected to the fixed seat 1 through a first rotating shaft 11, and a ball serving mechanism 3 rotatably connected to the rotary bracket 2 through a second rotating shaft 21. The tennis ball serving device further includes a first driving member that drives the rotary bracket 2 to rotate relative to the fixed seat 1 through the first rotating shaft 11, and a second driving member that drives the ball serving mechanism 3 to rotate relative to the rotary bracket 2 through the second rotating shaft 21. The first rotating shaft 11 and the second rotating shaft 21 have different rotation directions. Preferably, the rotation direction of the first rotating shaft 11 is perpendicular to the rotation direction of the second rotating shaft 21.

[0035] In this embodiment, the first driving member includes a first driving motor 22. The first driving motor 22 can drive the rotary bracket 2 to rotate relative to the fixed seat 1 through the first rotating shaft 11 within an angle range of -180° to $+180^{\circ}$. The second driving member includes a second driving motor 23. An initial ball serving angle of the ball serving mechanism 3 is between a horizontal direction and a vertical direction. The second driving motor 23 can drive the ball serving mechanism 3 to rotate relative to the rotary bracket 2 through the second rotating shaft 21 within an angle range of -45° to $+45^{\circ}$. In addition, preferably, the second driving motor 23 can drive the ball serving mechanism 3 to rotate relative to the rotary bracket 2 through the second rotating shaft 21 by a rotation angle of -23° to $+23^{\circ}$. In one specific embodiment, a range of an angle between an initial ball serving direction of the ball serving mechanism 3 and the horizontal direction may be 5° to 55° , and may be preferably 20° to 30° .

[0036] Therefore, the tennis ball serving device provided in this embodiment can control an overall angle and a ball serving angle of the device respectively through the first rotating shaft 11 and the second rotating shaft 21 that are independent of each other. This can accurately adjust a ball serving angle and trajectory in multiple dimensions and simulate more ball serving manners, and is suitable for tennis training by users.

[0037] Specifically, the first driving motor 22 and the second driving motor 23 are both arranged on the rotary

bracket 2. In this embodiment, the rotary bracket 2 includes a bottom frame 24 connected to the first rotating shaft 11 and a side frame 25 connected to the second rotating shaft 21. The side frame 25 is fixedly mounted on the bottom frame 24. The first driving motor 22 is arranged on the bottom frame 24, and the second driving motor 23 is arranged on the side frame 25. In other embodiments, the bottom frame 24 and the side frame 25 can be integrally formed.

[0038] Preferably, a plurality of auxiliary wheels 26 are arranged between the fixed seat 1 and the rotary bracket 2, and the auxiliary wheels 26 are connected to the first driving member 22, which can effectively reduce a friction force generated in the rotation process and enhance the smoothness and accuracy of rotation, to achieve the rotation of the rotary bracket 2 relative to the fixed seat 1 through the first rotating shaft 11 based on the driving of the first driving motor 22. The auxiliary wheels 26 reduce the friction force, thereby reducing a direct load on the rotating shaft and playing a role in buffering and sharing. This can avoid an error in the ball serving angle caused by shaking or deviation of the bracket. Meanwhile, this can also avoid an overload on the motors due to an excessive friction force, thereby prolonging the service lives of the motors. Moreover, when the rotary bracket 2 rotates rapidly, the auxiliary wheels 26 can cause the rotary bracket 2 to move more stably and smoothly.

[0039] In this embodiment, the fixed seat 1 is arranged below the rotary bracket 2, and the auxiliary wheels 26 are arranged on one side of the rotary bracket 2 close to the fixed seat 1 and abuts against the fixed seat 1. The auxiliary wheels 26 can enhance a supporting effect of the fixed seat 1 on the rotary bracket 2. Through the contact and supporting of the auxiliary wheels 26, the fixed seat 1 can effectively prevent positional deviation or deformation of the rotary bracket 2 during rotation, thereby enhancing the stability and reliability of the entire device.

