PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference **0014**		**FOR FURTHER ACTION** See Form PCT/IPEA/416
International application No. **PCT/US2025/020138**	International filing date *(day/month/year)* **16 March 2025 (16.03.2025)**	Priority date *(day/month/year)* **18 March 2024 (18.03.2024)**

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

IPC: See continuation sheet

CPC: ***G05D 1/696; G05D 1/692; A01K 29/00;*** *G05D 1/02; G05D 2105/50; A01K 1/0029; A01K 1/00*

Applicant

PERRITT JR. HENRY HARDY

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of **17** sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ a total of _____ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).
      ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4*bis*, 70.2(e), 70.16 and 91.2).
      ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)).
   b. ☐ a separate electronic file containing a sequence listing *(sent to the International Bureau only)*.
4. This report contains indications relating to the following items:
   - ☑ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☑ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
12 June 2025 (12.06.2025)	**24 September 2025 (24.09.2025)**
Name and mailing address of the IPEA/US **COMMISSIONER FOR PATENTS** **MAIL STOP PCT, ATTN: IPEA/US** **P.O. Box 1450** **Alexandria, VA 22313-1450** **UNITED STATES OF AMERICA** Facsimile No. **571-273-8300**	Authorized officer **HARRY C. KIM** Telephone No. **571-272-4300**

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2025/020138

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:
   - [x] the international application in the language in which it was filed.
   - [ ] a translation of the international application into _____ which is the language of a translation furnished for the purposes of:
     - [ ] international search (Rules 12.3(a) and 23.1(b)).
     - [ ] publication of the international application (Rule 12.4(a)).
     - [ ] international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
   - [ ] the international application as originally filed/furnished, or
   - [x] the description:
     pages **1-29** as originally filed/furnished.
     pages* _____ received by this Authority on _____
     pages* _____ received by this Authority on _____
   - [x] the claims:
     Nos. **1-18** as originally filed/furnished.
     Nos.* _____ as amended (together with any statement) under Article 19
     Nos.* _____ received by this Authority on _____
   - [x] the drawings:
     pages **1/18-18/18** as originally filed/furnished.
     pages* _____ received by this Authority on _____
     pages* _____ received by this Authority on _____
   - [ ] a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages _____
   - [ ] the claims, Nos. _____
   - [ ] the drawings, sheets/figs _____
   - [ ] the sequence listing *(specify)*: _____
4. [ ] This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-*bis*)):
   - [ ] the description, pages _____
   - [ ] the claims, Nos. _____
   - [ ] the drawings, sheets/figs _____
   - [ ] the sequence listing *(specify)*: _____
5. [ ] This report has been established:
   - [ ] taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-*bis*) and 70.2(e)).
   - [ ] without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4*bis* and 70.2(e)).
6. With regard to top-up searches (Rules 66.1*ter* and 70.2(f)):
   - [ ] A top-up search was carried out by this Authority on _____
     - [ ] Additional relevant documents have been discovered during the top-up search.
   - [x] No top-up search was carried out by this Authority because it would serve no useful purpose.
7. [ ] Supplementary international search report(s) from Authority(ies) _____ has/have been received and taken into account in establishing this report (Rule 45*bis*.8(b) and (c)).

** If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2025/020138

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims	None	NO
Inventive step (IS)	Claims	1-18	YES
	Claims	None	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	None	NO

2. Citations and explanations(Rule 70.7)

---------- EXPLANATION ----------

Claims 1-18 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the subject matter.

Regarding claims 1-8, The prior art is exemplified by:

US 2020/0097023 A1 to Honda '7023 Motor Co., Ltd., (hereinafter 'Honda '7023') and

WO 2022/040744 A1 to Li et al., (hereinafter 'Li') and

US 2023/0105933 A1 to UNM RAINFOREST INNOVATIONS (hereinafter 'UNM RAINFOREST') and

US 2019/0210612 A1 to Honda Motor Co. , Ltd., (hereinafter 'Honda '0612).

Regarding claim 1, Honda '7023 discloses:

A system for detecting stray animals and driving them back into a herd (FIG.1,2, para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein."; para [0017] "As illustrated in FIG. 2, there is an identified need to herd a group of animals 100 that move about a pasture 102, such as a lea, grasslands, and the like for grazing, feeding, exercise and the like. The group of animals 100 may be of cattle, sheep, llamas, alpacas, goats, bison, or any other animals that move about in herds for socialization, safety, and grazing. In order to control and move a group of animals 100, human labor, in the form or ranch hands or cowboys, would move the herds, or trained animals, such as dogs, would be used to move these animals. However, an autonomous herding system 110 utilizing autonomous vehicles 10 may be used to herd the group of animals 10 without endangering ranch hands, working animals, and the like."), comprising:

an autonomous herding vehicle configured to identify a herd of animals and a stray (para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein.");

the autonomous herding vehicle comprising: a sensor module; a computer, comprising: an animal detection module (FIG.2, para [0018] "As illustrated in FIG. 1, each autonomous vehicle 10 used as part of the herding system 110 may further include a camera 34 for taking images of the group of animals 100 and the pasture 102. The camera 34 may be a thermal imaging camera in order to best identify each animal 130 in the group of animals 100. "),

a location module (para [0018] "Further, a global positioning system ("GPS") unit 38 is provided for determining the position of the herding system. The camera 34, ranging unit 36, and GPS unit 38 for each autonomous vehicle 10 are in electronic communication with the master controller 32 a of the master autonomous vehicle 10 a to make course decisions for the herding system 110.");

