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(54) **Title:** COMPETITIVE LINE GENERATION ALGORITHMS

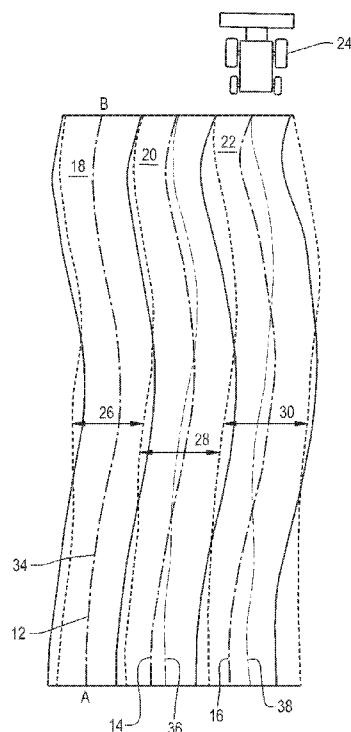


Fig. 3

(57) **Abstract:** An agricultural vehicle has an automatic guidance control system. A control module is connected to a GPS receiver, to at least one vehicle control, and to a display. The control module uses a first set of guidance information that is generated using a first algorithm or an estimation thereof, or imported, and then uses at least a second set of guidance information associated with at least one additional source that is generated using a second algorithm or an estimation thereof, or imported. The control module then compares the first set of guidance information with the second set of guidance information by causing the display to show the first and second sets of guidance information overlaid one over the other.



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COMPETITIVE LINE GENERATION ALGORITHMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a guidance system for agricultural vehicles, and more particularly to a guidance system that allows an operator to choose from among guidance lines generated by competitive line generation algorithms.

2. Description of the Related Art

[0002] Agricultural vehicles and implements are commonly used to perform various agricultural functions, such as tilling, planting, spraying, and fertilizing. As modern farming methods have become more competitive, it has become increasingly important that fields and agricultural products to be applied to the fields are used efficiently. To this end, agricultural functions applied to the fields, whether such agricultural function is tillage, seeding, or application of fertilizer or other chemicals, are carefully controlled in order to prevent gaps where the agricultural function is not applied, or overlaps where the agricultural function is applied more than once.

[0003] Agricultural vehicles commonly utilize control systems connected to position sensing technology, such as global positioning systems (GPS), to provide automatic guidance control in performing these various agricultural functions. The automatic guidance control systems are capable of steering the vehicle with a high degree of accuracy. The automatic guidance control systems often operate by creating at least one original base guidance line, called an “AB line,” and then generating an array of adjacent guidance lines to be followed by the agricultural vehicle in performing its function. These adjacent guidance lines, or swaths, depend not only on the geometry of the original AB guidance line, but also upon the physical characteristics and

limitations of the agricultural vehicle and/or any towed agricultural implements. Such physical characteristics and limitations may include width, location of the implement with respect to the vehicle, and limitations of movement, such as minimum turning radius.

[0004] Farmers often own multiple agricultural vehicles or implements built by different manufacturers. The guidance lines that are created by the automatic guidance control systems of these different agricultural vehicles do so using different algorithms. As a result, the guidance lines often differ, especially as the adjacent guidance lines get further and further from the original AB guidance line. If the previous guidance lines were created by the automatic guidance control system algorithm of another manufacturer, the guidance lines created by the automatic guidance control system algorithm of an agricultural vehicle being utilized currently may not match. Further, it may not be optimal to simply use the other manufacturer's algorithm to generate matching guidance lines, as the physical characteristics and limitations of the present agricultural vehicle may not match those of the previous agricultural vehicle.

[0005] Additionally, even if the previous guidance lines were created by the automatic guidance control system algorithm of the present manufacturer, the agricultural vehicle may be currently coupled to an implement of another manufacturer. In this case, neither the automatic guidance control system algorithm of the present manufacturer, nor the automatic guidance control system algorithm of the implement to which the agricultural vehicle is coupled, may result in optimum overlap of the resulting swaths to the original swaths.

