

A Barrier Adapted For An Access Gate

Field of the Invention

[0001] The present invention relates to a barrier adapted for an access gate. In particular, the present invention relates to an access gate with an improved sensory
5 feature of the barrier flap that prevents injuries implicated on users utilizing the access gate, and an improved reduction in the noise induced by the barrier, and yet, prevents forced entry by trespassers.

Background

[0002] Various applications of a gate allow a specific point of entry that is
10 limited to a space or a moderately sized opening. A gate may prevent or control the entry or exit to an area. An access gate may be used as a form of gate that enforces a one-way traffic of users, therefore allowing only one user to pass through the gate at a time. Further, passage through the access gate may be restricted to users only when a coin, a ticket, a pass, or similar, is inserted, and may be automated or
15 acknowledged by a system operating the access gate.

[0003] The access gate may have different types of barrier elements implemented to restrict or permit entry of users through the gates. Some examples common in the market today are the turnstile bars and the sliding, swinging or revolving flaps.

20 **[0004]** The access gate may be used in various settings. It may be used as a barrier for the purpose of permitting only paid access (using the coins or pre-paid

ticket), or as a restricted barrier to the area that only permits authorized users. Such access gates are commonly found in places like mass transit stations, office lobbies or stadiums, just to name a few.

5 **[0005]** Places that utilize such access gates may experience a large number of traffic flow. The movement of the barrier element has to be able to permit access of the authorized users quickly, and yet close as quickly should an unauthorized person attempts to pass the access gates. As such, it is important that the access gates operate with speed and efficiency, with its barrier elements opening and closing without any injuries implicated on the users.

10 **[0006]** With the large scale of traffic flow, it is also likely that the noise level induced from such high frequency of the movement of the barrier elements will be high. Accordingly, there is a need to reduce the noise that may be induced by the constant movement of the barrier elements.

Summary

15 **[0007]** In one aspect of the present invention, there is provided a barrier adapted for an access gate, permitting or restricting a user to enter an area or space. The barrier comprising a metal base frame; a motor assembly mounted on the metal base frame, wherein the motor assembly includes an electric motor and a gear assembly, the motor assembly having an integrated control unit for controlling the electric motor; a
20 barrier flap with a wing-like shape flap pivotally mounted on the metal base frame at a lower end, wherein the barrier flap is operationally actuated by the motor assembly to pivot about the lower end along a horizontal axis between the opened and closed positions, the barrier flap is connected to the motor assembly through a primary bar and

a secondary bar in a multi-bar linkage; and a guiding support extended from the metal base frame upwardly towards an upper end of the barrier flap and engaging it thereto, the guiding support having a guide rail for supporting and guiding the upper end of the barrier flap along the horizontal axis, wherein the primary bar is directly driven by the motor assembly at one end and the secondary bar is connected between the primary bar and the barrier flap.

[0008] In one embodiment, the electric motor may include any one of a brushless DC motor, a brushed DC motor, a brushless AC motor and etc.

[0009] In another embodiment, the multi-bar linkage is a four-bar linkage.

10 [0010] In one embodiment, the barrier flap is a telescopic structure having an outer shell and at least one inner core flap, the outer shell flap and the inner core flap are individually supported by a respective tertiary bar, and each respective tertiary bar is pivoted on the metal base frame. The two tertiary bar supporting the outer shell and the inner core flap are pivoted on a same pivot joint. Further, each of the tertiary bar is connected to the primary bar via a respective secondary bar.

[0011] In another embodiment, the tertiary bar connected to the inner core flap is adapted to move faster than the outer shell. The tertiary bar connected to the inner core flap is adapted to move differentially in accordance with its stroke length.

[0012] In yet another embodiment, the barrier further comprises at least one stopper for limiting rotation of the primary bar to a predefined curvature. The barrier further comprises a resilient member, wherein the resilient member provides a returning force against the barrier flap when the barrier is in its closed position.

[0013] In another embodiment of the present invention, the motor assembly is oriented perpendicularly on the metal base frame.

[0014] In another embodiment, the gear assembly further comprises a planetary gear and a bevel gear. The planetary gear provides stability and even distribution of the load from the electric motor. The bevel gear further comprises a miter gear, adapted to change a driving direction at 90° or right angle, angularly driving the flap lever joint.

[0015] In yet another embodiment of the present invention, the motor assembly is configured to drive the primary bar to actuate the barrier flap bidirectional only. The integrated controller is configured to detect if there is an obstruction against the barrier flap. The barrier flap is retracted immediately when the obstruction is detected.

[0016] In one embodiment of the present invention, there is an access gate comprising a barrier. The access gate comprises a pair of opposing configured barrier.

Brief Description of the Drawings

[0017] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0018] **FIG. 1** shows a perspective view of a barrier comprising a barrier flap in accordance with one embodiment of the present invention;

[0019] **FIG. 2** shows a perspective view of the barrier comprising the barrier flap in an opened position;

[0020] **FIG. 3A** illustrates a close perspective view of the various components provided for the barrier as shown in **FIG. 1**;

[0021] FIG. 3B provides a schematic drawing of the four-bar linkage;

[0022] FIG. 4 shows a perspective view of a barrier comprising a telescopic flap in accordance with another embodiment of the present invention;

[0023] FIG. 5 shows a perspective view of the barrier comprising the telescopic
5 flap in an opened position;

[0024] FIG. 6A illustrates a close perspective view of the various components provided for the barrier as shown in FIG. 4;

[0025] FIG. 6B provides a schematic drawing of the four-bar linkage when the barrier (as shown in FIG. 4) is in its opened position; and

10 [0026] FIG. 6C provides a schematic drawing of the four-bar linkage when the barrier (as shown in FIG. 4) is in its closed position.

