

AIRCRAFT PERCHING SYSTEM AND CHARGING METHOD

[0001] The present application claims the filing date of earlier Chinese Invention Patent applications Nr. 202411079087.6 , Nr. 202411079049.0 and Nr. 202411078985.X which were filed on 07 August 2024, Chinese Utility Model application Nr. 202421914096.8, Nr. 202421914216.4 and Nr. 202421913910.4 which were filed on 07 August 2024, Chinese Invention Patent applications Nr. 202411309940.9 and Nr. 202411309972.9 which were filed on 19 September 2024, and Chinese Invention Patent application Nr. 202511074375.7 which was filed on 01 August 2025 as its priority. All contents or relevant information of these priority applications is/are hereby incorporated by reference partially and/or completely, wherever relevant or appropriate.

[0002] The present patent application relates to the technical field of aircraft, and particularly relates to an aircraft perching system and a charging method.

[0003] Since unmanned aerial vehicles (UAVs) need to continuously resist gravity during flight and hovering, power consumption is significant, leading to the common problem of short endurance. Currently, the endurance capability of a single-battery UAV struggles to meet the demands of long-duration operations. Frequent return trips to the ground for charging not only reduce work efficiency but also increase the risk of task interruption.

[0004] Existing UAV airports can achieve charging or battery swapping but have defects: they require power supply and network connection, resulting in heavy weight, large volume, stringent installation conditions, and high cost; when UAVs perch at the airport, they cannot continue working, stopping tasks for charging, which severely impacts operational continuity.

[0005] Mainstream equipment mounting positions are typically underneath the UAV, preventing direct docking with ground-based landing pads. To ensure charging, mounted equipment must cease operation, further limiting the UAV's practicality.

[0006] Existing UAVs suffer from at least one of the following defects. Firstly, the contradiction between mechanical perching and power supply: existing perching technologies often rely on electrical power to maintain a hovering or charging state, such as ground pads requiring grid support, leading to system complexity and high energy consumption. For example, some UAV perching devices require continuous power to maintain contact charging, which not only increases the UAV's load but also fails to fundamentally alleviate the endurance pressure. Secondly, conflict between structural design and functional implementation: some perching systems adopt ground-based structures, requiring UAVs to land on flat pads, which is limited by terrain and prevents task execution during charging.

[0007] Although suspended perching structures have been explored, most lack integrated charging functions, or their charging interface designs are complex, making it difficult to efficiently combine them with the perching mechanism, thus failing to achieve integrated "perching-charging-operating" operation. Additionally, some suspended perching devices have appeared in the prior art, but they lack integrated charging functions; some charging solutions (like ground pads) cannot solve the problem of work interruption during perching.

[0008] Conventional perching systems rely on ground-based landing pads, which obstruct downward-mounted equipment during charging, forcing task interruption. Additionally, complex mechanical grippers increase UAV weight and power consumption. The present invention addresses these by relocating the landing gear to

the aircraft's back and implementing a distributed perching network, enabling continuous operation while perched.

[0009] A primary advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system alleviates UAV battery endurance pressure by reducing power consumption during flight and hovering through mechanical suspended perching, combined with a charging and energy replenishing device to achieve dynamic endurance extension.

[0010] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system enables the aircraft to continue working while in a perched state, without requiring electrical power to maintain hovering, relying solely on mechanical latching to maintain the perched state, ensuring task continuity.

[0011] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system reduces landing pad construction and maintenance costs, abandoning the grid configuration of traditional airports and adopting a lightweight suspended structure, reducing equipment weight, volume, and installation costs.

[0012] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system optimizes the UAV charging and energy replenishing method by integrating a contact charging interface on the basis of suspended perching, utilizing the UAV's self-weight to achieve stable charging and avoid return trips to the ground for charging.

[0013] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system improves UAV operational efficiency by reducing charging interruption time, allowing the UAV to

simultaneously charge and execute tasks while perched, enhancing utilization per unit time.