[0040] Specifically, the ball serving mechanism 3 includes a guide rail 31. Two ends of the guide rail 31 are respectively a ball feeding end and a ball serving end. The ball feeding end of the guide rail 31 corresponds to a ball conveying path. A ball serving wheel is arranged at the ball serving end of the guide rail 31.

[0041] In this embodiment, the ball serving wheel is composed of a first rotating wheel 32 and a second rotating wheel 33. The first rotating wheel 32 and the second rotating wheel 33 are respectively arranged on two sides of the guide rail 31, and a gap for allowing a tennis ball to pass through is provided between the two rotating wheels. By adjusting rotating speeds and pressures of the first rotating wheel 32 and the second rotating wheel 33, parameters such as a ball speed and rotation of the tennis ball serving device during ball serving can be controlled. The first rotating wheel 32 and the second rotating wheel 33 are connected to different driving motors to achieve various ball serving effects. The tennis ball will be pressed and accelerated under highspeed rotation

of the rotating wheels, and is finally ejected through the gap between the first rotating wheel 32 and the second rotating wheel 33.

[0042] Specifically, a width of the gap between the first rotating wheel 32 and the second rotating wheel 33 is not greater than a diameter of a tennis ball used. For example, when the diameter of the tennis ball used is 6.8 cm, the width of the gap between the first rotating wheel 32 and the second rotating wheel 33 can be set to 6.5 cm.

[0043] Specifically, the second driving motor 23 is connected to the ball serving mechanism 3 through a connecting rod 34, to achieve, based on the second driving motor 23 and the connecting rod 34, the rotation of the ball serving mechanism 3 relative to the rotary bracket 2 through the second rotating shaft 21. In this embodiment, the second driving motor 23 is connected to the ball serving end of the guide rail 31 through the connecting rod 34.

[0044] In this embodiment, the ball serving mechanism 3 further includes a rotating wheel mounting plate 35 fixedly connected to the guide rail 31. A middle portion of the rotating wheel mounting plate 35 is fixedly connected to the guide rail 31. The first rotating wheel 32 and the second rotating wheel 33 are respectively arranged on two sides of the rotating wheel mounting plate 35. The first rotating wheel 32 is connected to one driving motor through a third rotating shaft 36, and the second rotating wheel 33 is connected to the other driving motor through a fourth rotating shaft 37. Extension directions of the third rotating shaft 36 and the fourth rotating shaft 37 are the same as that of the second rotating shaft 21.

[0045] Preferably, barrier plates 38 protrude from two sides of the guide rail 31, and an inner side of the guide rail 31 is recessed downward to form a ball guide path for guiding a tennis ball along a path of the guide rail 31 to be accurately conveyed between the two ball serving wheels. The barrier plates 38 can effectively prevent the tennis ball from being detached from the rail in the process that the tennis ball moves from the ball feeding end of the guide rail 31 to the ball serving end, thereby enhancing the stability and accuracy of ball serving. Preferably, a height of each barrier plate 38 relative to the guide rail 31 is not less than a radius of the tennis ball used.

[0046] The height and an angle of each barrier plate 38 relative to the guide rail 31 can be set as needed to adapt to an internal structure of the tennis ball serving device and a ball serving requirement. For example, the barrier plates 38 can extend upward away from the guide rail 31 to guide a tennis ball to accurately fall into the guide rail 31.

[0047] Further, a groove 27 is formed in a position of the rotary bracket 2 corresponding to the ball serving mechanism 3, and a width of a cross section of the groove 27 in the rotation direction of the second rotating shaft 21 is greater than a width of a cross section of the ball serving mechanism 3 in the rotation direction of the second rotating shaft 21. Therefore, when the second driving

motor 23 drives the ball serving mechanism 3 to rotate relative to the rotary bracket 2 through the second rotating shaft 21, the ball serving mechanism 3 can directly pass through the groove 27 without being limited by the rotary bracket 2, thereby causing the ball serving mechanism 3 to have a larger rotation angle during rotation relative to the rotary bracket 2 through the second rotating shaft 21. In this embodiment, the groove 27 is formed in a position of the rotary bracket 2 corresponding to the ball serving end of the guide rail 31.