Detailed Description

[0027] The following descriptions of a number of specific and alternative embodiments are provided to understand the inventive features of the present invention.

15 It shall be apparent to one skilled in the art, however that this invention may be practiced without such specific details. Some of the details may not be described in length so as to not obscure the invention. For ease of reference, common reference numerals will be used throughout the figures when referring to same or similar features common to the figures.

20 [0028] FIG. 1 shows a perspective view of a barrier 100 comprising a barrier flap 102 in accordance with one embodiment of the present invention. The barrier 100

is built within a housing (not shown). Typically, two of these barriers **100** when placed along the same horizontal axis, positioned alongside mirroring each other, form an access gate. The access gate permits or restricts a user to enter an area or space, which may require any form of authorization to open the access gate. The system and method
 5 adapted for providing and authorizing access through the access gate is well known in the art, and therefore, no further illustrations are provided herewith.

[0029] The barrier **100** comprises a motor assembly **101**, the barrier flap **102**, a bearing support **103**, an adjustable bar **104**, a flap lever joint **105**, a resilient member (not shown), a guiding support **107** and a metal base frame **108**. The motor assembly
 10 **101**, the barrier flap **102**, the bearing support **103**, the adjustable bar **104**, the flap lever joint **105**, the resilient member and the guiding support **107** in the barrier **100** will be compacted within the housing (not shown) of the access gates. In one embodiment, the resilient member may be a puller spring or a tension spring, such as a helical spring.

[0030] The motor assembly **101** is a motor assembly with an integrated control
 15 unit (not shown). The barrier flap **102** is a type of barricade used in the access gate, which leaves the barrier **100** in an opened or closed position, pivoting in a to and fro movement on the metal base frame **108**. For avoidance of doubt, the barrier **100** is in the opened position when the barrier flap **102** is retracted towards the motor assembly
 20 **101**, and the barrier **100** is in the closed position when the barrier flap **102** is pivoted away from the motor assembly **101**. The barrier flap **102** is attached to and being supported by a metal bar **110** that is pivoted on the metal base frame **108** through the bearing support **103**. The bearing support **103** lessens the friction and reduces the noise induced in the pivoting movement of the barrier flap **102**. The adjustable bar **104** has one end connected to a proximal end of the metal bar **110** supporting the barrier flap

102 and the other end connected to the flap lever joint **105**. The adjustable bar **104** is adjustable in length for controlling the stroke length of the barrier flap **102**. The metal bar **110** is pivoted to the bearing support **103** at one lower distal end and is supported at the upper distal end by the guiding support **107**, wherein the upper distal end swivels along the guiding support **107**. The flap lever joint **105** is substantially a L-shaped connector with the angled corner attaching to the motor assembly **101**. The motor assembly **110** drives the flap lever joint **105** to operationally rotate about the angled corner in both clockwise and anti-clockwise directions. The other distal end of the flap level joint **105** is pivotally connected to the adjustable bar **104** as mentioned above. The other end of the flap level joint **105** that is extended out from the angled corner serves as a stopper arm to limit the rotations of the flap level joint **105**. The adjustable bar **104**, the flap lever joint **105** and the metal bar **110** together with the metal base frame **108** that supports the metal bar **110** and the flap lever joint **105** are connected one to another in a loop to form a four-bar linkage, which will be further described below in details. The guiding support **107** guides the stroke of the opening or closing movement of the barrier flap **102** in the barrier **100**.

[0031] The barrier flap **102** pivots about the bearing support **103** only in the to and fro or bidirectional movement between the barrier's **100** opened and closed positions. The resilient member has one end attached to the metal bar **110** and another end attached to the base frame **108**. It extends when the barrier flap **102** is in its closed position on the barrier **100**. But it pulls back the barrier flap **102** to the opened position when the motor assembly **101** loses power to drive the barrier flap **102** back. Further, the type of barrier flap **102** in the present invention is a wing-like shape flap with its

outer length following a curvature arc. In the barrier **100**, only a single piece of the wing-like shape flap is utilized as the barrier flap **102**.

[0032] Still referring to **FIG. 1**, the motor assembly **101** in accordance with one embodiment of the present invention, comprises an integrated control unit. The motor assembly **101** further includes an electric motor and a gear assembly that drives the flap lever joint **105**. For space saving, the motor assembly **101** is orientated perpendicularly on the metal base frame **108**, such that the flap lever joint **105** is driven horizontally. Accordingly, the gear assembly is adapted to convert the vertical driving force to a horizontal one. The motor assembly **101** controls the barrier **100** in both to and fro direction, i.e. retracting the barrier flap **102** inward in the barrier's **100** opened position, or driving the barrier flap **102** outward in the barrier's **100** closed position.