[0006] What is needed in the art is a way to import the guidance patterns or swaths from a competitive automatic guidance control system, or to generate guidance patterns or swaths using a mathematical estimation of the algorithm used by such competitive automatic guidance control system, such as a best fit calculation based on two or more sets of swaths recorded using GPS

when such competitive automatic guidance control system is in use, and to compare them for compatibility with guidance patterns or swaths generated by other algorithms from different manufacturers, possibly including the present manufacturer, and possibly including the previous manufacturer. Further needed is a way to compare guidance patterns or swaths generated by algorithms from different manufacturers, or guidance patterns or swaths generated using mathematical estimation of the algorithms used by such competitive automatic guidance control systems, possibly including the present manufacturer, and possibly including the manufacturer of a presently coupled implement, against guidance patterns or swaths generated previously by the current manufacturer. Furthermore, what is needed in the art is the ability to import swaths from any source and achieve the same results.

SUMMARY OF THE INVENTION

[0007] The present invention provides such a way to import the guidance patterns from competitive automatic guidance control systems, or to generate guidance patterns or swaths using a mathematical estimation of the algorithm used by such competitive automatic guidance control system, such as a best fit calculation based on two or more sets of swaths recorded using GPS when such competitive automatic guidance control system is in use, and to compare them for compatibility with guidance patterns or swaths generated by other algorithms from different manufacturers, possibly including the present manufacturer, and possibly including the previous manufacturer. The present invention further provides the ability to compare guidance patterns or swaths generated by algorithms from different manufacturers, or guidance patterns or swaths generated using mathematical estimation of the algorithms used by such competitive automatic guidance control system, possibly including the present manufacturer, and possibly including the manufacturer of a presently coupled implement, against guidance patterns or swaths generated

previously by the current manufacturer. The present invention further provides the ability to import swaths from any source and achieve the same results.

[0008] The present invention may import guidance patterns or swaths from a competitive automatic guidance control system display, or may generate guidance patterns or swaths using the mathematical estimation of the algorithm used by such competitive automatic guidance control system, such as a best fit calculation based on two or more sets of swaths recorded using GPS when such competitive automatic guidance control system is in use, then display one or more guidance patterns generated by algorithms from different manufacturers, possibly including the present or previous manufacturer. The present invention then displays the overlapping patterns or swaths, so that an operator can select a best match. Further, the present invention may display one or more guidance patterns generated by algorithms from different manufacturers, or mathematical estimations of such competitive automatic guidance control systems, overlapping previous patterns or swaths generated previously by the current manufacturer.

[0009] The invention in one form is directed to an agricultural vehicle having an automatic guidance control system. A control module is connected to a GPS receiver, to at least one vehicle control, and to a display. The control module uses a first set of guidance information that is either generated using a first algorithm, generated using a mathematical estimation of the first algorithm, or imported. The control module then uses at least a second set of guidance information associated with at least one additional source, the second set of guidance information having either been generated using a second algorithm, generated using a mathematical estimation of the second algorithm, or imported. The control module then compares the first set

of guidance information with the second set of guidance information by causing the display to show the first and second sets of guidance information overlaid one over the other.

[0010] The invention in another form is directed to an automatic guidance control system for an agricultural vehicle. A control module is again connected to a GPS receiver, to at least one vehicle control, and to a display. The control module again uses a first set of guidance information that is either generated using a first algorithm, generated using a mathematical estimation of the first algorithm, or imported. The control module then uses at least a second set of guidance information associated with at least one additional source, the second set of guidance information having been either generated using a second algorithm, generated using a mathematical estimation of the second algorithm, or imported. The control module then compares the first set of guidance information with the second set of guidance information by causing the display to show the first and second sets of guidance information overlaid one over the other.

[0011] The invention in another form is directed to a method of automatically guiding an agricultural vehicle. The first step of the method is providing a control module connected to a GPS receiver, to at least one vehicle control, and to a display. The second step of the method is using a first set of guidance information within the control module, the first set of guidance information having been either generated using a first algorithm, generated using a mathematical estimation of the first algorithm, or imported. The third step of the method is using a second set of guidance information associated with at least one additional source within the control module, the second set of guidance information having been either generated using a second algorithm, generated using a mathematical estimation of the second algorithm, or imported. The fourth step of the method is comparing the first set of guidance information with the second set of guidance

information by causing the display to show the first and second sets of guidance information overlaid one over the other. The fifth step of the method is allowing an operator to use an input on the display to choose between the first and second sets of guidance information based on the comparison.