[0048] Further, a limiting member is arranged on the rotary bracket 2 corresponding to the ball feeding end of the guide rail 31. The limiting member is configured to limit a rotation angle of the guide rail 31 when the guide rail rotates in a direction in which the ball feeding end is upward and the ball serving end is downward, thereby playing a role in preventing an extremely large ball serving angle of tennis ball serving device. Preferably, the first driving motor 22 is arranged on the rotary bracket 2 below the ball feeding end of the guide rail 31, to simultaneously serve as a limiting member, thereby simplifying the structure of the tennis ball serving device provided in this embodiment.

Embodiment 2

[0049] This embodiment provides a tennis ball machine, including the tennis ball serving device provided in Embodiment 1.

[0050] Further, the tennis ball machine provided in this embodiment further includes a tennis ball feeding device. A ball conveying path of the tennis ball feeding device corresponds to the ball feeding end of the guide rail 31.

[0051] In summary, the present disclosure provides a tennis ball serving device and a tennis ball machine having same. The tennis ball serving device provided in the present disclosure can achieve a multi-dimensional ball serving manner through a two-shaft rotating structural design, and can simulate various ball serving and hitting situations, thus meeting different types of tennis training needs. The overall structure of the device is simple and not complicated, and the device is easily used and has good stability and reliability.

The foregoing descriptions are merely preferred embodiments of the present disclosure, but are not intended to limit present disclosure. Any modification, equivalent replacement, or improvement made within the spirit and principle of the present disclosure shall fall within the protection scope of the present disclosure.

Claims

1. A tennis ball serving device, comprising a fixed seat, a rotary bracket rotatably connected to the fixed seat through a first rotating shaft, and a ball serving mechanism rotatably connected to the rotary bracket through a second rotating shaft, wherein

the tennis ball serving device further comprises a first driving member that drives the rotary bracket to rotate relative to the fixed seat through the first rotating shaft, and a second driving member that drives the ball serving mechanism to rotate relative to the rotary bracket through the second rotating shaft; and the first rotating shaft and the second rotating shaft have different rotation directions.

2. The tennis ball serving device according to claim 1, wherein a groove is formed in a position of the rotary bracket corresponding to the ball serving mechanism, and a width of a cross section of the groove in the rotation direction of the second rotating shaft is greater than a width of a cross section of the ball serving mechanism in the rotation direction of the second rotating shaft, so that the ball serving mechanism is able to pass through the groove when rotating relative to the rotary bracket through the second rotating shaft.
3. The tennis ball serving device according to claim 1 or 2, wherein the first driving member comprises a first driving motor; the first driving motor drives the rotary bracket to rotate relative to the fixed seat through the first rotating shaft within an angle range of -180° to $+180^\circ$; the second driving member comprises a second driving motor; an initial ball serving angle of the ball serving mechanism is between a horizontal direction and a vertical direction; and the second driving motor drives the ball serving mechanism to rotate relative to the rotary bracket through the second rotating shaft within an angle range of -45° to $+45^\circ$.
4. The tennis ball serving device according to claim 1, wherein a plurality of auxiliary wheels are arranged between the fixed seat and the rotary bracket, and the auxiliary wheels are connected to the first driving member to be driven by the first driving member to cause the rotary bracket to rotate relative to the fixed seat through the first rotating shaft.
5. The tennis ball serving device according to claim 4, wherein the fixed seat is arranged below the rotary bracket, and the auxiliary wheels are arranged on one side of the rotary bracket close to the fixed seat and abuts against the fixed seat.
6. The tennis ball serving device according to claim 1, wherein the ball serving mechanism comprises a guide rail; two ends of the guide rail are respectively a ball feeding end and a ball serving end; and a ball serving wheel is arranged at the ball serving end of the guide rail.
7. The tennis ball serving device according to claim 6,

wherein barrier plates protrude from two sides of the guide rail, and an inner side of the guide rail is recessed downward to form a ball guide path for guiding a tennis ball movement trajectory.

