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function (5) is in a deactivated state and the control (6) is operated by the user, the control unit (4) is configured to control the information system (8) to provide a message to the user of the vehicle requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function (5), and, provided that the requested predetermined action is identified to have been performed, reactivate the automatic door opening function (5) enabling the door (7) to be opened by the control (6).



Description

TECHNICAL FIELD

[0001] The invention relates to an arrangement for a vehicle and a method for controlling a door of a vehicle.

BACKGROUND

[0002] A vehicle, such as an autonomous vehicle, often has an opening button to be pushed by a passenger for opening a door of the vehicle. By pushing the button, the door will be automatically opened by an opening mechanism. Such an automatic door opening function can be used as long as some preconditions are fulfilled. In some scenarios, however, where it would be inappropriate to open the door, the automatic door opening function is not allowed to be used. For example, an obstacle can be present outside the vehicle which obstacle prevents the door from being opened or the vehicle may have been driven into the ditch and is tilted.

[0003] In these cases, a passenger that needs to get out of the vehicle has to perform several actions for manually opening the door which can be difficult in many situations. The levers or handles to be used can be unknown or hidden to the passenger, and the door can be heavy to open.

SUMMARY

[0004] An objective of the invention is to provide an arrangement for a vehicle, by which arrangement opening of a vehicle door can be facilitated.

[0005] The objective is achieved by an arrangement for a vehicle, wherein the arrangement comprising a control unit with an automatic door opening function, a control in communication with the control unit, by which control a door of the vehicle can be automatically opened by a user of the vehicle, and an information system providing information to the user of the vehicle, and the control unit is configured to deactivate the automatic door opening function and prevent the door from being opened by the control when a predetermined condition is fulfilled, and wherein provided that the automatic door opening function is in a deactivated state and the control is operated by the user, the control unit is configured to control the information system to provide a message to the user of the vehicle requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function, and, provided that the requested predetermined action is identified to have been performed, reactivate the automatic door opening function enabling the door to be opened by the control.

[0006] The invention is based on the insight that in some situations a deactivation of the automatic door opening function of the vehicle can better be overridden by a user of the vehicle to enable the door to be automatically opened. Hereby, the user does not need to per-

form several manual actions for opening the vehicle door to get out of the vehicle, as long as the electric power supply is still working.

[0007] Predetermined conditions usually used for deactivation of the automatic door opening function where it may be beneficial to override such a deactivation are one or more circumstances comprising that there is an obstacle outside the vehicle, the vehicle is tilted, the vehicle is driven, the wheels are not aligned with the vehicle body, etc.

[0008] According to one embodiment of the arrangement, the requested predetermined action is to operate the control for a predetermined time period, and preferably the control is an opening button to be pressed for the predetermined time period. Hereby, the automatic door opening function can be reactivated in an easy way at the same time as the risk of unintentionally reactivation of the function is minimized. As an example only, the predetermined time period can be a value selected in the interval 3-8 seconds, preferable 4-7 seconds. The predetermined time period is preferably approximately 5 seconds. By use of the regular opening button for door opening, a user-friendly control well known to the user can be utilized.

[0009] According to a further embodiment of the arrangement, when the automatic door opening function has been reactivated, the control unit is configured to control the door to perform an opening motion as long as the control is operated by the user and stop the opening motion of the door when the control is released by the user. Hereby, the user can choose how much the door should be opened depending on the current situation and the opening required for getting out of the vehicle.

[0010] According to a further embodiment of the arrangement, when the automatic door opening function has been reactivated, the control unit is configured to control the door such that an opening motion of the door is performed at a lower speed relative to a speed used for an opening motion of the door when the predetermined condition is not fulfilled and the automatic door opening function has not been reactivated. By using a lower speed than is normally used when the door is automatically opened in the activated state of the automatic door opening function, it is easier to stop the opening motion of the door, by releasing the control for instance, with higher accuracy and thus achieve the desired opening position of the door.

[0011] According to a further embodiment of the arrangement, the information system comprises a display showing the message. Hereby, the message can be provided in a user-friendly way, often without any need for additional hardware since usually a vehicle already has some kind of display used for other purposes too.

[0012] According to another aspect of the invention, a further objective is to provide a method for controlling a door of a vehicle, by which method opening of a vehicle door can be facilitated.

[0013] This objective is achieved by a method for controlling a door of a vehicle, wherein the vehicle has an automatic door opening function and the door can be automatically opened by a user of the vehicle by operating a control, and the automatic door opening function is deactivated if a predetermined condition is fulfilled, preventing the door from being opened by the user operating the control, and provided that the automatic door opening function is in a deactivated state and the control is operated by the user, the method comprising providing a message to the user of the vehicle requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function, and, provided that the requested predetermined action is identified to have been performed, reactivating the automatic door opening function enabling the door to be opened by the user operating the control.