[0033] The integrated control unit in the motor assembly **101** reduces the number of wires required in the barrier **100**, making the barrier **100** simpler and easy to maintain, and reducing the overall structure's footprint of the barrier **100**. Additionally, the integrated control unit controls the motor assembly **101** that drives the flap lever joint **105**. The integrated control unit switches the phase of the current in the electric motor continuously as the electric motor drives the flap lever joint **105** forward and backward in a single axis. The forward movement of the flap lever joint **105** extends the barrier flap **102** outwards, and the backward movement of the flap lever joint **105** retracts the barrier flap **102** inwards.

[0034] The motor assembly **101** is adapted to angularly drive the flap lever joint **105** through the gear assembly. The gear assembly comprises a planetary gear followed by a bevel gear. The planetary gear reduces backlash of the motor assembly **101**,

providing better overall efficiency. Backlash is the amount of lost motion due to clearance or slackness when movement is reversed and contact is re-established. Backlash occurs in the barrier **100** due to the pivoting movement of the barrier flap **102**. The planetary gear provides greater stability in the motor assembly **101**, providing
 5 even distribution of the load from the electric motor. The type of bevel gear utilized in the gear assembly can be a miter gear. The miter gear is a pair of bevel gear, adapted to change a driving direction at a 90° or right angle. The miter gear therefore is adapted to angularly drive the flap lever joint **105**.

[0035] Therefore, the configuration of the gear assembly together with the
 10 electric motor, provide a more space effective configuration as compared to a conventional DC motor for driving access gate that is placed horizontally. The gear assembly of the motor assembly **101** is fixated on the metal frame **108**, where the bevel gear in the gear assembly is connected to the flap lever joint **105**. The motor assembly **101** drives the flap lever joint **105** forward in the single axis when the barrier flap **102**
 15 is extended outwards. When the barrier flap **102** is retracted inwards, the motor assembly **101** drives the flap lever joint **105** backward in the same single axis.

[0036] In the above embodiment, the motor assembly **101** may include any suitable electric motor for driving the barrier flap **102** operationally. The electric motor may include any one of a brushless DC motor, a brushed DC motor, a brushless AC
 20 motor and etc.

[0037] The barrier flap **102** moves bi-directionally as it pivots about in the barrier's **100** opened and closed position, pivoting about the bearing support **103** in one horizontal axis. With a higher traffic flow of users utilizing the access gate, the barrier

100 needs to be able to withstand a large amount of frictional force induced by the constant movement. Therefore, the bearing support **103** is provided as one embodiment in the present invention, to lessen the friction caused by the constant movements in the barrier **100**. Additionally, the noise induced by the barrier flap's **102** movement (as it
5 moves into the opened or closed position), is reduced due to the bearing support **103**.

[0038] The adjustable bar **104** has one end mounted to the metal bar **110** of the barrier flap **102**. The length of the adjustable bar **104** controls the stroke length of the barrier flap **102**, providing the overall stroke length of the barrier flap **102** adapted for the barrier **100**. When two of the barrier **100** are placed mirroring each other along the
10 same horizontal axis, the overall stroke length of the barrier flap **102** provides a form of barricade to permit or restrict a user to access through. The adjustability in the overall stroke length of the barrier flap **102** does not limit the distance between the position of the two mirroring barrier **100**.

[0039] Further, the other end of the adjustable bar **104** is mounted to the flap
15 lever joint **105** that is operationally driven by the motor assembly **101**. Therefore, the flap lever joint **105** drives the adjustable bar **104** to pivot about the metal bar **110** of the barrier flap **102**. Additionally, the flap lever joint **105** adapts in a manner to provide a self-locking mechanism, preventing the flap lever joint **105** to move in any other direction other than about its pivot point.

20 [0040] The guiding support **107** guides the stroke of the pivot movement of the barrier flap **102**. The guiding support **107** reduces the sideways vibration produced by the opening and closing movement of the barrier flap **102**. Therefore, the guiding support **107** increases the stability of the overall movement of the barrier flap **102** in

the barrier **100**. Further, the guiding support **107** improves the radial load factor of the barrier **100**. The radial load factor affects the overall force due to the torque (force) transmitted by the gear assembly. Improving the radial load factor provides essential support for the barrier **100** to withstand external load (up to 100J) enforced upon the barrier flap **102** and yet maintain the barrier's **100** functionality. This also allows the metal bar **110** that is mounted to the barrier flap **102** to be lighter and thinner as compared with conventional designs. Conventional designs require a heavier or steadier metal bar mounted to the barrier flap **102** to prevent forced entry through the access gates.

[0041] As **FIG. 1** illustrates the barrier **100** when it is in the closed position, the resilient member is extended as barrier flap **102** is driven outwards. The extension in the resilient member depends on the length of the adjustable bar **104** mounted to the flap lever joint **105**. The longer the length of the adjustable bar **104**, the further the barrier flap **102** can be extended outwards, hence extending the resilient member longer. The resilient member also provides a returning force against the barrier flap **102** as the motor assembly **101** drives it outwards, hence making the barrier **100** difficult to be forced apart. Additionally, with the aid of the guiding support **107**, the barrier flap **102** is forced to move only along the guide rail, further preventing the barrier flap **102** to be forced opened.