5

8. The tennis ball serving device according to claim 6, wherein the ball serving wheel comprises a first rotating wheel and a second rotating wheel; the ball serving mechanism further comprises a rotating wheel mounting plate fixedly connected to the guide rail; and a middle portion of the rotating wheel mounting plate is fixedly connected to the guide rail; the first rotating wheel and the second rotating wheel are respectively arranged at two ends of the rotating wheel mounting plate; and a gap which is not greater than a diameter of a tennis ball is provided between the first rotating wheel and the second rotating wheel.
- 10
- 15
9. The tennis ball serving device according to claim 1, wherein the rotation direction of the first rotating shaft is perpendicular to the rotation direction of the second rotating shaft.
- 20
10. A tennis ball machine, comprising the tennis ball serving device according to any one of claims 1 to 9.
- 25

30

35

40

45

50

55

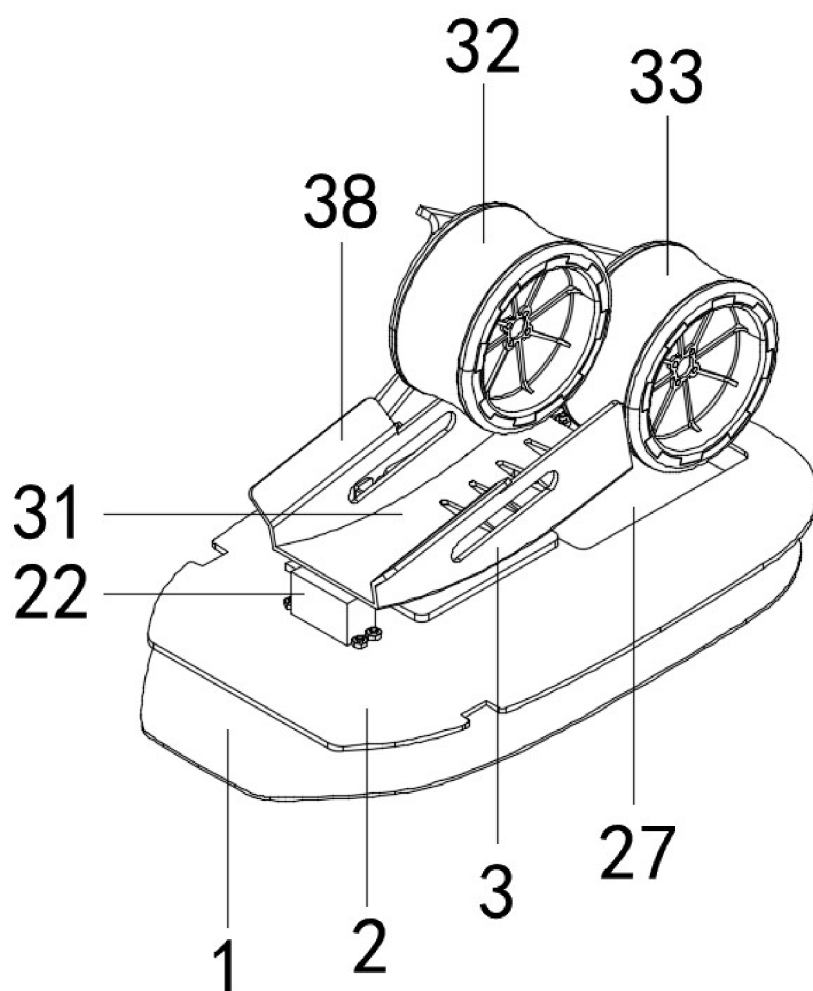


FIG. 1

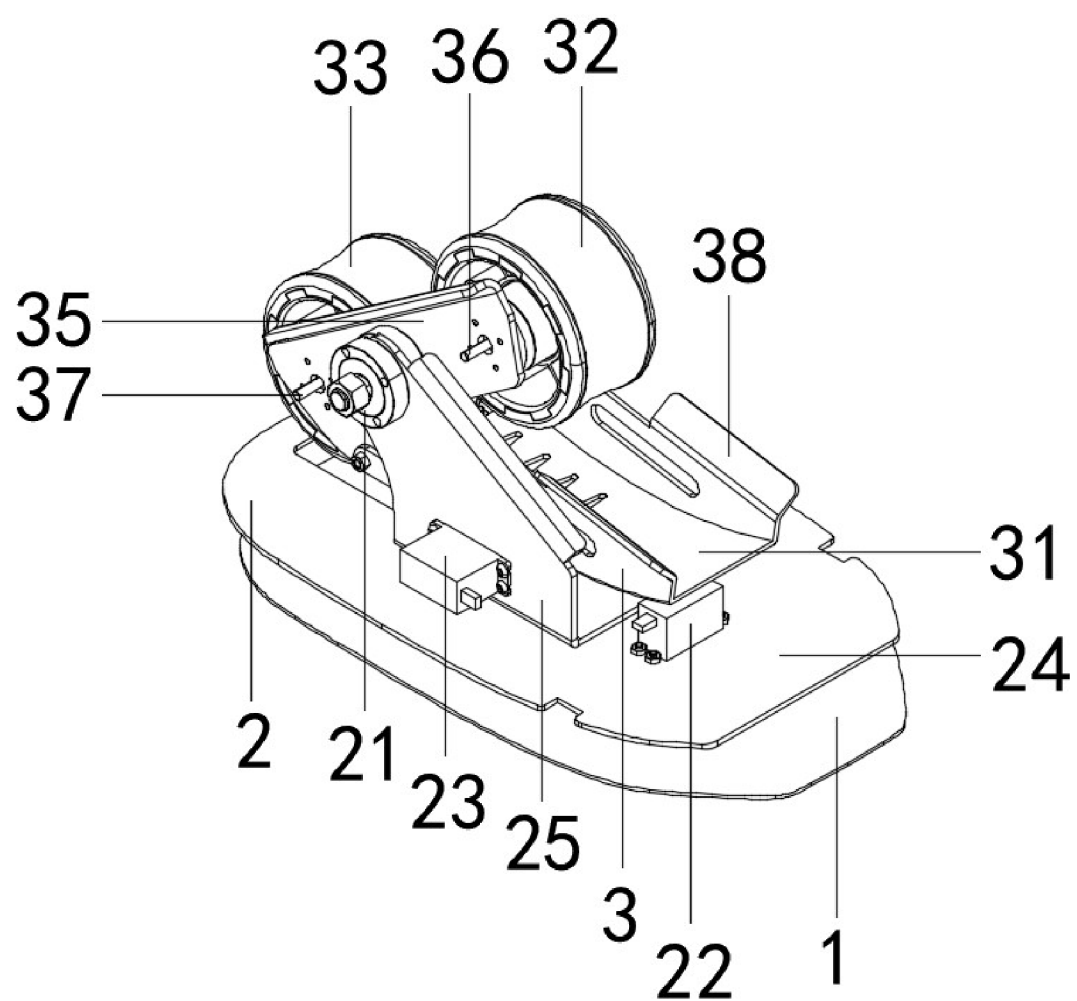


FIG. 2

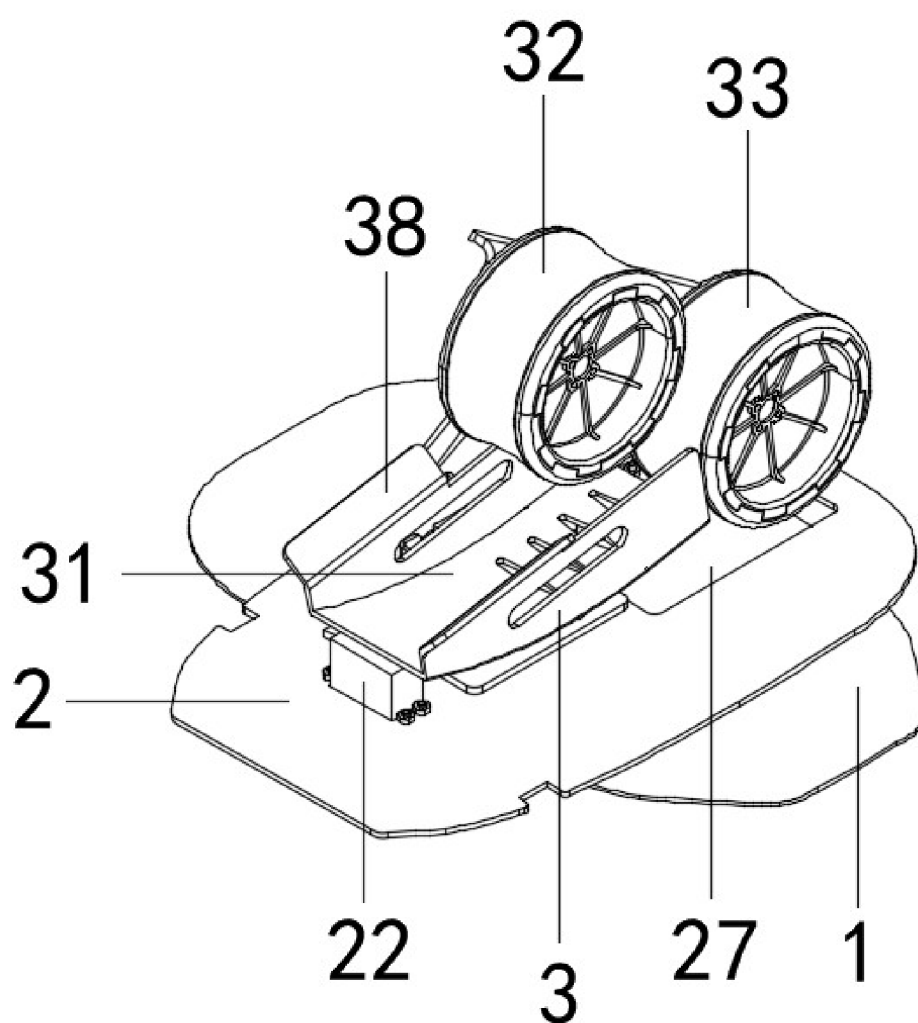


FIG. 3

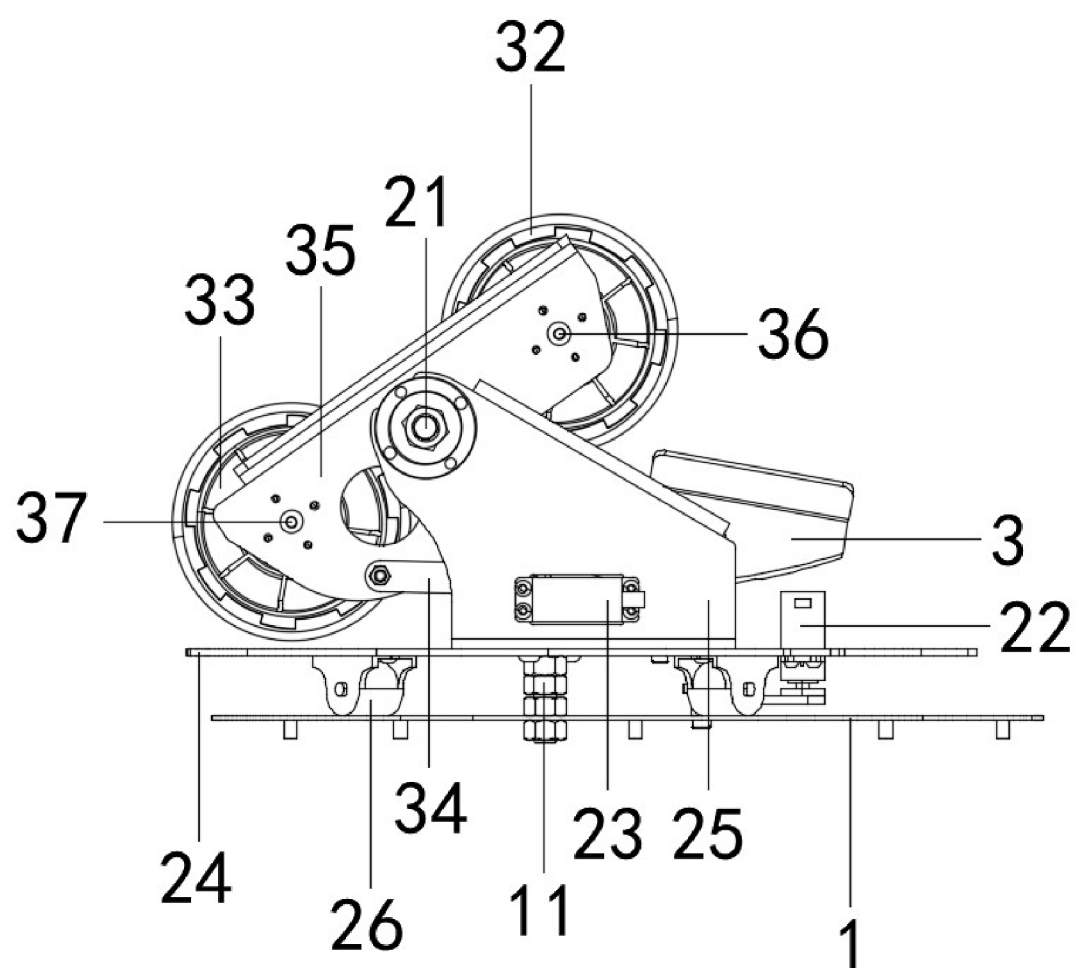


FIG. 4

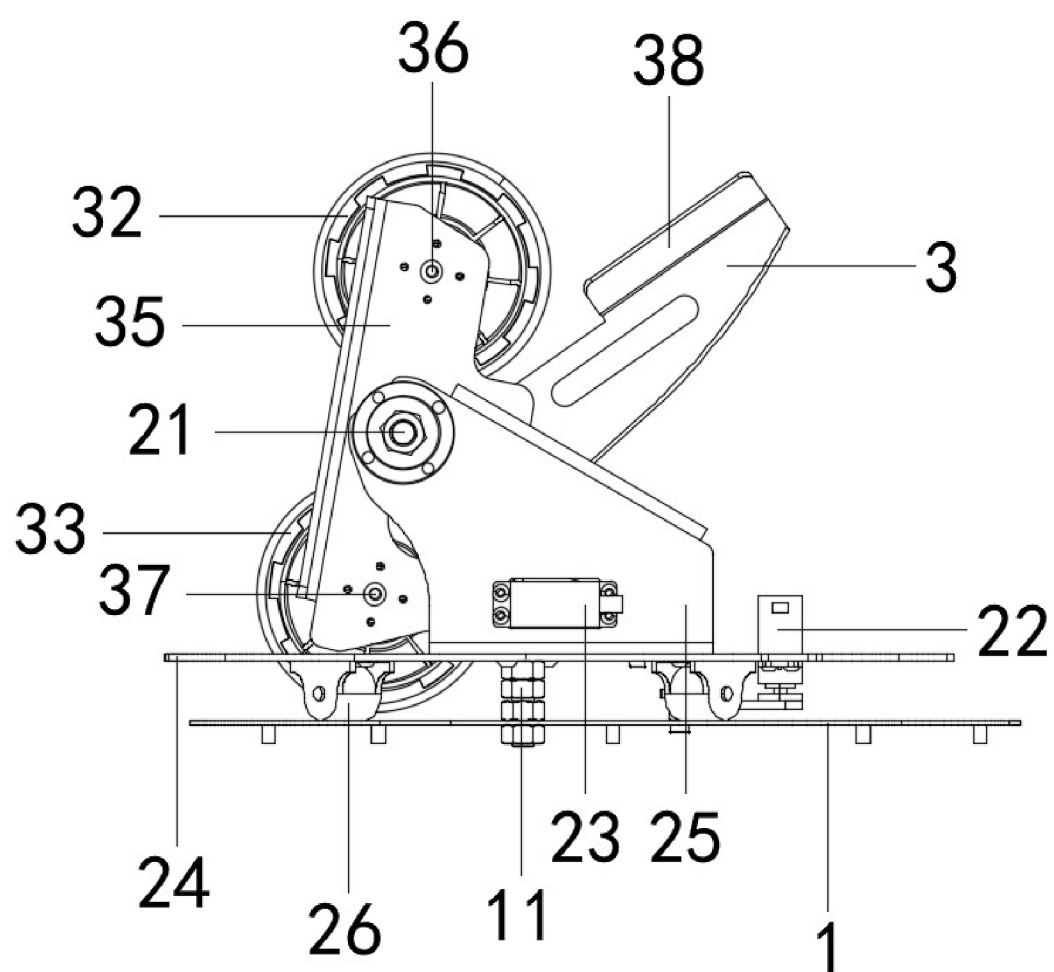


FIG. 5

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2026/073571