[0012] An advantage of the present invention is that it allows an operator to choose a best match from among different guidance lines and/or swaths generated by different algorithms associated with other manufacturers' automatic guidance control systems, or mathematic estimations of such algorithms. A further advantage is that it does so using a simple and intuitive display and operator inputs.

[0013] A further advantage of the present invention is that it allows farmers to use agricultural vehicles and implements built by different manufacturers, while optimizing the overlap between previously created guidance lines and swaths, and subsequently created guidance lines and swaths.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

[0015] Fig. 1 is a graphical representation of a guidance line and swath pattern, having been created by a competitive manufacturer's agricultural vehicle using its own automatic guidance control system algorithm;

[0016] Fig. 2 is a graphical representation of imperfectly overlapping swaths that result when a

present manufacturer's agricultural vehicle follows guidance lines created by the competitive manufacturer's automatic guidance control system algorithm;

[0017] Fig. 3 is a graphical representation of a guidance line and swath pattern, having been created by the present manufacturer's agricultural vehicle using its own automatic guidance control system algorithm, overlaid over the previous guidance line and swath pattern;

[0018] Fig. 4 is a graphical representation of an embodiment of the invention, being a predictive overlap control model using a Control Module and a display;

[0019] Fig. 5 is a graphical representation of another embodiment of the invention, being a predictive overlap control model using a Control Module and a display; and

[0020] Fig. 6 is a graphical representation of another embodiment of the invention, being a predictive overlap control model using a Control Module and a display.

[0021] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring now to the drawings, and more particularly to Figs. 1 through 3, there is shown a graphical representation of problems associated with prior art guidance patterns and swath generation. In Fig. 1, a competitive manufacturer's agricultural vehicle 10 has created and followed an AB guidance line 12 using its own automatic guidance control system algorithm, and subsequently created and followed adjacent guidance lines 14 and 16, based on AB guidance line 12 and the geometry and characteristics of competitive manufacturer's agricultural vehicle 10, also using its own automatic guidance control system algorithm. This has resulted in swaths 18, 20, and 22.

[0023] In Fig. 2, the present manufacturer's agricultural vehicle 24 has followed the guidance lines 12, 14, and 16 created by the automatic guidance control system algorithm of competitive manufacturer's agricultural vehicle 10, or guidance patterns or swaths generated using a mathematical estimation of the algorithm used by such competitive automatic guidance control system, such as a best fit calculation based on two or more sets of swaths recorded using GPS when such competitive automatic guidance control system was in use. However, because the geometry and characteristics of the present manufacturer's agricultural vehicle 24 differ from the geometry and characteristics of competitive manufacturer's agricultural vehicle 10, overlapping swaths 26, 28, and 30 not only fail to perfectly overlap swaths 18, 20, and 22, but also result in gaps and overlaps 32.

[0024] In Fig. 3, the present manufacturer's agricultural vehicle 24 has generated its own guidance lines, including AB guidance line 34, and adjacent guidance lines 36 and 38, using its own automatic guidance control system algorithm. The AB guidance line 34 may even be chosen to correspond with the AB guidance line 12 of competitive manufacturer's agricultural vehicle 10. While the automatic guidance control system algorithm of the present manufacturer's agricultural vehicle 24 is optimized to the geometry and characteristics of the present manufacturer's agricultural vehicle 24, such that no gaps and overlaps would occur between overlapping swaths 26, 28, and 30, adjacent guidance lines 36 and 38 may become increasingly different from corresponding adjacent guidance lines 14 and 16, so that overlapping swaths 26, 28, and 30 become further and further from swaths 18, 20, and 22.

[0025] Although not illustrated, the same principle may apply if the present manufacturer's agricultural vehicle 24 has generated the previous guidance lines 12, 14, and 16 using its own automatic guidance control system algorithm, and is now connected to another manufacturer's

agricultural implement. If the present manufacturer's agricultural vehicle 24 subsequently follows its own guidance lines 12, 14, and 16, a result similar to Fig. 2 may occur. If the present manufacturer's agricultural vehicle 24 subsequently generates AB guidance line 34, and adjacent guidance lines 36 and 38, using the automatic guidance control system algorithm of the manufacturer of the connected agricultural implement, or a mathematical estimation of the automatic guidance control system algorithm of the manufacturer of the connected agricultural implement, a result similar to Fig. 3 may occur. Furthermore, the swaths may be imported from another source entirely, such as software designed to optimize productivity not otherwise associated with an automatic guidance control system algorithm of an agricultural vehicle.