[0042] The resilient member is mounted to the barrier flap **102** and extends in length when the barrier **100** is in the closed position. In an incident when the power supply or any other possible emergency situation occurs, the barrier **100** ceases operation, and hence, the resilient member returns the barrier flap **102** back to the barrier's **100** opened position. This allows the users utilizing the access gate to pass

through the gates rapidly. In scenarios when the resilient member remains extended (in case of malfunction in the resilient member), the user may be able to force the barrier flap **102** inwards into the housing, to pass through the access gate.

[0043] In an incident when the barrier flap **102** extends outwards while a user is
5 passing through the barrier **100** and hits the user, therefore obstructing the pivoting movement of the barrier flap **102**. The integrated control unit in the motor assembly **101** monitors the time taken for the barrier flap **102** to be fully extended outwards or fully retracted inwards. When the timing taken for the barrier flap **102** to be fully extended outwards or fully retracted inwards is delayed, the integrated control unit
10 triggers an obstruction detection function. When the obstruction detection function is triggered, the integrated control unit controls the motor assembly **101** to fully retract the barrier flap **102** inwards. This reduces the chances of implicating injuries on the user.

[0044] In another scenario when a trespasser or an unauthorized user attempts
15 to force the barrier **100** open, the motor assembly **101** is also operable to provide the driving force to withstand any opposing force on the barrier flap **102** from the trespassers or the unauthorized users attempting to utilize the access gates. The integrated control unit in the motor assembly **101** controls the current set to the electric motor, therefore controlling the amount of force delivered by the electric motor to the
20 barrier flap **102**.

[0045] The metal base frame **108** supports the components that the barrier **100** comprises of, with the base fixated to the ground for a steady infrastructure of the barrier **100**. The bearing support **103** is mounted onto the metal base frame **108**, along

the same vertical axis as the inner portion of the barrier flap **102**, where the metal bar **110** of the barrier flap **102** pivots about the bearing support **103** in one horizontal axis positioning the barrier's **100** opened and closed position. The metal base frame **108** extends upwards from its base and supports the length of the metal bar **110** of the barrier flap **102**. The guiding support **107** is mounted on the upper frame of the metal base frame **108**, at a distal end opposing the bearing support **103**. In the middle of the metal bar **110** of the barrier flap **102**, mounted to one end of the adjustable bar **104**. The other end of the adjustable bar **104** is mounted to the flap lever joint **105**, and the flap lever joint **105** is mounted to the gear assembly of the motor assembly **101**. The motor assembly **101** drives the flap lever joint **105**; therefore driving the adjustable bar **104** to pivot the barrier flap **102** outwards. The flap lever joint **105** is specifically placed in between the motor assembly **101** and the extended metal base frame **108**. Further, the motor assembly **101** is mounted on the inner corner of the metal base frame **108** beside the bearing support **103**.

[0046] The barrier flap **102**, the adjustable bar **104** and the flap lever joint **105** when mounted together onto the metal base frame **108** forms a similar configuration of a four-bar linkage. Description for the configuration of the various components will be further elaborated in **FIG. 3A-3B** below.

[0047] **FIG. 2** shows a perspective view of the barrier **100** in an opened position. In the opened position, the barrier flap **102** is retracted inwards into the housing of the barrier **100**. The integrated control unit in the motor assembly **101** operationally switches the phase of the current in the electric motor, to retract the barrier flap **102** inwards in the opened position.

[0048] The placement of the various components in the barrier **100** allows the entire structure including the barrier flap **102** to fit into the housing (not shown) when the barrier **100** is in the opened position. As the resilient member (not shown) returns to its original length, the barrier flap **102** is guided inwards along the guiding support **107**.

5 [0049] FIG. 3A illustrates the constructs of the barrier **100** as shown in FIG. 1. The constructs of the barrier **100** are generally a four-bar linkage **300** that swivels the barrier flap **102** about the bearing support **103**. In the four-bar linkage **300**, the flap lever joint **105** that is mounted to the motor assembly **101** at a static location on the metal base frame **108** is acted as a primary bar **302**. The adjustable bar **104** is further
 10 pivoted on the flap lever joint **105** at the other end as a secondary bar **303**. Following that, the metal bar **110** holding the barrier flap **102** is pivotally supported on the metal base frame **108** at the lower distal end and further mounted to the other end of the adjustable bar **104** along the center of the metal bar **110**. The metal bar **110** acts as a tertiary bar **304** of the four bar linkage **300**. The metal base frame **108** supporting the
 15 bearing support **103** and the flap lever joint **105** (through the motor assembly **101** mounted thereon) forms a base bar **301** of the four-bar linkage **300**.

[0050] The base bar **301** comprises two fixed points in the four-bar linkage **300**. One end of the base bar **301** is the bearing support **103** that is mounted onto the metal base frame **108**. The other end of the base bar **301** is the static location of the primary
 20 bar **302** that is mounted to the motor assembly **101**.

[0051] The primary bar **302** is provided as a crank to rock the tertiary bar **304** through the secondary bar **303**. Two stoppers **305** are mounted on the metal base frame **108** to limit the primary bar **302** to rotate freely about the motor shaft. In particular, the

primary bar **302** is limited to swivel in a limited stroke length. The stroke length of the primary bar **302** is predetermined based on a stroke length required for the tertiary bar **304**.

[0052] One end of the secondary bar **303** is mounted to the primary bar **301** and
5 the other end is mounted to the center of the tertiary bar **304**. The secondary bar **303** is adjustable in length, which may be used to adjust the overall stroke length of tertiary bar **304** when desired.