[0014] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system resolves the conflict between equipment mounting and pad docking by arranging the perching structure on top of the UAV, avoiding interference from bottom-mounted equipment during docking, enabling continuous equipment operation during charging.

[0015] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system enhances the stability of perching and charging through a design of three sets of docking interfaces and a telescopic top rod abutment structure, ensuring dual stability of mechanical latching and charging contact.

[0016] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system simplifies landing pad deployment conditions, eliminating the need for a complex power supply network, and allowing flexible installation in various scenarios such as building beams, columnar objects, etc., improving universality.

[0017] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system extends the endurance capability of a single UAV with a single battery by enabling charging and energy replenishment while perched, reducing battery replacement frequency, and expanding the UAV's operational coverage.

[0018] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system promotes the networking of regional UAV charging layouts, constructing a distributed charging

network with low-cost, easily deployable suspended charging devices, expanding application scenarios.

[0019] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system achieves perching
5 solely through mechanical structure latching, without requiring electrical power to maintain it, reducing energy consumption and alleviating battery pressure.

[0020] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system can continue to execute tasks while in the perched state, simultaneously completing charging and
10 energy replenishment, overcoming the constraint of traditional charging requiring shutdown.

[0021] Another advantage of the present invention is to provide an aircraft perching system and charging method, wherein said aircraft perching system utilizes the UAV's self-weight to maintain tight contact of the charging interface, with a three-set male-
15 female charging interface design ensuring stable current and signal transmission.

[0022] The perching structure employs lightweight materials, reducing UAV payload by $\geq 15\%$ compared to conventional grippers.

[0023] A telescopic top rod extends to abut against a docking portion inside the hollow shell, working synergistically with limit blocks to resist wind-induced oscillations
20 at Level 8.

[0024] Distributed perching devices deployed at task-specific heights form a regional network, allowing UAVs to perform photography/environmental sensing while perched via back-mounted gear, eliminating hover energy consumption .

[0025] According to one aspect of the present invention, an aircraft perching system capable of achieving the aforementioned purposes and other objectives and advantages comprises:

a perching platform;

5 an aircraft docking and charging system, wherein said aircraft docking and charging system is adapted to be connected to an aircraft, said aircraft docking and charging system being capable of being suspended below said perching platform, such that said aircraft is suspended below said perching platform when disengaged from a flight state; and

10 a charging assembly, wherein said charging assembly is disposed on said perching platform and said aircraft docking and charging system, such that when said aircraft is suspended below said perching platform, said charging assembly electrically connects to said aircraft to perform charging while said aircraft is in a perched state.

15 [0026] According to an embodiment of the present invention, said charging assembly includes a first charging terminal disposed on the perching platform and a second charging terminal disposed on the aircraft docking and charging system; wherein when the aircraft is suspended from a suspension docking section by its self-weight, the first charging terminal and the second charging terminal are pressed into contact and
20 conduct electricity, enabling the aircraft to simultaneously perform charging and operational tasks while in the perched state.

[0027] According to an embodiment of the present invention, said perching platform has at least one perching bay, said perching bay being provided with a suspension docking section and a docking channel communicating with the outside, said docking

channel including a flared guide section whose width decreases from an opening towards the suspension docking section.

[0028] According to an embodiment of the present invention, said aircraft docking and charging system is disposed on top of the aircraft and is capable of sliding along
5 the docking channel into the suspension docking section to form a mechanical latch.

[0029] According to an embodiment of the present invention, said aircraft docking and charging system is disposed inside the aircraft.

[0030] According to an embodiment of the present invention, said charging assembly comprises at least two sets of symmetrically distributed contact terminal groups, and
10 each contact terminal group comprises at least one independent electrical contact point.

[0031] According to an embodiment of the present invention, said first charging terminal is a male connector, and said second charging terminal is a female connector.

[0032] According to an embodiment of the present invention, the system further
15 comprises at least one charging power source, wherein said charging power source is disposed on said perching platform, and wherein said charging power source is a regulated power supply.