[0026] Turning now to Fig. 4, a simplified graphical representation of an embodiment of a system incorporating a Competitive Line Generation Algorithm according to the present invention is provided. An agricultural vehicle 24 has a control module 40 connected to a display 42. The control module 40 is further connected to a GPS receiver 44 that provides location information to the control module 40. The control module 40 is further connected to one or more vehicle controls 46, allowing the control module 40 to control at least a steering function of the agricultural vehicle 24.

[0027] The control module 40 is operable to import and store guidance patterns and/or swaths, possibly generated by an algorithm associated with a competitive manufacturer's agricultural vehicle guidance control system or by an algorithm associated with an entirely different manufacturer's agricultural vehicle guidance control system, or possibly imported from another source entirely, such as software designed to optimize productivity not otherwise associated with an automatic guidance control system algorithm of an agricultural vehicle. The control module 40 may further be operable to calculate guidance patterns and/or swaths using algorithms

associated with a competitive manufacturer's agricultural vehicle guidance control system or associated with an entirely different manufacturer's agricultural vehicle guidance control system. The control module 40 may further be operable to generate guidance patterns or swaths using a mathematical estimation of the algorithm used by such competitive automatic guidance control system, as noted previously.

[0028] The control module 40 may then be operable to cause display 42 to show a previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22. Previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22 may represent initial guidance lines and/or swaths created by a competitive manufacturer's agricultural vehicle 10 using its automatic guidance control system algorithm, or a mathematical estimation thereof, taking into account the geometry and characteristics of competitive manufacturer's agricultural vehicle 10. Alternately, previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22 may represent initial guidance lines and/or swaths created by the control module 40 of the present manufacturer's agricultural vehicle 24 using its own automatic guidance control system algorithm, and taking into account the geometry and characteristics of the present manufacturer's agricultural vehicle 24. Alternately, previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22 may represent guidance lines and/or swaths imported from another source entirely, such as software designed to optimize productivity not otherwise associated with an automatic guidance control system algorithm of an agricultural vehicle, or a mathematical estimation thereof.

[0029] The control module 40 is then operable to cause display 42 to overlay AB guidance line 34, adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30 over previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22. AB guidance line 34,

adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30 may represent any of guidance lines and/or swaths created by the control module 40 of the present manufacturer's agricultural vehicle 24 using its own automatic guidance control system algorithm, guidance lines and/or swaths created by a competitive manufacturer's agricultural vehicle 10 using its automatic guidance control system algorithm and subsequently imported into the control module 40, guidance lines and/or swaths calculated by the control module 40 using the automatic guidance control system algorithm associated with a competitive manufacturer's agricultural vehicle 10, or a mathematical estimation thereof, guidance lines and/or swaths created by an entirely different manufacturer's agricultural vehicle and subsequently imported into the control module 40, or guidance lines and/or swaths calculated by the control module 40 using the automatic guidance control system algorithm associated with an entirely different manufacturer's agricultural vehicle, or a mathematical estimation thereof.

[0030] The control module 40 may then allow an operator to use inputs 48, 50, and 52 to select between different sets of overlaid AB guidance lines 34, adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30, created using or imported from automatic guidance control system algorithms associated with a competitive manufacturer's agricultural vehicle or associated with entirely different manufacturers' agricultural vehicles, or mathematical estimations thereof, as well as overlaid AB guidance line 34, adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30, created using the automatic guidance control system algorithm associated with the present manufacturer's agricultural vehicle. In this way, the operator can select the best match between overlaid AB guidance lines 34, adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30 and previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22, by choosing the appropriate inputs 48, 50, and 52 to choose the algorithms being

used, and pressing generate button 78 to cause control module 40 to generate the lines and display them on display 42. In other words, the operator can select the best automatic guidance control system algorithm, or mathematical estimation thereof, to match the previous guidance lines 12, 14, and 16 and/or swaths 18, 20, and 22.