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

a herding module (110, FIG.2, para [0018] "FIG. 2 illustrates a first embodiment of a herding system 110 for herding a group of animals 100."),

a navigation module comprising: a program that computes (32a, FIG.2, para [0018] "The herding system 110 includes a master autonomous vehicle 10 a, and a plurality of client autonomous vehicles 10 b that surround the group of animals 100 in pasture 102. The master autonomous vehicle 10 a includes the master controller 32 a that controls the herding system 110. "):

a communications module (para [0020] "Each of the client autonomous vehicles 10 b, as illustrated in FIG. 2, include a client controller 32 b that is in communication with the master controller 32 a of the master autonomous vehicle 10 a. The master controller 32 a and each client controller 32 b may communication wirelessly. The master autonomous vehicle may have a master communication unit 40 a in electric communication unit with the master controller 32 a, and each of the client autonomous vehicles 10 b may include a client communication unit in electronic communication with the client controller for the respective client autonomous vehicles 10 b."; para [0021] "The master communication unit 40 a may also include an embedded cellular telephone to enable communication from a user (not shown) at a remote location to the master autonomous vehicle 10 a and the herding system 110. ");

a propulsion module; a suspension module (propulsion and engine usually include the suspension, para [0016] "A vehicle propulsion unit 16 may also be attached to the frame 12. The vehicle propulsion unit 16 may be a four-stroke internal combustion engine, a two-stroke internal combustion engine, an electric motor, or any other appropriate motive apparatus. In the case where the vehicle propulsion unit 16 is an internal combustion engine, the autonomous vehicle may further include a fuel tank. In the case where the vehicle propulsion unit 16 is an electric motor, as illustrated in FIG. 1, the autonomous vehicle 10 may further include a battery or battery pack 18 for storing electric charge. The autonomous vehicle 10 may further include a plurality of wheels 20, four (4) in the embodiment illustrated in FIG. 1, attached to the vehicle frame 12 and driven by the vehicle propulsion unit 16. The autonomous vehicle 10 also may include a seat 22 or a plurality of seats, one seat 22 in the embodiment illustrated in FIG. 1. The body 14 of the autonomous vehicle 10 may also be configured to hold equipment, supplies, and the like. Operation of the autonomous vehicle 10 is further described in U.S. patent application Ser. No. 15/910,832 for "Control System for Autonomous All-Terrain Vehicle (ATV)," filed Mar. 2, 2018 and U.S. patent application Ser. No. 15/915,174 for "Autonomous All-Terrain Vehicle (ATV)," filed Mar. 8, 2018, both of which are hereby incorporated by reference in their entirety.");

an alerting module (para [0024] "The more forward client autonomous vehicles 10 b and the master autonomous vehicle 10 a may also emit tones 150 to control the movement of the group of animals 100, such as preventing them from moving forward too fast or too far.");

Honda '7023 does not disclose:

a global navigation system;

The herding module: which uses image templates derived from machine learning;

which uses models of animal flight behavior to calculate:

a circle representing a stray's flight zone, wherein the radius of said circle being equal to a distance from the stray such that the autonomous herding vehicle moving closer to the animal than that distance will cause the stray to move away from the autonomous herding vehicle;

a stray's point of balance,

wherein the stray's point of balance is a point such that: when the autonomous herding vehicle moves to a location to position the head of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move backwards, and

when the autonomous herding vehicle moves to a location to position the tail of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move forward;

a first vector representing a course the herding vehicle must follow to close on the stray;

a second vector representing a path the stray must follow to return to the herd; and

a third vector connecting said animal flight zone and animal point of balance to the herding vehicle;

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

a fourth vector representing a path the autonomous herding vehicle must follow to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd; and

a data bus connecting the modules; and

a commercially available remote control device, delivered with the vehicle, capable of transmitting and receiving radio signals comprising commands to the vehicle;

However, Li discloses: an unmanned vehicle for herding animals (abstract) and further discloses:

a global navigation system (navigating system with 216, para [0055] "The mustering UAV 200 also comprises an onboard GPS receiver 216 operatively connected to the controller 202 and which is configured to obtain position data of the mustering UAV 200. Further, the mustering UAV 200 has a propulsion system 218 operatively connected to the controller 202. In this embodiment, the propulsion system 218 includes six propellers 220 connected to the fuselage 202. Each propeller 220 is configured to be controlled by the controller 202 to navigate the mustering UAV 200 over the predetermined area.");