[0053] In the tertiary bar **304** at a proximal distance from the point where one end of the secondary bar **303** is mounted to, a spring connector **307** is provided. The
10 spring connector **307** allows one end of the resilient member as mentioned in **FIG. 1** in the barrier **100** to be mounted on the tertiary bar **304**. The other end of the resilient member is mounted to a corner of the primary bar **302** to another spring connector **307**.

[0054] In the present embodiment, the four-bar linkage **300** is essentially a crank-rocker linkage, where the primary bar **302** is the shortest in length to rock the
15 tertiary bar **304** in a curvature arc **309**. It is well known in the art that the various lengths and connection points of the four bars may control the movement of the four-bar linkage **300**.

[0055] **FIG. 3B** provides a schematic drawing of the four-bar linkage **300** of the barrier **100** of **FIG. 3A**, comprising the base bar **301**; the primary bar **302**; the
20 secondary bar **303** and the tertiary bar **304**.

[0056] Each end of the base bar **301** is denoted with a circle to illustrate the fixed points of the base bar **301**. A first fixed point **308** of the base bar **301** is the

bearing support **103** and a second fixed point **310** is the static location of the flap lever joint **105**. The base bar **301** is the only bar in the four-bar linkage **300** that remains in its static location and does not pivot about or swivel about in any direction.

[0057] The primary bar **302** is the shortest in length in the four-bar linkage **300**.

5 It is the flap lever joint **105** that is mounted to the motor assembly **101** and to the adjustable bar **104** as shown in **FIG. 3A**. One end of the primary bar **302** is mounted to the second fixed point **310** of the base bar **301** and the other end of the primary bar **302** is mounted to one end of the secondary bar **303**. The primary bar **302** swivels about along the same axis, following a miniature curvature arc **306**. The rotation of the
10 primary bar **302** that pivots about the second fixed point **310** is limited by the stoppers **305**.

[0058] The secondary bar **303** is the adjustable bar **104** as shown in **FIG. 3A**.

The other end of the secondary bar **303** is mounted to one end of the tertiary bar **304**. The other end of the tertiary bar **304** is pivoted to the first fixed point **308** of the base
15 bar **301**.

[0059] When the barrier **100** is in the opened position, the barrier flap **102** retracts inwards within the housing of the barrier **100**. When the barrier **100** moves from its opened position to the closed position, the barrier flap **102** extends outwards. A point **A** denotes the point where the secondary bar **303** and the tertiary bar **304** are
20 mounted together, when the barrier **100** is in the opened position. A point **B** denotes the point where the same secondary bar **303** and the same tertiary bar **304** are mounted together, when the barrier **100** is in its closed position.

[0060] As the barrier **100** moves from its opened position to its closed position, the barrier flap **102** extends outwards. The primary bar **302** rocks the tertiary bar **304** through the secondary bar **303** simultaneously. The tertiary bar **304** or more specifically, the barrier flap **102** moves from Point **A** to Point **B**, following the curvature arc **309**.

[0061] FIG. 4 shows a perspective view of a barrier **400** comprising a telescopic flap **401** in a closed position in accordance with another embodiment of the present invention. The barrier **400** comprises the telescopic flap **401**, a motor assembly **402**, a guiding support **403**, a bearing support **404**, a telescopic flap lever joint **405**, a lever bar **406**, a resilient member (not shown) and a metal base frame **407**. The difference between the barrier **400** in FIG. 4 and the barrier **100** in FIG. 1 lies in the type of flap lever joint (the flap lever joint **105** and the telescopic flap lever joint **405**), the type of barricade (the barrier flap **102** and the telescopic flap **401**) and the configuration of the integrated control unit in the motor assembly (the integrated control unit in the motor assembly **101** and the integrated control unit in the motor assembly **402**). Other components including the guiding support **403**, the bearing support **404** and the resilient member remains essentially the same. The resilient member also extends as the telescopic flap **401** extends outwards.

[0062] The telescopic flap **401** in the barrier **400** differs from the barrier flap **102** in the barrier **100**, as the barrier **400** comprises the telescopic flap **401** having an outer shell **408** and an inner core flap **409**. Such configuration of the telescopic flap **401** allows a wider gap (as compared to the barrier **100**) between the two mirroring barriers **400**. Such configuration of the telescopic flap **401** also allows a wider area of protection, allowing wider objects to pass through between the two mirroring barriers

400 or the access gate when authorized. The telescopic flap **401** extends outwards when the barrier **400** is in its closed position, and retracts inwards when the barrier **400** is in its opened position.

[0063] In another embodiment, the telescopic flap **401** may include a plurality
5 of inner core flaps **409**.

[0064] The outer shell **408** and the inner core flap **409** of the telescopic flap **401** are both supported by their respective lever arm **410**. The respective lever arms **410** are independently pivoted on the bearing support **404**, i.e. pivoted on a same pivot joint. The upper distal end of the lever arm **410** for supporting the outer shell **408** is further
10 moveably supported by the guiding support **403**, wherein the upper distal end operationally trails along the guiding support **403**. The guiding support **403** is adapted with a guiding rail allowing the lever arm **410** to swivel about the pivot and trail along the guiding rail. The telescopic flap **401** retracts inwards or extends outwards in the same single axis. As the telescopic flap **401** retracts inwards, the inner core flap **409**
15 simultaneously retracts within the outer shell **408**.