[0033] According to another aspect of the present application, the application further provides an aircraft charging method, wherein said charging method comprises the
20 following steps:

(a) controlling the aircraft to move such that an aircraft docking and charging system moves to a perching bay of a perching platform, causing said aircraft docking and charging system to form a mechanical latch with the perching bay to maintain a perched state;

(b) in the latched state, utilizing the self-weight of the aircraft to bring a second charging terminal disposed on the aircraft docking and charging system into contact and electrical conduction with a first charging terminal on the perching platform;

- 5 (c) triggering a charging power source to perform a circuit self-test, and after the self-test passes, charging an aircraft battery.

[0034] According to an embodiment of the present invention, in step (a) of said charging method, controlling said aircraft docking and charging system to enter from an opening of said perching bay and move along a docking channel to a suspension
10 docking section of said perching bay.

[0035] According to an embodiment of the present invention, in step (b) of said charging method, the first charging terminal and the second charging terminal adopt a three-set, nine-pair male-female charging interface configuration, with each set of interfaces comprising three pairs of current or signal transmission terminals.

15 [0036] According to an embodiment of the present invention, in step (b) of said charging method, the charging power source is a 24V/600W regulated power supply.

[0037] According to an embodiment of the present invention, in step (c) of said charging method, while said aircraft is in the perched state, the aircraft maintains equipment mounting and operation, simultaneously performing data collection or
20 communication tasks.

[0038] According to an embodiment of the present invention, said charging method further comprises a disengagement step:

[0039] when the aircraft activates a power system, the charging power source simultaneously disconnects a charging circuit;

[0040] the aircraft docking and charging system moves reversely along the docking channel to outside the opening;

[0041] the aircraft power system switches to battery power mode to continue flight.

[0042] The further objects and advantages of the present invention will be fully realized through understanding of the subsequent description and drawings.

[0043] These and other objects, features, and advantages of the present invention are fully demonstrated by the detailed description below and the drawings.

[0044] FIG. 1 illustrates a schematic diagram of the overall structure of an aircraft docking system, showing the perching platform, aircraft docking and charging system, and charging assembly.

[0045] FIG. 2 depicts the structural configuration of the perching platform, highlighting the docking channel and suspension docking section.

[0046] FIG. 3 depicts the structural configuration of the perching platform, highlighting the charging terminal.

[0047] FIG. 4 is a schematic structural diagram of the aircraft docking and charging system of said aircraft perching system according to the aforementioned first preferred embodiment of the present patent application.

[0048] FIG. 5 is a schematic structural diagram of the charging assembly of said aircraft perching system according to the aforementioned first preferred embodiment of the present patent application.

[0049] FIG. 6 is a schematic diagram of steps of an aircraft charging method according to another preferred embodiment of the present patent application.

[0050] The following description is provided to enable those skilled in the art to understand and practice the technical operations disclosed within the present patent application. The preferred embodiments described are for illustrative purposes only,

and other obvious variations may occur to those skilled in the art. The fundamental principles defined in the following description can also be applied to other implementations, modifications, improvements, equivalents, and technical solutions without departing from the original spirit and scope of the present patent application.

5 [0051] Those skilled in the art should understand that in the disclosure of the present patent application, the directional or positional relationships indicated by terms such as "longitudinal," "lateral," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," etc., are based on the orientations or positional relationships shown in the drawings. These terms are used solely for the
10 convenience of describing the present patent application and simplifying the description, and do not indicate or imply that the referred device or element must have a specific orientation, structure, or operation. Therefore, the above terms should not be construed as limiting the present patent application.

[0052] Furthermore, the term "a" should be understood as "at least one" or "one or
15 more." That is, in one embodiment, the number of an element may be one, while in other embodiments, the number of the element may be multiple. In summary, the term "a" should not be construed as limiting quantity.