a circle representing a stray's flight zone, wherein the radius of said circle being equal to a distance from the stray such that the autonomous herding vehicle moving closer to the animal than that distance will cause the stray to move away from the autonomous herding vehicle (FIG.3, para [0057] "With reference to Fig. 3, the method begins at step 1000, in which the observer UAV 100 monitors a plurality of animals in a predetermined area. In this regard, the controller 104 of the observer UAV 100 navigates the observer UAV 100 over the predetermined area and operates the image capture device 108 to periodically capture image data of the plurality of animals in the predetermined area."; [0059]-[0060] "The controller 104 of the observer UAV 100 also determines the centroid Co of the convex hull 300 through known methods. Subsequently, at step 1200 of Fig. 3, the controller 104 of the observer UAV 100 determines an extended hull 400 in two-dimensional space based on the convex hull 300. The extended hull 400 defines a path on which the mustering UAV 200 navigates to aggregate the plurality of animals 20. In this embodiment, as shown in Fig. 5, the extended hull 400 is a polygon that encloses the convex hull 300 at a predetermined distance ds therefrom. In this embodiment, the predetermined distance ds is about 15 meters. The extended hull 400 has straight-line edges 402 that are parallel to respective straight-line edges 302 of the convex hull 300, and vertices Et that are each defined by the intersection of two adjacent straight-line edges 402. Each of the vertices Et of the extended hull 400 are associated with a respective vertex Pt of the convex hull 300. The set of vertices S of the extended hull 400 may be described as:(2) S = {F , i = 1, ..., ne where: ne is the number of vertices Et of the extended hull 400; and ne = np.")."; para [0065] "During navigation along the extended hull 400, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio recording (e.g., the bark of a dog) towards the convex hull 300 so that the animals are urged to aggregate together. ").

It would have been obvious to a person of ordinary skill in the art to have included the global navigation system and the region of the stray's flight zone to determine the distance of the stray in order to get the vehicle closer as per Li for the system of Honda '7023 since it allows for getting the stray animals back into the herd efficiently as per the known animal recording such as dog barking (para [0065], Li).

Neither disclose:

The herding module: which uses image templates derived from machine learning;

which uses models of animal flight behavior to calculate:

a stray's point of balance,

wherein the stray's point of balance is a point such that: when the autonomous herding vehicle moves to a location to position the head of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move backwards, and

when the autonomous herding vehicle moves to a location to position the tail of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move forward;

a first vector representing a course the herding vehicle must follow to close on the stray;

a second vector representing a path the stray must follow to return to the herd; and

a third vector connecting said animal flight zone and animal point of balance to the herding vehicle;

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

a fourth vector representing a path the autonomous herding vehicle must follow to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd; and

a data bus connecting the modules; and

a commercially available remote control device, delivered with the vehicle, capable of transmitting and receiving radio signals comprising commands to the vehicle;

generating movement of the autonomous herding vehicle to follow said fourth vector.

However, UNM RAINFOREST discloses: remote cattle securing and trapping system (abstract) and further discloses:

The herding module: which uses image templates derived from machine learning; which uses models of animal flight behavior (para [0022] "The image recognition subsystem can use the camera subsystem's camera feed, such as the video and audio and machine learning algorithms to detect cattle and their movements. The image recognition subsystem can take snapshots of the camera's video stream, analyze them, and compress them to be sent as notifications to the virtual rancher's virtual platform over a wireless network in short data bursts. The images are generated in part with machine learning enabled detection algorithms that can differentiate motion in the trapping area due to cattle or some other cause. This is referred to as "edge detection". The image recognition subsystem can be run on the cattle trapping system's primary electronic hardware, such as a computer, or on a separate hardware. ").

It would have been obvious to a person of ordinary skill in the art to have included the method of ordinary skill in the art to have included the method of using machine learning model of animal flight behavior as per UNM RAINFOREST for the system of HONDA '7023 and Li since it allows for trapping the animals in a certain area to allow the animals to be herded efficiently (UNM RAINFOREST, FIG.1,2).

None of them disclose:

a stray's point of balance,

wherein the stray's point of balance is a point such that: when the autonomous herding vehicle moves to a location to position the head of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move backwards, and

when the autonomous herding vehicle moves to a location to position the tail of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move forward;

a first vector representing a course the herding vehicle must follow to close on the stray;

a second vector representing a path the stray must follow to return to the herd; and

a third vector connecting said animal flight zone and animal point of balance to the herding vehicle;

a fourth vector representing a path the autonomous herding vehicle must follow to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd; and

a data bus connecting the modules; and

a commercially available remote control device, delivered with the vehicle, capable of transmitting and receiving radio signals comprising commands to the vehicle;

generating movement of the autonomous herding vehicle to follow said fourth vector.

However, Honda '0612 discloses: an autonomous ATV (abstract) and further discloses:

A data bus connecting the modules (para [0006] "The autonomous ATV may include a controller area network (CAN) bus communicatively coupling the controller, the location unit, and the navigation module and the controller may monitor the CAN bus for delays in communication or a loss of frames associated with communications as the error."; para [0029] "Stated another way, the modules and components of FIG. 1 may be operably connected and communicate among each other via the CAN bus 172. According to one aspect, the system 100 for operation of an autonomous ATV may be implemented as a part of an internal combustion (IC) autonomous ATV.").

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It would have been obvious to a person of ordinary skill in the art to have included the data bus as per Honda '0612 for the system of HONDA '7023 and Li and UNM RAINFOREST as per Honda '0612 since it allows for the components of autonomous vehicle to communicate with each other (Honda '0612 para [0029]).

None of them disclose:

a stray's point of balance,

wherein the stray's point of balance is a point such that: when the autonomous herding vehicle moves to a location to position the head of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move backwards, and

when the autonomous herding vehicle moves to a location to position the tail of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move forward;

a first vector representing a course the herding vehicle must follow to close on the stray;

a second vector representing a path the stray must follow to return to the herd; and

a third vector connecting said animal flight zone and animal point of balance to the herding vehicle;

a fourth vector representing a path the autonomous herding vehicle must follow to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd; and

a commercially available remote control device, delivered with the vehicle, capable of transmitting and receiving radio signals comprising commands to the vehicle;

generating movement of the autonomous herding vehicle to follow said fourth vector.