[0065] One lever bar **406** has one end connected to the center of the outer shell's **408** lever arm **410** and the other end connected to the telescopic flap lever joint **405**. Another lever bar **406** has one end connected at a proximal distance from the bearing support **404** to the inner core flap's **409** lever arm **410** and the other end
20 connected to the telescopic flap lever joint **405**. The lever bar **406** connected to the inner core flap's **409** lever arm **410** is longer in length as compared to the lever bar **406** connected to the outer shell's **408** lever arm **410**. This allows the speed of the inner core flap **409** to be driven outwards or retracted inwards faster. As the inner core flap

409 moves at a faster speed as compared to the outer shell **408**, the inner core flap **409** extends outwards or retracts inwards simultaneously with the outer shell **408**.

[0066] The telescopic flap lever joint **405** is substantially a L-shaped connector with the angled corner attaching to the motor assembly **402**. The distal end of the
5 telescopic flap lever joint **405** is pivotally connected to the two lever bars **406** as mentioned above. The other end of the telescopic flap lever joint **405** that is extended out from the angled corner serves as a stopper arm to limit the rotation of the telescopic flap lever joint **405**.

[0067] Similar to the flap lever joint **105** as shown in **FIG. 1**, the motor
10 assembly **402** drives the telescopic flap lever joint **405** to operationally rotate about the angled corner in both clockwise and anti-clockwise directions. As both lever bars **406** are pivotally connected together to the distal end of the telescopic flap lever joint **405**, the telescopic flap lever joint **405** drives both lever bars **406** simultaneously in a single axis, and cannot be moved in any other way or directions. This further improves a
15 security feature of the barrier **400** as it prevents the telescopic flap **401** from pivoting about in other directions other than the driving moment of the telescopic flap lever joint **405**.

[0068] The motor assembly **402** in accordance with another embodiment of the present invention, comprises an integrated control unit. The motor assembly **402**
20 includes an electric motor and a gear assembly that angularly drives the telescopic flap lever joint **405**.

[0069] The integrated control unit of the motor assembly **402** differs from the integrated control unit of the motor assembly **101** as shown in **FIG. 1**, as the force

required to drive the telescopic flap lever joint **405** is greater. A greater force is required as the inner core flap **409** of the telescopic flap **401** has to be driven outwards simultaneously at a faster speed as compared to the outer shell **408**. The integrated control unit in the motor assembly **402** controls the force required to drive the
 5 telescopic flap lever joint **405**.

[0070] The gear assembly of the motor assembly **402** comprises a planetary gear and a bevel gear. Configurations and description of the gear assembly are similar to the gear assembly of the motor assembly **101** of **FIG. 1**. Similarly, the telescopic flap lever joint **405** is mounted to the gear assembly.

10 [0071] Similar to **FIG. 1**, the metal base frame **407** supports the components comprising the barrier **400** with the base fixated to the ground for a steady infrastructure of the barrier **400**. The bearing support **404** is mounted onto the metal base frame **407**.

[0072] The guiding support **403** is mounted in the middle of the upper portion
 15 of the metal base frame **407**, at a distal end opposing the bearing support **404**, which forces the lever arm **410** supporting the outer shell **408** to move along the guide rail. The bearing support **404** is mounted on one corner of the base of the metal base frame **407**. One lever bar **406** is connected to the middle of the lever arm **410** of the outer shell **408**. At a proximal distance from the bearing support **404**, the other lever bar **406**
 20 is connected to the lever arm **410** of the inner core flap **409**. The telescopic flap lever joint **405** is mounted together to the gear assembly of the motor assembly **402**. The motor assembly **402** is mounted to the middle portion of the metal base frame **407**, a distal length above the base unlike the motor assembly **101** in the barrier **100** of **FIG. 1**.

[0073] The telescopic flap **401**, the telescopic flap lever joint **405** and the lever bars **406** when mounted together onto the metal base frame **407** forms a similar configuration of a four-bar linkage. Description of the configuration of the various components will be further elaborated in **FIG. 6A-6C** below.

5 [0074] **FIG. 5** show a perspective view of the barrier **400** of **FIG. 4** that comprises the telescopic flap **401** in an opened position. Both the outer shell **408** and the inner core flap **409** are retracted inwards by the motor assembly **402**. The placement of the various components in the barrier **400** allows the entire structure including the telescopic flap **401** to fit into the housing (not shown).

10 [0075] **FIG. 6A** illustrates the constructs of the barrier **400** of **FIG. 4**. The constructs of the barrier **400**, is generally a four-bar linkage **600** for controlling the outer shell **408** and the inner core flap **409** in a telescopic motion. **FIG. 6B** illustrates a schematic drawing of the four-bar linkage when the barrier **400** is in its opened position. **FIG. 6C** illustrates a schematic drawing of the four-bar linkage when the
15 barrier **400** is in its closed position.

[0076] The four-bar linkage **600** comprises a base bar **601**, a primary bar **602**, an outer-shell-secondary bar **603**, an inner-core-flap-secondary bar **604**, an outer-shell-tertiary bar **605**, and an inner-core-flap-tertiary bar **606**.