[0053] Referring to FIGS. 1 to 6 of the drawings accompanying the specification of the present application, an aircraft perching system and charging method according
20 to a first preferred embodiment of the present application are elucidated in the following description. Said aircraft perching system comprises a perching platform 10, an aircraft docking and charging system 20, and a charging assembly 30 disposed on said perching platform 10 and said aircraft docking and charging system 20. Said aircraft docking and charging system 20 is connected to an aircraft, said aircraft
25 docking and charging system 20 being capable of being suspended below said

perching platform 10, such that when said aircraft is disengaged from a flight state and suspended below said perching platform 10, said charging assembly 30 electrically connects to said aircraft to perform charging while said aircraft is in a perched state.

[0054] Said perching platform 10 has at least one perching bay 110 capable of
5 accommodating said aircraft docking and charging system 20. When said aircraft docking and charging system 20 moves to said perching bay 110 of said perching platform 10, the aircraft is in a perched state (e.g., landed); when said aircraft docking and charging system 20 moves out of said perching bay 110 of said perching platform 10, the aircraft is in a flight state.

10 [0055] Said perching bay 110 of said perching platform 10 is further provided with an opening 1101, a docking channel 1102, and a suspension docking section 1103. Said docking channel 1102 communicates said opening 1101 with said suspension docking section 1103. When the aircraft transitions from a flight state to a perched state, the aircraft docking and charging system 20 can enter from said opening 1101 into said
15 docking channel 1102 and move along said docking channel 1102 to said suspension docking section 1103. When the aircraft transitions from a perched state to a flight state, the aircraft docking and charging system 20 moves from said suspension docking section 1103 along said docking channel 1102 to the outside of said opening 1101.

20 [0056] It is worth mentioning that in this preferred embodiment, said opening 1101 of said perching bay 110 faces the ground (or is inclined downward), meaning the aircraft in a flight state enters said opening 1101 from below said perching bay 110 and moves along said docking channel 1102 to said suspension docking section 1103.

[0057] In this preferred embodiment, said docking channel 1102 of said perching bay
25 110 has a first guide section 11021, a second guide section 11022, and a third guide

section 11023, wherein said third guide section 11023 is located between said first guide section 11021 and said second guide section 11022. Said first guide section 11021 and said third guide section 11023 are connected by said second guide section 11022. Said first guide section 11021 communicates with said suspension docking section 1103 of said perching bay 110, and said second guide section 11022 is connected to said opening 1101.

[0058] In this preferred embodiment, said second guide section 11022 is of a flared structure, meaning the width of said second guide section 11022 gradually decreases from said opening 1101 towards said third guide section 11023, so as to guide said aircraft docking and charging system 20 towards said suspension docking section 1103 via said docking channel 1102.

[0059] As shown in FIG. 2, said docking channel 1102 adopts a "vertical flared section and horizontal groove section" design. The docking channel includes a flared guide section with a width that tapers at an angle of 15 degrees from the opening towards the suspension docking section.

[0060] As an example, in the first preferred embodiment of the present application, said first guide section is a horizontal channel, and said second guide section is a vertical channel. It can be stated that in this preferred embodiment, the horizontal channel and the vertical channel are not limited to strictly perpendicular horizontal and vertical structures.

[0061] When said aircraft docking and charging system 20 moves within said docking channel 1102, said docking channel 1102 guides said aircraft docking and charging system 20 to move between said opening 1101 and said suspension docking section 1103 along said second guide section and said first guide section.

[0062] The aircraft docking and charging system (20) is mounted on the UAV's back, comprising a central connection rod (2) and three lock rods (3) circumferentially distributed. Each lock rod (3) terminates in a hook-shaped engagement member that clamps the perching platform's exterior wall (CN118850387A).

5 [0063] In this preferred embodiment, said perching bay 110 is of a tubular structure, wherein said suspension docking section 1103 is a groove formed in said tubular structure. When said aircraft docking and charging system 20 moves via said docking channel 1102 above said suspension docking section 1103, under the self-weight of the aircraft, said aircraft docking and charging system 20 drops into said suspension
10 docking section 1103 and is suspended in a perched state by said perching bay 110.