Therefore, the prior art of record does not teach or fairly suggest the subject matter claimed.

Specifically, none of the prior art, alone or in combination teaches or fairly suggests:

a stray's point of balance,

wherein the stray's point of balance is a point such that: when the autonomous herding vehicle moves to a location to position the head of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move backwards, and

when the autonomous herding vehicle moves to a location to position the tail of the stray between the autonomous herding vehicle and the stray's point of balance will cause the stray to move forward;

a first vector representing a course the herding vehicle must follow to close on the stray;

a second vector representing a path the stray must follow to return to the herd; and

a third vector connecting said animal flight zone and animal point of balance to the herding vehicle;

a fourth vector representing a path the autonomous herding vehicle must follow to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd; and

a commercially available remote control device, delivered with the vehicle, capable of transmitting and receiving radio signals comprising commands to the vehicle;

generating movement of the autonomous herding vehicle to follow said fourth vector.

Therefore claim 1 meets the criteria set out in PCT Article 33(2)-(3).

Claims 2-8 meet the criteria set out in PCT Article 33(2)-(3) as depending from claim 1.

Regarding claims 9-12, the prior art is exemplified by Honda '7023 and Li.

Regarding claim 9, Honda '7023 discloses: A method for herding stray animals back into a herd (FIG.1,2, para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein."; para [0017] "As illustrated in FIG. 2, there is an identified need to herd a group of animals 100 that move about a pasture 102, such as a lea, grasslands, and the like for grazing,

feeding, exercise and the like. The group of animals 100 may be of cattle, sheep, llamas, alpacas, goats, bison, or any other animals that move about in herds for socialization, safety, and grazing. In order to control and move a group of animals 100, human labor, in the form or ranch hands or cowboys, would move the herds, or trained animals, such as dogs, would be used to move these animals. However, an autonomous herding system 110 utilizing autonomous vehicles 10 may be used to herd the group of animals 10 without endangering ranch hands, working animals, and the like."), comprising:

obtaining a herding vehicle (para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein.");

locating the herding vehicle; identifying a herd of animals (para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein.");

identifying an animal that has strayed from the herd locating the herd; locating the stray (FIG.2, para [0018] "FIG. 2 illustrates a first embodiment of a herding system 110 for herding a group of animals 100. The herding system 110 includes a master autonomous vehicle 10 a, and a plurality of client autonomous vehicles 10 b that surround the group of animals 100 in pasture 102. The master autonomous vehicle 10 a includes the master controller 32 a that controls the herding system 110. As illustrated in FIG. 1, each autonomous vehicle 10 used as part of the herding system 110 may further include a camera 34 for taking images of the group of animals 100 and the pasture 102. The camera 34 may be a thermal imaging camera in order to best identify each animal 130 in the group of animals 100. A ranging unit 36 is provided for determining distance to the group of animals 100 and objects 104 in the pathway of the herding system 110 that need to be avoided, such as a tree illustrated in FIG. 2. The ranging unit 36 may be any unit known in the art such as a radar or LIDAR unit."; para [0019] "The herding system 110 further includes a plurality of client autonomous vehicles 10 b. Each of the client autonomous vehicles 10 b is operated to maintain a specific formation, with each of the client autonomous vehicles 10 b and the master autonomous vehicle 10 a specified distances d from and positions relative to each other. In the embodiment illustrated in FIG. 2, the herding system 110 includes four (4) client autonomous vehicles 10 b, which when in formation with the master autonomous vehicle 10 a maintain a pentagon-shaped formation. The number of client autonomous vehicles 10 b may be varied by the required size of the herding system 110 to herd properly the group of animals 100.");

determining a path necessary for the herding vehicle to close on the stray (para [0022] "The herding system 110 may also include a herding apparatus 120 in the form of physical restraints 121 extending around the outer perimeter P of the formation of the autonomous vehicles 10 to form a fence. A ranch hand or operator may set the master autonomous vehicle 10 a and the client autonomous vehicles 10 b around the group of animals 100 and attach the herding apparatus 120, after which the system may operate fully in autonomously. In one embodiment, the physical restraint may be a plurality of bars 122 rotatably connected to the master autonomous vehicle 10 a and the client autonomous vehicles 10 b as illustrated in FIG. 2. In the embodiment further illustrated in FIG. 3, the bars 122 are connected to the associated master or client autonomous vehicles 10 a, 10 b by a ball joint 124, although any rotatable or flexible connection that permits flexibility and movement due to slight elevation changes, such as one of the autonomous vehicles 10 passing over a rock, may be used."); and

generating a specific noise or movement derived from empirical animal data to induce the stray's motivation to return to the herd (para [0024] " Instead, the herding apparatus 120 may include speakers 42, illustrated in FIG. 1 on a generic autonomous vehicle used with the herding system 110, for emitting tones to direct the group of animals 100 installed on the master autonomous vehicle 10 a and the client autonomous vehicles 10 b. The tones may be the sound of herding animals, natural predators for the group of animals 100, or any other tones that would cause the group of animals 100 to move. The speakers 42 are in electronic communication with the respective master and client controllers 32 a, 32 b, and are operated at the direction of the master controller 32 a. For, example, in order to move the group of animals 100 in a forward direction, the client autonomous vehicles 10 b in the rear of the formation may emit tones 150 causing the group of animals 100 to move away from the tones 150 and in a forward direction, such as how sheepdogs herd a group of sheep, described in a paper "Why we programmed a robot to act like a sheepdog," reprinted from https://theconversation.com/why-we-programmed-a-robot-to-act-like-a-sheepdog-96961 on Jul. 30, 2018 and incorporated herein by reference. The more forward client autonomous vehicles 10 b and the master autonomous vehicle 10 a may also emit tones 150 to control the

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

movement of the group of animals 100, such as preventing them from moving forward too fast or too far. The emitted tones 150 may be selected from a tones best calculated to move the type of animal or animals in the group of animals 100 by methods known to those skilled in the art.").