[0077] The telescopic flap lever joint **405** acts as the primary bar **602** of the
20 four-bar linkage **600**. The lever bars **406** connected to the lever arms **410** of the corresponding outer shell **408** and inner core flap **409**, acts as the outer-shell-secondary bar **603** and the inner-core-flap-secondary bar **604** respectively. The lever arm **410** of the outer shell **408** acts as the outer-shell-tertiary bar **605** and the lever arm **410** of the

inner core flap **409** acts as the inner-core-flap-tertiary bar **606**. The base bar **601** comprises two fixed points. The outer-shell-tertiary bar **605** and the inner-core-flap-tertiary bar **606** pivots about a first fixed point **612** of the base bar **601**. The primary bar **602** that rotates about a second fixed point **613** of the base bar **601**.

5 **[0078]** The primary bar **602** is provided as a crank to rock the outer-shell-tertiary bar **605** and the inner-core-flap-tertiary bar **606** concurrently through the outer-shell-secondary bar **603** and the inner-core-flap-secondary bar **604** respectively. A stopper **607** is mounted on the metal base frame **407** to limit the primary bar **602** from rotating freely about the gear assembly of the motor assembly **402**. In particular, the
10 primary bar **602** is limited to swivel in a limited stroke length. The stroke length of the primary bar **602** is predetermined based on a stroke length required for telescopic flap **401**.

[0079] One side of the primary bar **602** also has a spring connector **609** attached on its end. The spring connector **609** allows one end of the resilient member in
15 the barrier **400** to be connected thereon. The other end of the resilient member may be connected to another spring connector **609** mounted on the base of the metal base frame **407**.

[0080] One end of the outer-shell-secondary bar **603** and one end of the inner-core-flap-secondary bar **604** is mounted together to the longer side of the primary bar
20 **602**. The primary bar **602** is sandwiched between the outer-shell-secondary bar **603** and the inner-core-flap-secondary bar **604**. The other end of the outer-shell-secondary bar **603** is mounted to the center of the outer-shell-tertiary bar **605**. The other end of the

inner-core-flap-secondary bar **604** is attached near to the bearing support **404**, to the wider end of the inner-core-flap-tertiary bar **606**.

[0081] The outer-shell-tertiary bar **605** supports the outer shell **408** of the telescopic flap **401**. One end (wider end) pivots about the bearing support **404**. The
 5 other end of the outer-shell-tertiary bar **605** is connected to the guiding support **403**. The outer-shell-tertiary bar **605** moves along the guiding support **403** when the four-bar linkage **600** is operable, bringing the outer shell **408** of the telescopic flap **401** in the bidirectional movement as the barrier **400** is in its opened or closed position.

[0082] Similarly, the inner-core-flap-tertiary bar **606** supports the inner core
 10 flap **409** of the telescopic flap **401** with the wider end pivoting about the bearing support **404**. The inner-core-flap-tertiary bar **606** shares the same pivot point as the outer-shell-tertiary bar **605**.

[0083] The inner-core-flap-secondary bar **604** is mounted to the inner-core-flap-tertiary bar **606** at a close distance from the bearing support **404**. The inner-core-flap-secondary bar **604** is longer in length as compared to the outer-shell-secondary bar
 15 **603** as the speed required for the inner core flap **409** of the telescopic flap **401** to retract inwards or extend outwards has to move differentially in accordance with the inner core flap's **401** stroke length. It is desired that the speed of the inner core flap **401** is faster than that speed required for the outer shell **408** of the telescopic flap **401**. This
 20 allows the inner core flap **409** and the outer shell **408** to retract and extend concurrently, and to act as a barricade for the barrier **400**.

[0084] The four-bar linkage **600** is similar to the four-bar linkage **300** of FIG. 3 but comprises two configurations of the crank-rocker type linkage. The first crank-

rocker type linkage comprises the base bar **601**, the primary bar **602**, the outer-shell-secondary bar **603**, and the outer-shell-tertiary bar **605**. The second crank-rocker type linkage comprises the base bar **601**, the primary bar **602**, the inner-core-flap-secondary bar **604**, and the inner-core-flap-tertiary bar **606**. Similarly, the primary bar **602** is the shortest in length to rock the outer-shell-tertiary bar **605** and the inner-core-flap-tertiary bar **606** in a curvature arc **610**. It is well known in the art that the various lengths and connection points of the various configurations of the bar controls the movement of the four-bar linkage **600**.

[0085] Referring to **FIG. 6B**, each end of the base bar **601** is denoted with a circle to illustrate the first fixed point **612** and the second fixed point **613** of the base bar **601**. The base bar **601** is the only bar in the four-bar linkage **600** that remains in its static location and does pivot about or swivel about in any direction.

[0086] The primary bar **602** is the shortest in length in the four-bar linkage **600**. The one side of the primary bar **602** is mounted together with one end of the outer-shell-secondary bar **603** and the inner-core-flap-secondary bar **604** at a point **A**. The spring connector **609** on the primary bar **602** allows one end a resilient member **411** to be connected. The other end of the resilient member **411** may be connected to another spring connector mounted to the metal base frame **407**. The primary bar **602** swivels about along the same axis, following a miniature curvature arc **611**.