[0064] Said perching bay 110 of said perching platform 10 further comprises at least one limiting portion 111 formed on one side of said suspension docking section 1103, wherein said limiting portion 111 is used to restrict movement of said aircraft docking and charging system 20 located within said suspension docking section 1103. L-
15 shaped limiting portions are provided on both sides of the suspension docking section to restrict lateral displacement of the docking rod; the guide roller on the upper end of the docking rod uses a material with a low rolling friction coefficient to avoid interface wear caused by rigid collisions.

[0065] As shown in FIG. 6, said perching platform 10 further comprises at least two
20 bay carriers 11, wherein said bay carriers 11 surround to form said perching bay 110. In one specific example of the present application, said perching platform 10 comprises three said bay carriers 11 equally spaced apart, wherein said bay carriers 11 are arranged in a tubular configuration, and said perching bay 110 is formed between two adjacent said bay carriers 11.

[0066] Said bay carriers 11 of said perching platform 10 provide support for the aircraft in the perched state, meaning the perched aircraft is suspended onto said bay carriers 11 of said perching platform 10.

[0067] In a specific example of the present application, said aircraft docking and charging system 20 is disposed on top of the aircraft, i.e., said aircraft docking and charging system 20 protrudes from the top of the aircraft, enabling the aircraft to perch and land via said aircraft docking and charging system 20.

[0068] In another specific example of the present application, said aircraft docking and charging system 20 is built into the aircraft, and said aircraft docking and charging system 20 is part of the aircraft. As an example, the aircraft docking and charging system 20 is a main board structure of the aircraft. Said aircraft docking and charging system 20 comprises a aircraft docking and charging system main board 21 and at least two docking rods 22 disposed on said aircraft docking and charging system main board 21, wherein said docking rods 22 and said aircraft docking and charging system main board 21 are of an integrated structure.

[0069] When the aircraft is in the perched state, said docking rods 22 of said aircraft docking and charging system 20 correspond to said suspension docking section 1103 of said perching bay 110, and said suspension docking section 1103 of said perching bay 110 supports said docking rods 22 of said aircraft docking and charging system 20.

[0070] The suspension docking section (1103) includes a telescopic top rod (203) that extends to press against a mating abutment inside the perching bay (110). This creates frictional resistance $\geq 200\text{N}$, stabilizing the UAV during charging in windy conditions (CN118753550A).

[0071] In this preferred embodiment, said aircraft docking and charging system 20 comprises three said docking rods 22 arranged in a "Y"-shaped structure, with the three said docking rods 22 equally spaced. In summary, the present application utilizes the top-mounted Y-shaped docking rod cooperating with the groove of the tubular perching bay, leveraging the UAV's self-weight to achieve suspended perching without requiring electrical power to maintain hovering.

[0072] Said aircraft docking and charging system 20 further comprises at least two guide rollers 23, wherein said guide rollers 23 are disposed on the upper ends of said docking rods 22. When said aircraft docking and charging system 20 moves along said docking channel 1102, said guide rollers 23 guide the movement of said aircraft docking and charging system 20 in a rolling manner, preventing interference between said aircraft docking and charging system 20 and said perching bay 110.

[0073] Said charging assembly 30 is used for charging the aircraft while in said perched state, wherein said charging assembly 30 further comprises at least one first charging terminal 31 and at least one second charging terminal 32, wherein said first charging terminal 31 and said second charging terminal 32 are adapted to each other, meaning said first charging terminal 31 and said second charging terminal 32 can be electrically connected to form a conductive path.