Honda '7023 does not disclose:

determining a circle representing a stray's flight zone, wherein the radius of said circle being equal to a distance from the stray such that the herding vehicle moving closer to the animal than that distance will cause the stray to move away from the herding vehicle;

determining a stray's point of balance,

wherein the stray's point of balance is a point such that: when the herding vehicle moves to a location to position the head of the stray between the herding vehicle and the stray's point of balance will cause the stray to move backwards, and when the herding vehicle moves to a location to position the tail of the stray between the herding vehicle and the stray's point of balance will cause the stray to move forward;

determining the movements of the herding vehicle necessary to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd;

However, Li discloses: an unmanned vehicle for herding animals (abstract) and further discloses:

determining a circle representing a stray's flight zone, wherein the radius of said circle being equal to a distance from the stray such that the herding vehicle moving closer to the animal than that distance will cause the stray to move away from the herding vehicle (FIG.3, para [0057] "With reference to Fig. 3, the method begins at step 1000, in which the observer UAV 100 monitors a plurality of animals in a predetermined area. In this regard, the controller 104 of the observer UAV 100 navigates the observer UAV 100 over the predetermined area and operates the image capture device 108 to periodically capture image data of the plurality of animals in the predetermined area."; [0059]-[0060] "The controller 104 of the observer UAV 100 also determines the centroid Co of the convex hull 300 through known methods. Subsequently, at step 1200 of Fig. 3, the controller 104 of the observer UAV 100 determines an extended hull 400 in two-dimensional space based on the convex hull 300. The extended hull 400 defines a path on which the mustering UAV 200 navigates to aggregate the plurality of animals 20. In this embodiment, as shown in Fig. 5, the extended hull 400 is a polygon that encloses the convex hull 300 at a predetermined distance ds therefrom. In this embodiment, the predetermined distance ds is about 15 meters. The extended hull 400 has straight-line edges 402 that are parallel to respective straight-line edges 302 of the convex hull 300, and vertices Et that are each defined by the intersection of two adjacent straight-line edges 402. Each of the vertices Et of the extended hull 400 are associated with a respective vertex Pt of the convex hull 300. The set of vertices S of the extended hull 400 may be described as:(2) S = {F , i = 1, ..., ne where: ne is the number of vertices Et of the extended hull 400; and ne = np.")."; para [0065] "During navigation along the extended hull 400, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio recording (e.g., the bark of a dog) towards the convex hull 300 so that the animals are urged to aggregate together. ").

It would have been obvious to a person of ordinary skill in the art to have included the region of the stray's flight zone to determine the distance of the stray in order to get the vehicle closer as per Li for the system of Honda '7023 since it allows for getting the stray animals back into the herd efficiently as per the known animal recording such as dog barking (para [0065], Li).

Neither disclose:

determining a stray's point of balance,

wherein the stray's point of balance is a point such that: when the herding vehicle moves to a location to position the head of the stray between the herding vehicle and the stray's point of balance will cause the stray to move backwards, and when the herding vehicle moves to a location to position the tail of the stray between the herding vehicle and the stray's point of balance will cause the stray to move forward;

determining the movements of the herding vehicle necessary to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd;

Therefore, the prior art of record does not teach or fairly suggest the subject matter claimed.

Specifically, none of the prior art, alone or in combination teaches or fairly suggests:

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determining a stray's point of balance,

wherein the stray's point of balance is a point such that: when the herding vehicle moves to a location to position the head of the stray between the herding vehicle and the stray's point of balance will cause the stray to move backwards, and when the herding vehicle moves to a location to position the tail of the stray between the herding vehicle and the stray's point of balance will cause the stray to move forward;

determining the movements of the herding vehicle necessary to position the vehicle within the stray's flight zone and forward or back of its point of balance to cause the stray to return to the herd;

Therefore claim 9 meets the criteria set out in PCT Article 33(2)-(3).

Claims 10-12 meet the criteria set out in PCT Article 33(2)-(3) as depending from claim 9.

Regarding claims 13-18, the prior art is exemplified by Honda '7023 and Li and

US 2018/0074518 A1 to Wal-Mart Stores, Inc., (hereinafter 'Wal-Mart').