[0031] Note that the AB guidance line 34, adjacent guidance lines 36 and 38, and/or swaths 26, 28, and 30 shown overlaid over previous AB guidance line 12, adjacent guidance lines 14 and 16, and/or swaths 18, 20, and 22 shown in Fig. 4 are shown with differences exaggerated for the sake of illustration. In fact, the differences in swath line generation and algorithms may be very minimal for immediately adjacent guidance lines and/or swaths. The accumulated differences that would actually cause issues, and therefore require operator review, may occur many guidance lines and/or swaths away from the initial AB guidance line and/or swaths. In order to improve operator experience and functionality, embodiments having further features are shown in Figs. 5 and 6.

[0032] Specifically, Fig. 5 shows display 42 in another configuration, wherein present manufacturer's agricultural vehicle 24 is shown superimposed over a guidance line 54. Note that this may represent the present manufacturer's agricultural vehicle's present location, or may represent a location where the operator has chosen to zoom in in order to view an accumulated error location in closer detail. An entire field button 56, zoom in button 58, and zoom out button 60 are usable to show the entire field or to focus on a particular location. Other recorded obstacle 62 is shown for reference during the evaluation of lines. Upon generating guidance lines and/or swaths using algorithms from a competitor's automatic guidance control system, or a mathematical estimation thereof, the map may automatically zoom out to a full field view, and show locations where the accumulated error has reached a chosen threshold, as chosen by the

operator. The operator can then zoom in, zoom out, or pan in order to view the accumulated error locations in closer detail.

[0033] Even given the focus on a specific accumulated error location, the accumulated error may still be small in comparison to the scale of the agricultural vehicle 24, so that an adjust window 64 may be provided. The adjust window 64 may give a magnified visual accumulated error indication 66, and an input field for the chosen error threshold 68. Adjustment buttons 70 may allow the operator to “nudge” the agricultural vehicle 24 to compensate for the accumulated error at that location. The adjust window 64 may automatically “hide” when not in use, and may “unhide” by way of the operator tapping on the map.

[0034] Fig. 6 shows display 42 in another configuration, showing inner boundaries 72, outer boundaries 74, and recorded obstacles 62. As guidance lines 54 and/or swaths are generated (only a few of which are shown here for clarity), the interaction between the various sets of guidance lines and/or swaths with the boundaries 72 and 74, as well as with recorded obstacles 62, can be observed by the operator. Small pins 76, or other markings, can then be used to identify on the field where the error threshold 68 has been reached and requires operator review. The operator can then select these pins 76 and zoom directly to them for viewing more specific accumulated error information. Alternately, the selection of the pins 76 may open a sub graphic, such as the adjust window 64 shown in Fig. 5 showing the magnified visual accumulated error indication 66 and adjustment buttons 70 for that accumulated error location.

[0035] While this invention has been described with respect to at least one embodiment, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from

the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

WHAT IS CLAIMED IS:

1. An agricultural vehicle having an automatic guidance control system, comprising:
a control module connected to a GPS receiver, at least one vehicle control, and a display;
said control module using a first set of guidance information, said first set of guidance information being one of:

generated using a first algorithm;

generated using a mathematical estimation of said first algorithm; and

imported;

said control module being operable to use a second set of guidance information associated with at least one additional source, said second set of guidance information being one of:

generated using a second algorithm;

generated using a mathematical estimation of said second algorithm; and

imported; and

said control module being further operable to compare said first set of guidance information with said second set of guidance information by causing said display to show one of said first and second set of guidance information overlaid over the other of said first and second set of guidance information.

2. The agricultural vehicle of claim 1, wherein:

said control module being further operable to allow an operator to use an input on said display to choose between said first set of guidance information and second sets of guidance information based on said comparison.

3. The agricultural vehicle of claim 1, wherein:

said second set of guidance information being associated with a competitive manufacturer agricultural vehicle guidance control system.

4. The agricultural vehicle of claim 3, wherein:

said second set of guidance information being at least one guide line or swath generated by said competitive manufacturer agricultural vehicle guidance control system.

5. The agricultural vehicle of claim 3, wherein:

said second algorithm being associated with a competitive manufacturer agricultural vehicle guidance control system.

6. The agricultural vehicle of claim 1, wherein:

said first set of guidance information includes a first base AB guide line; and

said second set of guidance information includes a second base AB guide line.