[0074] In one specific example of the present application, said first charging terminal 31 is disposed on said bay carriers 11 of said perching platform 10, and said second charging terminal 32 is disposed on said docking rods 22 of said aircraft docking and charging system 20. When said aircraft docking and charging system 20 moves to said suspension docking section 1103 of said perching bay 110, said first charging terminal 31 and said second charging terminal 32 are positioned opposite each other. Under the self-weight of the aircraft, said first charging terminal 31 and said second charging

terminal 32 maintain electrical contact, meaning said charging assembly 30 is in an electrically conductive state.

[0075] The aircraft perching system further comprises at least one charging power source 40, wherein said charging power source 40 is disposed on said perching platform 10. Said charging power source 40 is electrically connected to said first charging terminal 31, and said second charging terminal 32 is electrically connected to the aircraft. When the aircraft is in the perched state, said charging power source 40 can charge the aircraft via said first charging terminal 31 and said second charging terminal 32.

[0076] In this preferred embodiment, said charging assembly 30 comprises three sets of electrical contact interfaces formed by said first charging terminal 31 and said second charging terminal 32. It is understood that the specific number of said charging assembly 30 is given only as an example and is not limiting.

[0077] Said charging power source 40 is a regulated power supply. When said first charging terminal 31 and said second charging terminal 32 of said charging assembly 30 make electrical contact, after self-testing, said charging power source 40 charges the aircraft's battery.

[0078] Said first charging terminal 31 is disposed on said bay carriers 11 of said perching platform 10, wherein said second charging terminal 32 is disposed on the inner side of said docking rods 22 of said aircraft docking and charging system 20, and the positions of said first charging terminal 31 and said second charging terminal 32 correspond. When said aircraft docking and charging system 20 moves to said perching bay 110, under the self-weight of the aircraft, said first charging terminal 31 and said second charging terminal 32 maintain electrical contact, at which time said charging power source 40 charges the aircraft.

[0079] As an example, in one specific instance of the present application, said first charging terminal 31 further comprises at least one male connector, and said second charging terminal 32 further comprises at least one female connector, wherein said male connector and said female connector are adapted to each other. The surface of the male connector is plated with a 0.1mm thick gold layer; the female connector has built-in elastic contact pieces. The contact pressure of $\geq 1.5\text{N}$ prevents accidental charging when the UAV approaches, enhancing safety by a factor of three compared to conventional exposed charging interfaces.

[0080] It should be noted that the male connector is the end of a connector with pins or protrusions; in the aircraft perching system charging assembly, it is disposed on the bay carrier of the perching platform. The female connector is the end of a connector with sockets; in the aircraft perching system, it is located on the inner side of the docking rod of the aircraft docking and charging system. As an example, the male connector surface is plated with a 0.1mm thick gold layer, the female connector has built-in elastic contact pieces, and said male connector and female connector are adapted to each other. The male connector is inserted into the female connector for connection, thereby forming a stable electrical contact to achieve current or signal transmission, providing a pathway for charging the aircraft. The connection method involves inserting into the female connector. This structural design ensures that when the aircraft is suspended from the perching platform by its self-weight, the male and female connectors make tight contact, guaranteeing stable charging.

[0081] In one specific example of the present application, said charging power source 40 is built into said perching platform 10, wherein said charging power source 40 is a 24V/600W regulated power supply, connected respectively to the nine male connectors of the three sets of interfaces of said first charging terminal 31. The nine

female connectors of the three sets of interfaces located on the aircraft docking and charging system 20 are connected to the battery and the aircraft's main board. When the aircraft completes the perching action and all three sets of nine male-female contacts are fully made, the regulated power source inside said perching platform 10 performs a self-test on the circuit. After passing, it begins charging and replenishing the battery. When the aircraft leaves the landing pad, the nine contact terminals disconnect, and the aircraft's power switches to battery supply, flying away from the pad to continue the mission.

[0082] The present application arranges three sets of interfaces with three pairs each on the inner side of the docking rods 22 and the perching bay carriers. When the UAV is suspended, its self-weight presses the interfaces into tight contact. A built-in 24V/600W regulated power supply supplies power after self-testing. Additionally, the present application positions the aircraft docking and charging system on top of the UAV, avoiding interference from bottom-mounted equipment during docking. The perching platform can be installed on building beams, columnar objects, etc., without requiring level ground.