A. CLASSIFICATION OF SUBJECT MATTER

A63B69/40(2006.01)i; A63B69/38(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXTC, VEN, CNKI: 发球, 旋转, 左右, 上下, 角度, 调节, 电机, 摩擦轮, server, ball, rotating, left, right, up, down, angle, adjustment, motor, friction, wheel

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 206730459 U (DONGGUAN SIBOASI SPORTS GOODS TECHNOLOGY CO., LTD.) 12 December 2017 (2017-12-12) description, specific embodiments, and figures 1-3	1-10
X	CN 119258515 A (SHANGHAI FUTURE MIND TECHNOLOGY CO., LTD.) 07 January 2025 (2025-01-07) description, specific embodiments, and figures 1-3	1-10
Y	CN 220110385 U (SHENZHEN PUSUN HEALTH TECHNOLOGY CO., LTD.) 01 December 2023 (2023-12-01) description, specific embodiments, and figures 1-8	1-10
Y	CN 111228772 A (NORTH MINZU UNIVERSITY) 05 June 2020 (2020-06-05) description, paragraphs 38 and 46, and figures 1-6	1-10
A	CN 212998298 U (SHANGHAI JINGWANG SPORTS SUPPLIES CO., LTD.) 20 April 2021 (2021-04-20) entire document	1-10
A	US 2005103319 A1 (UNIFIED SOLUTIONS INC.) 19 May 2005 (2005-05-19) entire document	1-10

☒ Further documents are listed in the continuation of Box C.
☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 08 April 2026	Date of mailing of the international search report 14 April 2026
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

International application No.

PCT/CN2026/073571

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5464208 A (WNAN, INC.) 07 November 1995 (1995-11-07) entire document	1-10

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2026/073571

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 206730459 U	12 December 2017	None	
CN 119258515 A	07 January 2025	None	
CN 220110385 U	01 December 2023	None	
CN 111228772 A	05 June 2020	None	
CN 212998298 U	20 April 2021	None	
US 2005103319 A1	19 May 2005	None	
US 5464208 A	07 November 1995	None	