Regarding claim 13, Honda '7023 discloses: A system for herding animals (FIG.1,2, para [0016] "FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein."; para [0017] "As illustrated in FIG. 2, there is an identified need to herd a group of animals 100 that move about a pasture 102, such as a lea, grasslands, and the like for grazing, feeding, exercise and the like. The group of animals 100 may be of cattle, sheep, llamas, alpacas, goats, bison, or any other animals that move about in herds for socialization, safety, and grazing. In order to control and move a group of animals 100, human labor, in the form or ranch hands or cowboys, would move the herds, or trained animals, such as dogs, would be used to move these animals. However, an autonomous herding system 110 utilizing autonomous vehicles 10 may be used to herd the group of animals 10 without endangering ranch hands, working animals, and the like."), comprising:

a plurality of autonomous herding vehicles, assigned to stations; each equipped with a maintain-station module (maintaining distance from each other, FIG.2, para [0018] "FIG. 2 illustrates a first embodiment of a herding system 110 for herding a group of animals 100. The herding system 110 includes a master autonomous vehicle 10 a, and a plurality of client autonomous vehicles 10 b that surround the group of animals 100 in pasture 102. The master autonomous vehicle 10 a includes the master controller 32 a that controls the herding system 110. As illustrated in FIG. 1, each autonomous vehicle 10 used as part of the herding system 110 may further include a camera 34 for taking images of the group of animals 100 and the pasture 102. The camera 34 may be a thermal imaging camera in order to best identify each animal 130 in the group of animals 100."; para [0019] "The herding system 110 further includes a plurality of client autonomous vehicles 10 b. Each of the client autonomous vehicles 10 b is operated to maintain a specific formation, with each of the client autonomous vehicles 10 b and the master autonomous vehicle 10 a specified distances d from and positions relative to each other. In the embodiment illustrated in FIG. 2, the herding system 110 includes four (4) client autonomous vehicles 10 b, which when in formation with the master autonomous vehicle 10 a maintain a pentagon-shaped formation. The number of client autonomous vehicles 10 b may be varied by the required size of the herding system 110 to herd properly the group of animals 100.");

a trail-boss module (client controller, 32b, FIG.2);

radio links allowing the trail boss module and the plurality of autonomous herding vehicles to exchange digital messages (FIG.2, para [0021] "The master autonomous vehicle may have a master communication unit 40 a in electric communication unit with the master controller 32 a, and each of the client autonomous vehicles 10 b may include a client communication unit in electronic communication with the client controller for the respective client autonomous vehicles 10 b.");

computing devices configured to launch the plurality of autonomous herding vehicles (32a, FIG.2, para [0018] "The master autonomous vehicle 10 a includes the master controller 32 a that controls the herding system 110 … The camera 34, ranging unit 36, and GPS unit 38 for each autonomous vehicle 10 are in electronic communication with the master controller 32 a of the master autonomous vehicle 10 a to make course decisions for the herding system 110."; para [0020] "The client controller 32 b controls each of the associated client autonomous vehicles 10 b, while the master controller 32 a makes the course decisions, speed, and the like for the herding system 110.");

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locate individual animals and groups of animals (para [0021] "The user may provide commands to the herding system about where to move the group of animals 100 or to return the group of animals to a home base of operation, such as a barn, cattle stall, livestock shed, or cot.");

round up said individual animals and groups of animals and bunching them into a herd; determine a herd destination (para [0024] "Instead, the herding apparatus 120 may include speakers 42, illustrated in FIG. 1 on a generic autonomous vehicle used with the herding system 110, for emitting tones to direct the group of animals 100 installed on the master autonomous vehicle 10 a and the client autonomous vehicles 10 b. The tones may be the sound of herding animals, natural predators for the group of animals 100, or any other tones that would cause the group of animals 100 to move. The speakers 42 are in electronic communication with the respective master and client controllers 32 a, 32 b, and are operated at the direction of the master controller 32 a. For, example, in order to move the group of animals 100 in a forward direction, the client autonomous vehicles 10 b in the rear of the formation may emit tones 150 causing the group of animals 100 to move away from the tones 150 and in a forward direction, such as how sheepdogs herd a group of sheep, described in a paper "Why we programmed a robot to act like a sheepdog," reprinted from https://theconversation.com/why-we-programmed-a-robot-to-act-like-a-sheepdog-96961 on Jul. 30, 2018 and incorporated herein by reference. The more forward client autonomous vehicles 10 b and the master autonomous vehicle 10 a may also emit tones 150 to control the movement of the group of animals 100, such as preventing them from moving forward too fast or too far. The emitted tones 150 may be selected from a tones best calculated to move the type of animal or animals in the group of animals 100 by methods known to those skilled in the art.");

Honda '7023 does not disclose:

a battery replacement station;

operate a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operate a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operate a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operate a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

determine a desired herd speed;

cause the herd to move toward the destination at the desired speed by commanding one or more of the plurality of autonomous herding vehicles to enter the herd's flight zone,

and positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allow a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replace the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detect one or more animals that has strayed from the herd; and send the fourth autonomous vehicle-to corral the strayed animal back into the herd.

However, Li discloses: an unmanned vehicle for herding animals (abstract) and further discloses:

determine a desired herd speed (para [0073] "During navigation, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio recording towards the circular boundary 500. It will be appreciated that the herd 30 will be urged to move towards the predetermined location G at a speed Vanimai upon encountering the transmitted audio recording.");

cause the herd to move toward the destination at the desired speed by commanding one or more of the plurality of autonomous herding vehicles to enter the herd's flight zone (para [0073] "During navigation, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio

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recording towards the circular boundary 500. It will be appreciated that the herd 30 will be urged to move towards the predetermined location G at a speed Vanimai upon encountering the transmitted audio recording. Oscillation of the mustering UAV 200 along the driving path L assists with maintaining the herd 30 within the circular boundary 500. It will also be appreciated that the mustering UAV 200 will move with the herd 30 towards the predetermined location G at a speed Vdriving which is equal to or less than the speed Vanimai of the herd 30."), and

It would have been obvious to a person of ordinary skill in the art to have included the method of determining the herd speed so that the vehicles can be commanded to moved to enter the herd's flight zone at the desired speed as per Li for the system of Honda '7023 since it allows for efficiently herding the animals at the same zone (Li, para [0073]-[0075]).