[0083] It is worth mentioning that in the present application, said charging power source 40 has a built-in current detection module, automatically completing a line self-test after contact (taking < 5 seconds), and synchronously switching the UAV's power source upon disconnection to avoid power interruption.

[0084] In a regional monitoring scenario, 12 cylindrical perching devices (1) are installed on building beams at 20m intervals. The UAV sequentially perches at each device via back-mounted gear, capturing imagery for 5 minutes per site. Total energy consumption is reduced by 60% versus continuous hovering (CN118753551A). In a regional monitoring scenario, 12 cylindrical aircraft docking and charging systems are

installed on building beams at 20-meter intervals. The UAV perches at each device for 5-minute imaging tasks, reducing energy consumption by 60% compared to continuous hovering under equivalent conditions.

[0085] Referring to another aspect of the present application, the application further provides an aircraft charging method, wherein said charging method comprises the following steps:

[0086] (a) Control the aircraft such that the aircraft docking and charging system 20 moves to the perching bay 110 of the perching platform 10, causing said aircraft docking and charging system 20 to form a mechanical latch with the perching bay 110 to maintain a perched state.

[0087] (b) In the latched state, utilize the self-weight of the aircraft to bring the second charging terminal 32 disposed on the aircraft docking and charging system 20 into contact and electrical conduction with the first charging terminal 31 on the perching platform 10.

[0088] (c) Trigger the charging power source 40 to perform a circuit self-test, and after the self-test passes, charge the aircraft battery.

[0089] In step (a) of said charging method, control said aircraft docking and charging system 20 to enter from said opening 1101 of said perching bay 110 and move along said docking channel 1102 to said suspension docking section 1103 of said perching bay 110.

[0090] In step (b) of said charging method, the first charging terminal 31 and the second charging terminal 32 adopt a three-set, nine-pair male-female charging interface configuration, with each set of interfaces comprising three pairs of current or signal transmission terminals.

[0091] In step (b) of said charging method, the charging power source 40 is a 24V/600W regulated power supply.

[0092] In step (c) of said charging method, while said aircraft is in the perched state, the aircraft maintains equipment mounting and operation, simultaneously performing
5 data collection or communication tasks.

[0093] It is worth mentioning that said charging method further comprises a disengagement step:

[0094] When the aircraft activates the power system, the charging power source 40 simultaneously disconnects the charging circuit;

10 [0095] The aircraft docking and charging system 20 moves reversely along the docking channel 1102 to outside the opening 1101;

[0096] The aircraft power system switches to battery power mode to continue flight.

[0097] It should be noted that in the present application, the process where the aircraft docking and charging system moves from outside the perching platform, along
15 the docking channel, into the perching bay, and finally reaches the suspension docking section is the forward movement of the aircraft docking and charging system. Entering from the opening of the perching bay, sliding along the flared guide section whose width decreases from the opening towards the suspension docking section, into the suspension docking section to form a mechanical latch and maintain the perched
20 state. This direction is consistent with the movement direction of the aircraft transitioning from a flight state to a perched state.

[0098] The process where the aircraft docking and charging system disengages from the suspension docking section and returns along the docking channel to outside the opening of the perching bay is the reverse movement of said aircraft docking and
25 charging system 20. This path is exactly opposite to the forward movement and is the

movement direction of the aircraft docking and charging system when the aircraft transitions from a perched state to a flight state, corresponding to the action of the aircraft docking and charging system moving reversely along the docking channel to outside the opening.

- 5 [0099] In short, forward is the direction into the perching platform, reverse is the direction leaving the perching platform. Both are referenced relative to the opening and the suspension docking section of the perching bay, forming a clear directional correspondence based on the guiding path of the docking channel.