[0087] The other end of the outer-shell-secondary bar **603** is mounted to one end of the outer-shell-tertiary bar **605** (which is actually the telescopic flap lever joint **405** mounted to the center of the lever arm **410** supporting the outer shell **408** of **FIG. 6A**) at Point **B**. The other end of the inner-core-flap-secondary bar **604** is mounted to

one end of the inner-core-flap-tertiary bar **606** (which is actually the telescopic flap lever joint **405** mounted to the lever arm **410** supporting the inner core flap **409** of **FIG. 6A**) at Point **C**. The schematic drawing of the inner-core-flap-secondary bar **604** is longer in length as compared to the outer-shell-secondary bar **603**.

5 **[0088]** The other end of both the outer-shell-tertiary bar **605** and the inner-core-flap-tertiary bar **606** is mounted to one end of the base bar **601** (more specifically to the bearing support **404**). The schematic drawing of the inner-core-flap-tertiary bar **606** is shorter in length as compared to the outer-shell-tertiary bar **605**.

10 **[0089]** The schematic drawing of the inner-core-flap-secondary bar **604** is longer as the speed required for the inner core flap **409** to retract inwards or extends outwards needs to be faster than the speed required for the outer shell **408**. Further, the inner-core-flap-secondary bar **604** is mounted at a close distance to the bearing support **404**, hence providing a shorter in length schematic drawing of the inner-core-flap-tertiary bar **606**.

15 **[0090]** Point **A** swivels along the miniature curvature arc **611** as the barrier **400** moves from its opened position to its closed position or vice versa. Similarly, Point **B** and Point **C** swivels and follow the curvature arc **610** concurrently.

20 **[0091]** Referring to **FIG. 6C**, the telescopic flap **401** extends outwards as the barrier **400** is in its closed position. The primary bar **601** drives both the outer-shell-tertiary bar **605** and the inner-core-flap-tertiary bar **606** through the outer-shell-secondary bar **603** and the inner-core-flap-secondary bar **604** concurrently. Point **A** swivels along the miniature curvature arc **611** to a Point **D**. Point **B** and Point **C** follows the curvature arc **610** to a Point **E** and Point **F** respectively. Similarly, the first fixed

point **612** and the second fixed point **613** of the base bar **601** remains in the same static location as shown in **FIG. 6B**.

[0092] In the above embodiments, a four-bar linkage is provided by way of illustrations only, not limitations. In accordance with the present invention, it is possible that the four-bar linkage to be replaced by any mechanical linkage or multi-bar linkage system. Through the mechanical linkage or the multi-bar linkage system, the stroke, the velocity, acceleration of the flaps can be easily controlled, altered, modified by minimal modifications on the multi-bar linkage system or the mechanical linkage.

[0093] The above description illustrates various embodiments of the present invention along with examples of how aspects of the present invention may be implemented. While specific embodiments have been described and illustrated it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the present invention. The above examples, embodiments, instructions semantics, and drawings should not be deemed to be the only embodiments, and are presented to illustrate the flexibility and advantages of the present invention as defined by the following claims:

CLAIMS

1. An access gate for permitting or restricting passage to an area, the access gate comprising:

a base frame;

a motor gear assembly including an electric motor, a gear connected to the electric motor and a control unit for operating bidirectional rotation of the electric motor, with the motor gear assembly being mounted on the base frame;

a barrier flap (102, 408) having a curved edge and a substantially convergent corner opposite the curved edge, so that the barrier flap is rotatable substantially perpendicular to the passage controlled by the access gate about a flap pivot axis (103, 308, 404, 612) located near the convergent corner and the base frame;

a two-connection crank lever (105, 302, 405, 602) having first and second pivot axes orientated perpendicular to the crank lever, with the first pivot axis being connected to an output of the motor gear assembly, the second pivot axis being connected to the barrier flap via a linkage bar (104, 303, 406, 603) and crank radius of the second pivot axis from the first pivot axis is smaller than the length of the linkage bar (104, 303, 406, 603); and

a guide rail for supporting and cooperating with the barrier flap as the barrier flap is oscillated about the flap pivot axis, so that the barrier flap is in a close position to restrict passage through the access gate or is in the open position to permit passage through the access gate.

2. The access gate according to claim 1, further comprising a support bar (110, 304, 605) connecting the barrier flap to the flap pivot axis.

3. The access gate according to claim 2, further comprising an inner core flap (409) that is receivable inside the barrier flap, with the inner core flap being connected by an associated support bar (606) to the flap pivot axis and by an associated linkage bar (604) to the second pivot axis of the crank lever, so that the two linkage bars (603, 604) to the barrier flap and inner core flap share a common pivot axis (at the second pivot axis of the crank lever).

4. The access gate according to claim 3, wherein the linkage bar (604) associated with the inner core flap is longer than the linkage bar (603) associated with the barrier flap, so that rotation of the inner core flap is faster than rotation of the barrier flap in both directions.
5. The access gate according to claim 4, wherein the linkage bars are adjustable in lengths.
6. The access gate according to any one of the preceding claims, wherein output of the gear is perpendicular to output of the electric motor, so that the electric motor is assembled in an upright position for a smaller footprint of the base frame.
7. The access gate according to any one of the preceding claims, further comprising two stoppers for limiting each associated end position of the crank lever.
8. The access gate according to any one of the preceding claims, further comprising a resilient member connecting the crank lever to the base frame to bias the barrier flap to open, to allow passage through the access gate.