7. The agricultural vehicle of claim 1, wherein:

said control module being further operable to use a third set of guidance information associated with a second additional source, said third set of guidance information being one of:

generated using a third algorithm;

generated using a mathematical estimation of said third algorithm; and

imported; and

said control module being further operable to compare said first set of guidance information, said second set of guidance information, and said third set of guidance information by causing said display to alternately show one of said first, second, and third set of guidance information overlaid over another of said first, second, and third set of guidance information.

8. The agricultural vehicle of claim 7, wherein:

said control module being further operable to allow an operator to use an input on said display to choose between said first set of guidance information, said second set of guidance information, and said third set of guidance information.

9. The agricultural vehicle of claim 1, wherein:

said control module being further operable to allow an operator to input an error threshold, to identify where said error threshold has been reached, and to give specific accumulated error information upon selection of the identified location.

10. An automatic guidance control system for an agricultural vehicle, comprising:
a control module connected to a GPS receiver, at least one vehicle control, and a display;
said control module using a first set of guidance information, said first set of guidance information being one of:

generated using a first algorithm;

generated using a mathematical estimation of said first algorithm; and

imported;

said control module being operable to use a second set of guidance information

associated with at least one additional source, said second set of guidance information being one of:

generated using a second algorithm;

generated using a mathematical estimation of said second algorithm; and

imported; and

said control module being further operable to compare said first set of guidance information with said second set of guidance information by causing said display to show one of said first and second set of guidance information overlaid over the other of said first and second set of guidance information.

11. The automatic guidance control system of claim 10, wherein:

said control module being further operable to allow an operator to use an input on said display to choose between said first set of guidance information and second sets of guidance information based on said comparison.

12. The automatic guidance control system of claim 10, wherein:

said second set of guidance information being associated with a competitive manufacturer agricultural vehicle guidance control system.

13. The automatic guidance control system of claim 12, wherein:

said second set of guidance information being at least one guide line or swath generated by said competitive manufacturer agricultural vehicle guidance control system.

14. The automatic guidance control system of claim 12, wherein:

said second algorithm being associated with a competitive manufacturer agricultural vehicle guidance control system.

15. The automatic guidance control system of claim 10, wherein:

said first set of guidance information includes a first base AB guide line; and

said second set of guidance information includes a second base AB guide line.

16. The automatic guidance control system of claim 10, wherein:

said control module being further operable to use a third set of guidance information associated with a second additional source, said third set of guidance information being one of:

generated using a third algorithm;

generated using a mathematical estimation of said third algorithm; and

imported; and

said control module being further operable to compare said first set of guidance information, said second set of guidance information, and said third set of guidance information by causing said display to alternately show one of said first, second, and third set of guidance information overlaid over another of said first, second, and third set of guidance information.

17. The automatic guidance control system of claim 16, wherein:

said control module being further operable to allow an operator to use an input on said display to choose between said first set of guidance information, said second set of guidance information, and said third set of guidance information.

18. The automatic guidance control system of claim 10, wherein:

said control module being further operable to allow an operator to input an error threshold, to identify where said error threshold has been reached, and to give specific accumulated error information upon selection of the identified location.

19. A method of automatically guiding an agricultural vehicle, comprising the steps of:

providing a control module connected to a GPS receiver, at least one vehicle control, and a display;

using a first set of guidance information within said control module, said first set of guidance information being one of:

generated using a first algorithm;

generated using a mathematical estimation of said first algorithm; and

imported;

using a second set of guidance information within said control module, said second set of guidance information being associated with at least one additional source, said second set of guidance information further being one of:

generated using a second algorithm;

generated using a mathematical estimation of said second algorithm; and

imported;

comparing said first set of guidance information with said second set of guidance information by causing said display to show one of said first and second set of guidance information overlaid over the other of said first and second set of guidance information; and

allowing an operator to use an input on said display to choose between said first set of

guidance information and second sets of guidance information based on said comparison.

20. The method of claim 19, wherein:

said second set of guidance information being at least one guide line or swath generated by a competitive manufacturer agricultural vehicle guidance control system.

21. The method of claim 19, wherein:

said second algorithm being associated with a competitive manufacturer agricultural vehicle guidance control system.