[0014] In addition, the invention relates to a vehicle comprising an arrangement according to the invention.

[0015] The advantages of the method and the vehicle are similar to the advantages already discussed hereinabove with reference to the different embodiments of the arrangement.

[0016] Further advantages and advantageous features of the invention are disclosed in the following description and in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] With reference to the appended drawings, below follows a more detailed description of embodiments of the invention cited as examples.

[0018] In the drawings:

Fig. 1 shows a door opening arrangement and a vehicle provided with the door opening arrangement, and

Fig. 2 is a flow chart illustrating a method for controlling a door of a vehicle.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0019] Fig. 1 shows a vehicle 1, an enlarged part of the interior of the vehicle 1 and a schematic view of a door opening arrangement 2 of the vehicle 1. The arrangement 2 can be used together with various vehicle types, particularly autonomous vehicles with an automatic door opening function. Outside the vehicle 1 an obstacle 3 is schematically illustrated.

[0020] The door opening arrangement 2 comprises a control unit 4 with an automatic door opening function 5, a control 6 in communication with the control unit 4, by which control a door 7 of the vehicle 1 can be automatically opened by a user of the vehicle, and an information system 8 providing information to the user of the vehicle 1. The information system 8 is in communication with the

control unit 4. Further, the information system, such as a Human-Machine Interface (HMI), can comprise a display 9 for text or figures and/or equipment 10 for providing an audio signal.

[0021] The control unit 4 may comprise one or more microprocessors and/or one or more memory devices or any other components for executing computer programs to perform the method described herein. Thus, the control unit 4 is preferably provided with a computer program comprising program code means for performing the steps of any example embodiment of the method described hereinabove. The control unit 4 can be a separate component or be integrated in another controller of the vehicle 1.

[0022] The control 6 is suitably an opening button 11, and as shown in the example embodiment illustrated in Fig. 1, the control 6 is preferably the regular button 11 used for automatically opening the door 7. The control unit 4 with the automatic door opening function 5 controls the opening of the vehicle door 7. By pressing or pushing the opening button 11, the control unit 4 controls the door 7 via an opening actuator 12, such as a cylinder or motor, which opening actuator 12 is arranged for moving the door 7 relative to the vehicle body 13, such that opening of the vehicle door 7 is achieved.

[0023] The control unit 4 is however configured to deactivate the automatic door opening function 5 and prevent the door 7 from being opened by the control 6 when a predetermined condition is fulfilled. The obstacle 3 shown in Fig. 1 is an example of such a predetermined condition that can bring the automatic door opening function 5 to be deactivated.

[0024] In such a case, provided that the automatic door opening function 5 is in a deactivated state (due to the fact that the predetermined condition is fulfilled) and the control 6 is operated by the user, the control unit 4 is configured to control the information system 8 to provide a message to the user of the vehicle 1 requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function 5. The reactivation of the automatic door opening function comprising requesting the predetermined action, is initiated if the control is operated by the user, i.e. the user intends to open the door by pressing the opening button since there is a need to get out of the vehicle. Thus, the user wants to override the deactivation of the automatic door opening function.

[0025] Further, if the requested predetermined action is then identified to have been performed, the control unit 4 is configured to reactivate the automatic door opening function 5 enabling the door 7 to be opened by the control 6 again.

[0026] The requested predetermined action to be performed by the user can be to operate the control 6 for a predetermined time period, and since the control 6 is suitably the opening button 11, the requested predetermined action is preferably to press or push the opening button 11 and hold the opening button for the predetermined

time period.

[0027] For example, a message on the display 9 can be as follows: "Obstacle is interfering with door opening. TO OPEN DOOR, PRESS AND HOLD THE BUTTON UNTIL IT IS POSSIBLE TO EXIT. Please open door and exit with caution". Further, by the audio signal equipment 10, a warning signal or a voice announcement corresponding to the text message can be provided.

[0028] When the automatic door opening function 5 has been reactivated, the control unit 4 is suitably configured to control the door 7 to perform an opening motion as long as the control 6 is operated by the user and stop the opening motion of the door 7 when the control 6 is released by the user. Further, the control unit 4 is suitably configured to control the door 7 such that an opening motion of the door 7 is performed at a lower speed relative to a speed used for an opening motion of the door 7 when the predetermined condition is not fulfilled and the automatic door opening function 5 has not been reactivated. In other words; the vehicle door 7 will move with a relatively low speed as compared to the speed of the vehicle door 7 during normal use of the automatic door opening function 5 in the activated state.