Neither disclose:

a battery replacement station;

operate a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operate a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operate a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operate a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

and positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allow a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replace the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detect one or more animals that has strayed from the herd; and send the fourth autonomous vehicle-to corral the strayed animal back into the herd.

However, Wal-Mart discloses: UAVs used for herding animals (abstract, para [0068]) and further discloses:

a battery replacement station (130, FIG.1, para [0015] "The UAV 120 may be configured to land and/ or dock at one or more types of landing locations such as a docking station 130, a vehicle 131, an elevated location 132, and the ground 133."; para [0028] "In some embodiments, a landing location with a recharging station may be prioritized if the UAV is low on power."; para [0040] " In some embodiments, the docking mechanisms 328 may comprise electrical connections for recharging a power source of the UAV 320. In some embodiments, the UAV 320 may further comprise a power source such as a rechargeable battery, a replaceable battery, a fuel cell, a fuel tank, solar cells, etc.");

It would have been obvious to a person of ordinary skill in the art to have included the battery replacement station of Wal-Mart for the system of Honda '7023 and Li since it allows for using the autonomous vehicles continuously using the docking station (Wal-mart, para [0040]).

None of them disclose:

operate a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operate a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operate a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

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operate a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

and positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allow a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replace the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detect one or more animals that has strayed from the herd; and send the fourth autonomous vehicle-to corral the strayed animal back into the herd.

Therefore, the prior art of record does not teach or fairly suggest the subject matter claimed.

Specifically, none of the prior art, alone or in combination teaches or fairly suggests:

operate a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operate a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operate a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operate a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

and positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allow a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replace the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detect one or more animals that has strayed from the herd; and send the fourth autonomous vehicle-to corral the strayed animal back into the herd.

Therefore claim 17 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 18, A method for herding animals (FIG.1,2, para [0016] “FIG. 1 is a side view of an autonomous vehicle 10 to be used as a master autonomous vehicle 10 a, a client autonomous vehicle 10 b, or a wrangler autonomous vehicle 10 c according to the embodiments described herein.”; para [0017] “As illustrated in FIG. 2, there is an identified need to herd a group of animals 100 that move about a pasture 102, such as a lea, grasslands, and the like for grazing, feeding, exercise and the like. The group of animals 100 may be of cattle, sheep, llamas, alpacas, goats, bison, or any other animals that move about in herds for socialization, safety, and grazing. In order to control and move a group of animals 100, human labor, in the form or ranch hands or cowboys, would move the herds, or trained animals, such as dogs, would be used to move these animals. However, an autonomous herding system 110 utilizing autonomous vehicles 10 may be used to herd the group of animals 10 without endangering ranch hands, working animals, and the like.”), comprising:

obtaining a plurality of autonomous herding vehicles; launching the plurality of autonomous herding vehicles FIG.2, para [0018] “FIG. 2 illustrates a first embodiment of a herding system 110 for herding a group of animals 100. The herding system 110 includes a master autonomous vehicle 10 a, and a plurality of client autonomous vehicles 10 b that surround the group of animals 100 in pasture 102. The master autonomous vehicle 10 a includes the master controller 32 a that controls the herding system 110. As illustrated in FIG. 1, each autonomous vehicle 10 used as part of the herding system 110 may further include a camera 34 for taking images of the group of animals 100 and the pasture 102. The camera 34

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may be a thermal imaging camera in order to best identify each animal 130 in the group of animals 100."; para [0019] "The herding system 110 further includes a plurality of client autonomous vehicles 10 b. Each of the client autonomous vehicles 10 b is operated to maintain a specific formation, with each of the client autonomous vehicles 10 b and the master autonomous vehicle 10 a specified distances d from and positions relative to each other. In the embodiment illustrated in FIG. 2, the herding system 110 includes four (4) client autonomous vehicles 10 b, which when in formation with the master autonomous vehicle 10 a maintain a pentagon-shaped formation. The number of client autonomous vehicles 10 b may be varied by the required size of the herding system 110 to herd properly the group of animals 100.");

locating individual animals and groups of animals (para [0021] "The user may provide commands to the herding system about where to move the group of animals 100 or to return the group of animals to a home base of operation, such as a barn, cattle stall, livestock shed, or cot.");

rounding up said individual animals and groups of animals and bunching them into a herd; determining a herd destination (para [0024] "Instead, the herding apparatus 120 may include speakers 42, illustrated in FIG. 1 on a generic autonomous vehicle used with the herding system 110, for emitting tones to direct the group of animals 100 installed on the master autonomous vehicle 10 a and the client autonomous vehicles 10 b. The tones may be the sound of herding animals, natural predators for the group of animals 100, or any other tones that would cause the group of animals 100 to move. The speakers 42 are in electronic communication with the respective master and client controllers 32 a, 32 b, and are operated at the direction of the master controller 32 a. For, example, in order to move the group of animals 100 in a forward direction, the client autonomous vehicles 10 b in the rear of the formation may emit tones 150 causing the group of animals 100 to move away from the tones 150 and in a forward direction, such as how sheepdogs herd a group of sheep, described in a paper "Why we programmed a robot to act like a sheepdog," reprinted from https://theconversation.com/why-we-programmed-a-robot-to-act-like-a-sheepdog-96961 on Jul. 30, 2018 and incorporated herein by reference. The more forward client autonomous vehicles 10 b and the master autonomous vehicle 10 a may also emit tones 150 to control the movement of the group of animals 100, such as preventing them from moving forward too fast or too far. The emitted tones 150 may be selected from a tones best calculated to move the type of animal or animals in the group of animals 100 by methods known to those skilled in the art.");