[00100] Those skilled in the art should understand that the embodiments of the
10 present patent application shown in the above description and drawings are for illustration only and do not limit the present patent application. The objectives of the present patent application have been completely and effectively achieved. The functional and structural principles of the present patent application have been shown and explained in the embodiments. Without departing from said principles, the
15 implementation of the present patent application allows for any variations or modifications.

Claims

1. An aircraft perching system, comprising:

➤ a perching platform;

5 ➤ an aircraft docking and charging system, wherein said aircraft docking and charging system is adapted to be connected to an aircraft, said aircraft docking and charging system being capable of being suspended below said perching platform, such that said aircraft is suspended below said perching platform when disengaged from a flight state; and

10 ➤ a charging assembly, wherein said charging assembly is disposed on said perching platform and said aircraft docking and charging system, such that when said aircraft is suspended below said perching platform, said charging assembly electrically connects to said aircraft to perform charging while said aircraft is in a perched state.

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2. The aircraft perching system according to claim 1, said charging assembly comprises a first charging terminal disposed on the perching platform and a second charging terminal disposed on the aircraft docking and charging system; wherein when the aircraft is suspended from a suspension docking
20 section by its self-weight, the first charging terminal and the second charging terminal are pressed into contact and conduct electricity, enabling the aircraft to simultaneously perform charging and operational tasks while in the perched state.

3. The aircraft perching system according to claim 2, said perching platform comprises at least one perching bay, said perching bay being provided with a suspension docking section and a docking channel communicating with outside, said docking channel including a flared guide section whose width decreases from an opening towards the suspension docking section.
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4. The aircraft perching system according to claim 3, said aircraft docking and charging system is disposed on top of the aircraft and is capable of sliding along the docking channel into the suspension docking section to form a mechanical latch.
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5. The aircraft perching system according to claim 3, said aircraft docking and charging system is disposed inside the aircraft.
- 15 6. The aircraft perching system according to claim 4 or 5, said charging assembly comprises at least two sets of symmetrically distributed contact terminal groups, and each contact terminal group comprises at least one independent electrical contact point.
- 20 7. The aircraft perching system according to claim 6, said first charging terminal is a male connector, and said second charging terminal is a female connector.

8. The aircraft perching system according to claim 6, the system further comprises at least one charging power source, wherein said charging power source is disposed on said perching platform, and wherein said charging power source is a regulated power supply.

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9. An aircraft charging method, comprising:
- a) controlling an aircraft to move such that an aircraft docking and charging system moves to a perching bay of a perching platform, causing said aircraft docking and charging system to form a mechanical latch with a perching bay to maintain a perched state;
 - b) in a latched state, utilizing self-weight of said aircraft to bring a second charging terminal disposed on the aircraft docking and charging system into contact and electrical conduction with a first charging terminal on the perching platform; and
 - c) triggering a charging power source to perform a circuit self-test, and after said circuit self-test passes, charging an aircraft battery.

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9. The aircraft charging method according to claim 9, in step (a) of said aircraft charging method, controlling said aircraft docking and charging system to enter from an opening of said perching bay and move along a docking channel to a suspension docking section of said perching bay.

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10. The aircraft charging method according to claim 10, in step (b) of said aircraft charging method, the first charging terminal and the second charging terminal adopt a three-set, nine-pair male-female charging interface configuration, with each set of interfaces comprising three pairs of current or signal transmission terminals.

12. The aircraft charging method according to claim 11, in step (b) of said aircraft charging method, the charging power source is a 24V/600W regulated power supply.

13. The aircraft charging method according to claim 12, in step (c) of said aircraft charging method, while said aircraft is in the perched state, the aircraft maintains equipment mounting and operation, simultaneously performing data collection or communication tasks.

14. The aircraft charging method according to claim 13, said aircraft charging method further comprises a disengagement step:
when the aircraft activates a power system, the charging power source simultaneously disconnects a charging circuit;
the aircraft docking and charging system moves reversely along the docking channel to outside the opening; and
said power system switches to battery power mode to continue flight.