[0029] Fig. 2 shows a flow chart illustrating one example embodiment of a method for controlling the door 7 of the vehicle 1. As regards the components used for performing the method, reference is also made to the description hereinabove and Fig. 1.

[0030] Starting from a state where the automatic door opening function 5 is activated 100, the method comprises the step of checking 200 if the predetermined condition is fulfilled. If "NO", the automatic door opening function 5 is kept activated.

[0031] If "YES", next step is deactivating 300 the automatic opening door function 5, thereby preventing the door 7 from being opened by the user operating the control 6, and provided that the automatic door opening function 5 is in a deactivated state and the control is operated by the user, providing a message 400 to the user of the vehicle 1 requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function 5.

[0032] Thereafter checking 500 if the requested predetermined action is identified to have been performed. If "NO", next step is checking 200 if the predetermined condition is fulfilled. If "YES", i.e. the requested predetermined action has been performed, next step is reactivating 600 the automatic door opening function 5 enabling the door to be opened by the user operating the control 6.

[0033] After the automatic door opening function 5 is reactivated, the method can comprise checking 200 if the predetermined condition is fulfilled.

[0034] It is to be understood that the present invention is not limited to the embodiments described above and illustrated in the drawings; rather, the skilled person will recognize that many changes and modifications may be made within the scope of the appended claims.

Claims

1. An arrangement (2) for a vehicle (1), the arrangement comprising a control unit (4) with an automatic door opening function (5), a control (6) in communication with the control unit, by which control a door (7) of the vehicle can be automatically opened by a user of the vehicle, and an information system (8) providing information to the user of the vehicle, wherein the control unit (4) is configured to deactivate the automatic door opening function (5) and prevent the door (7) from being opened by the control (6) when a predetermined condition is fulfilled, **characterized in that** provided that the automatic door opening function (5) is in a deactivated state and the control (6) is operated by the user, the control unit (4) is configured to control the information system (8) to provide a message to the user of the vehicle requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function (5), and, provided that the requested predetermined action is identified to have been performed, reactivate the automatic door opening function (5) enabling the door (7) to be opened by the control (6).
2. An arrangement according to claim 1, **characterized in that** the requested predetermined action is to operate the control (6) for a predetermined time period.
3. An arrangement according to claim 1 or 2, **characterized in that** the control (6) is an opening button (11).
4. An arrangement according to claim 2 and 3, **characterized in that** the requested predetermined action is to press the opening button (11) for the predetermined time period.
5. An arrangement according to any preceding claim, **characterized in that** when the automatic door opening function (5) has been reactivated, the control unit (6) is configured to control the door (7) to perform an opening motion as long as the control (6) is operated by the user and stop the opening motion of the door (7) when the control (6) is released by the user.
6. An arrangement according to any preceding claim, **characterized in that** when the automatic door opening function (5) has been reactivated, the control unit (4) is configured to control the door (7) such that an opening motion of the door is performed at a lower speed relative to a speed used for an opening motion of the door when the predetermined condition is not fulfilled and the automatic door opening function (5) has not been reactivated.

7. An arrangement according to any preceding claim, **characterized in that** the information system (8) comprises a display (9) showing the message.
8. An arrangement according to any preceding claim, **characterized in that** the predetermined condition is fulfilled by one from the group of circumstances comprising: there is an obstacle (3) outside the vehicle, the vehicle is tilted, the vehicle is driven, and the wheels of the vehicle are not aligned with the vehicle body.
9. A vehicle (1) comprising an arrangement (2) according to any of claims 1-8.
10. A method for controlling a door (7) of a vehicle (1), wherein the vehicle has an automatic door opening function (5) and the door can be automatically opened by a user of the vehicle by operating a control (6), and the automatic door opening function (5) is deactivated if a predetermined condition is fulfilled, preventing the door (7) from being opened by the user operating the control (6), **characterized by** provided that the automatic door opening function (5) is in a deactivated state and the control (6) is operated by the user, providing a message to the user of the vehicle requesting the user to perform a predetermined action for enabling reactivation of the automatic door opening function (5), and, provided that the requested predetermined action is identified to have been performed, reactivating the automatic door opening function (5) enabling the door (7) to be opened by the user operating the control (6).
11. A method according to claim 10, wherein the requested predetermined action is to operate the control (6) for a predetermined time period.
12. A method according to claim 10 or 11, wherein the control (6) is an opening button (11).
13. A method according to claim 11 and 12, wherein the requested predetermined action is to press the opening button (11) for the predetermined time period.
14. A method according to any of claims 10-13, **characterized by** when the automatic door opening function (5) has been reactivated, performing an opening motion of the door (7) as long as the control (6) is operated by the user and stop the opening motion of the door (7) when the control (6) is released by the user.
15. A method according to any of claims 10-14, **characterized by** when the automatic door opening function (5) has been reactivated, controlling the door (7) such that an opening motion of the door is performed at a lower speed relative to a speed used for an opening motion of the door when the predetermined condition is not fulfilled and the automatic door opening function (5) has not been reactivated.
16. A method according to any of claims 10-15, **characterized by** showing the message on a display (9) of the vehicle.
17. A method according to any of claims 10-16, wherein the predetermined condition is fulfilled by one from the group of circumstances comprising: there is an obstacle (3) outside the vehicle, the vehicle is tilted, the vehicle is driven, and the wheels of the vehicle are not aligned with the vehicle body.