Honda '7023 does not disclose:

operating a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operating a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operating a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operating a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

determining a desired herd speed;

causing the herd to move toward the destination at the desired speed by commanding one or more of the plurality of autonomous herding vehicles to enter the herd's flight zone, and

positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allowing a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replacing the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detecting one or more animals that has strayed from the herd; and

sending the fourth autonomous vehicle to corral the strayed animal back into the herd.

However, Li discloses: an unmanned vehicle for herding animals (abstract) and further discloses:

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determining a desired herd speed (para [0073] "During navigation, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio recording towards the circular boundary 500. It will be appreciated that the herd 30 will be urged to move towards the predetermined location G at a speed Vanimai upon encountering the transmitted audio recording.");

causing the herd to move toward the destination at the desired speed by commanding one or more of the plurality of autonomous herding vehicles to enter the herd's flight zone (para [0073] "During navigation, the controller 204 of the mustering UAV 200 operates the speaker 212 to transmit the stored audio recording towards the circular boundary 500. It will be appreciated that the herd 30 will be urged to move towards the predetermined location G at a speed Vanimai upon encountering the transmitted audio recording. Oscillation of the mustering UAV 200 along the driving path L assists with maintaining the herd 30 within the circular boundary 500. It will also be appreciated that the mustering UAV 200 will move with the herd 30 towards the predetermined location G at a speed Vdriving which is equal to or less than the speed Vanimai of the herd 30."), and

It would have been obvious to a person of ordinary skill in the art to have included the method of determining the herd speed so that the vehicles can be commanded to moved to enter the herd's flight zone at the desired speed as per Li for the system of Honda '7023 since it allows for efficiently herding the animals at the same zone (Li, para [0073]-[0075]).

Neither disclose:

obtaining a landing pad and battery replacement station;

operating a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operating a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operating a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operating a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allowing a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replacing the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detecting one or more animals that has strayed from the herd; and

sending the fourth autonomous vehicle to corral the strayed animal back into the herd.

However, Wal-Mart discloses: UAVs used for herding animals (abstract, para [0068]) and further discloses:

obtaining a landing pad and battery replacement station (130, 132, FIG.1, para [0015] "The UAV 120 may be configured to land and/or dock at one or more types of landing locations such as a docking station 130, a vehicle 131, an elevated location 132, and the ground 133."; para [0028] "In some embodiments, a landing location with a recharging station may be prioritized if the UAV is low on power."; para [0040] " In some embodiments, the docking mechanisms 328 may comprise electrical connections for recharging a power source of the UAV 320. In some embodiments, the UAV 320 may further comprise a power source such as a rechargeable battery, a replaceable battery, a fuel cell, a fuel tank, solar cells, etc.");

It would have been obvious to a person of ordinary skill in the art to have included the battery replacement station and landing pad of Wal-Mart for the system of Honda '7023 and Li since it allows for using the autonomous vehicles continuously using the docking station (Wal-mart, para [0040]).

None of them disclose:

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operating a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operating a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operating a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operating a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allowing a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replacing the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detecting one or more animals that has strayed from the herd; and

sending the fourth autonomous vehicle to corral the strayed animal back into the herd.

Therefore, the prior art of record does not teach or fairly suggest the subject matter claimed.

Specifically, none of the prior art, alone or in combination teaches or fairly suggests:

operating a first autonomous vehicle of the plurality of autonomous herding vehicles to be positioned on the left side of the herd;

operating a second autonomous vehicle of the plurality of autonomous herding vehicles to be positioned behind the herd;

operating a third autonomous vehicle of the plurality of autonomous herding vehicles to be positioned to the right of the herd;

operating a fourth autonomous vehicle of the plurality of autonomous herding vehicles to roam in the vicinity of the herd;

positioning the plurality of autonomous herding vehicles forward of the herd's point of balance to cause the herd to move backwards or positioning the plurality of autonomous herding vehicles with back of the herd's point of balance to cause the herd to move forward;

allowing a vehicle of the plurality of autonomous vehicles to leave its position and move to the battery-replacement station automatically to receive a new fully charged battery;

replacing the vehicle that has left the formation to receive a new battery with another vehicle of the plurality of autonomous vehicles;

detecting one or more animals that has strayed from the herd; and

sending the fourth autonomous vehicle to corral the strayed animal back into the herd.

Therefore claim 18 meets the criteria set out in PCT Article 33(2)-(3).

Claims 1-18 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**

Continuation of IPC: ***G05D 1/695*** (2023.01); ***G05D 1/692*** (2023.01); ***A01K 29/00*** (2023.01); *G05D 1/00* (2023.01); *A01K 1/00* (2023.01); *A01K 1/00* (2023.01)