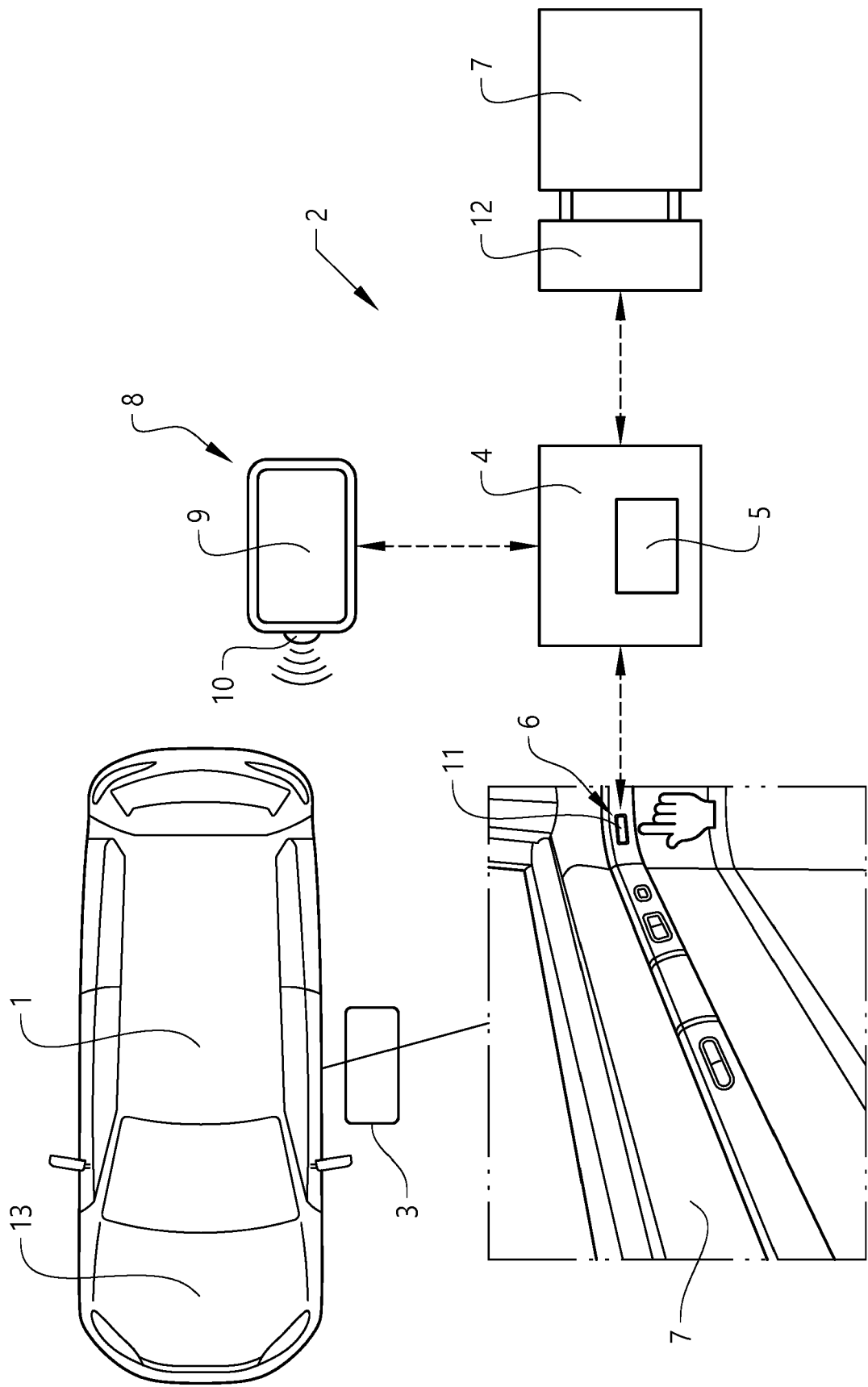


FIG. 1

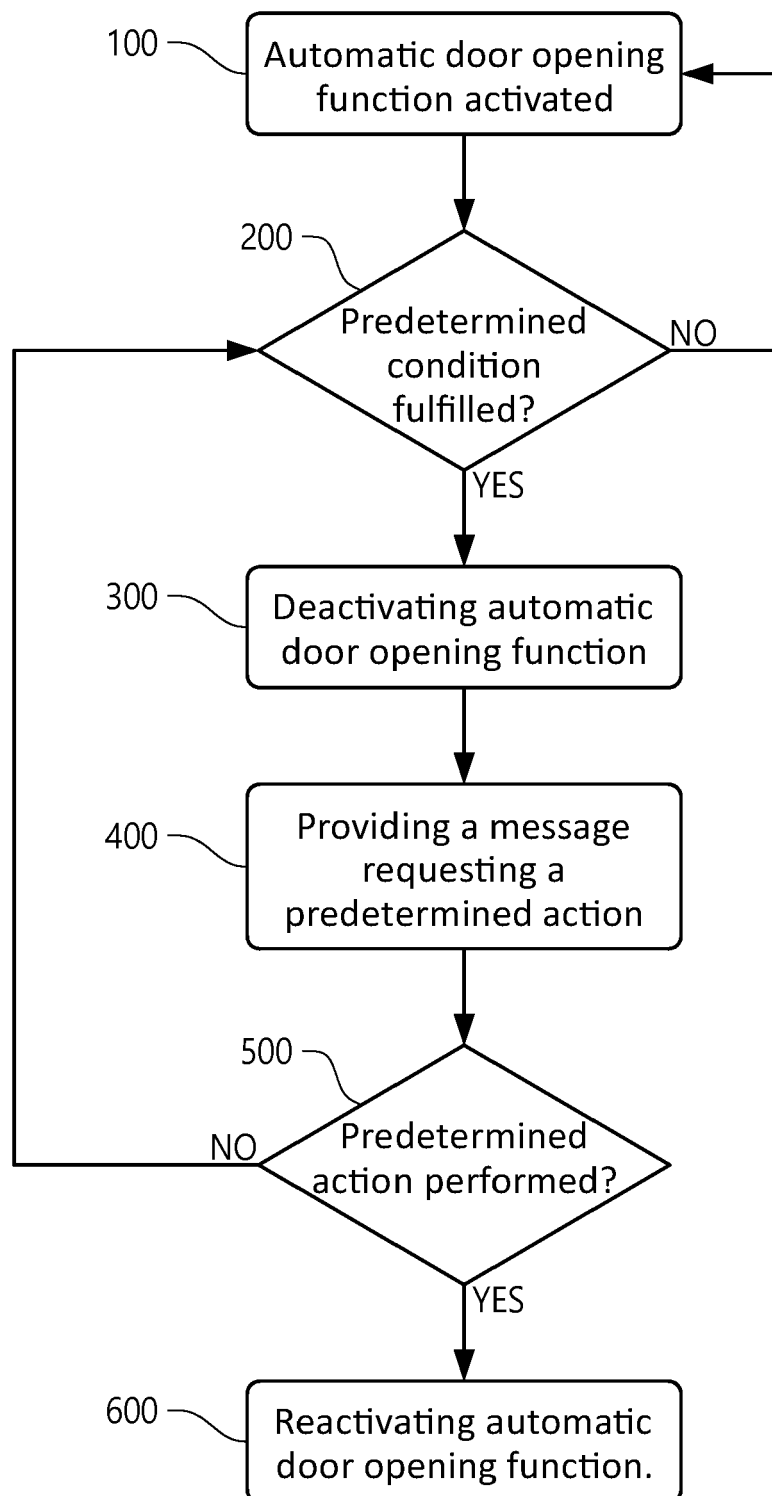


FIG. 2



EUROPEAN SEARCH REPORT

Application Number

EP 23 17 4117

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2019/323281 A1 (FORD GLOBAL TECH LLC [US]) 24 October 2019 (2019-10-24) * paragraphs [0014] - [0040]; figures 1-3 * -----	1-17	INV. E05F15/40 E05F15/42 E05F15/70
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		31 October 2023	Rémondot, Xavier
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 23 17 4117

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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31-10-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
15	US 2019323281 A1	24-10-2019	CN 110388164 A	29-10-2019
			DE 102019109955 A1	24-10-2019
			US 2019323281 A1	24-10-2019
20	-----			
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