22. The method of claim 19, further comprising the steps of:

using a third set of guidance information associated with a second additional source, said third set of guidance information being one of:

generated using a third algorithm;

generated using a mathematical estimation of said third algorithm; and

imported;

comparing said first set of guidance information, said second set of guidance information, and said third set of guidance information by causing said display to alternately show one of said first, second, and third set of guidance information overlaid over another of said first, second, and third set of guidance information; and

allowing an operator to use an input on said display to choose between said first set of guidance information, said second set of guidance information, and said third set of guidance information.

23. The method of claim 19, further comprising the steps of:

allowing an operator to input an error threshold, identifying where said error threshold has been reached, and giving specific accumulated error information upon selection of the identified location.

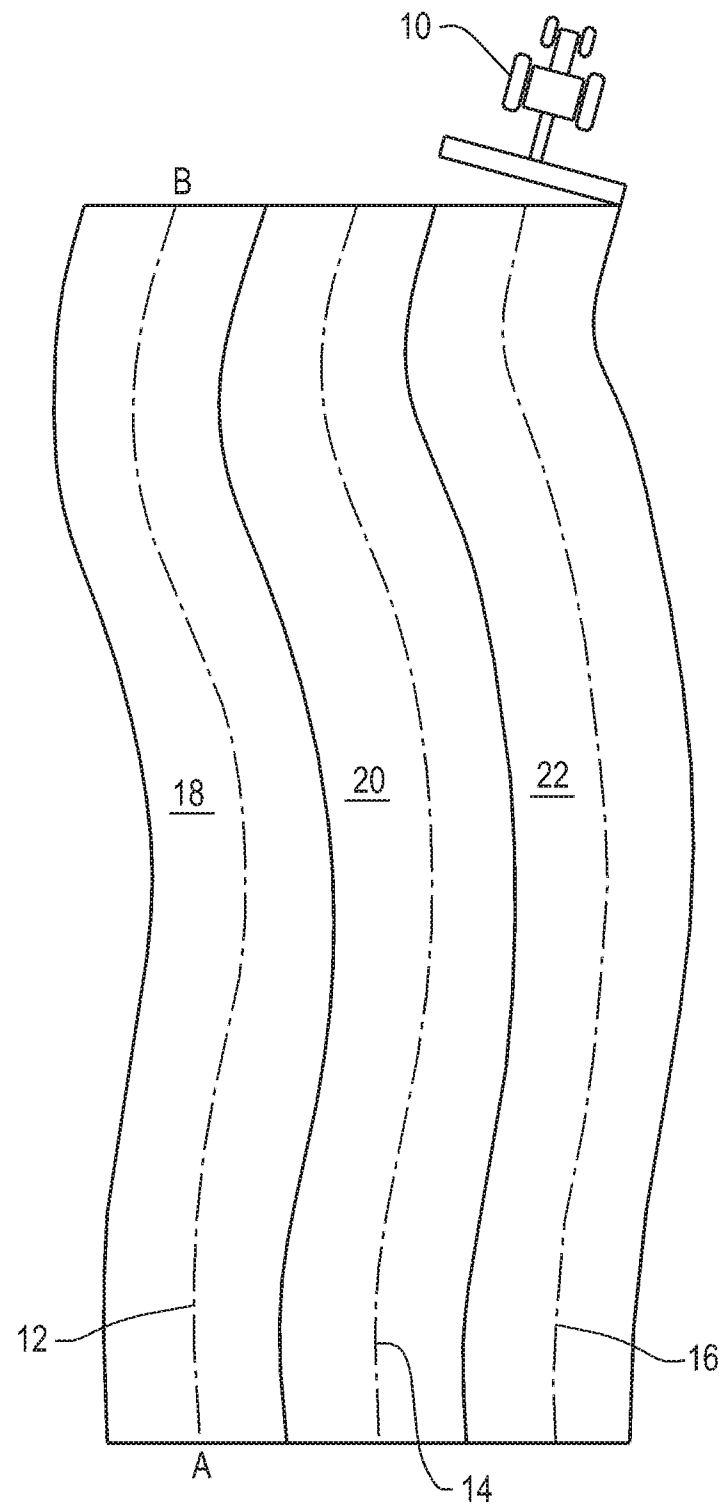


Fig. 1

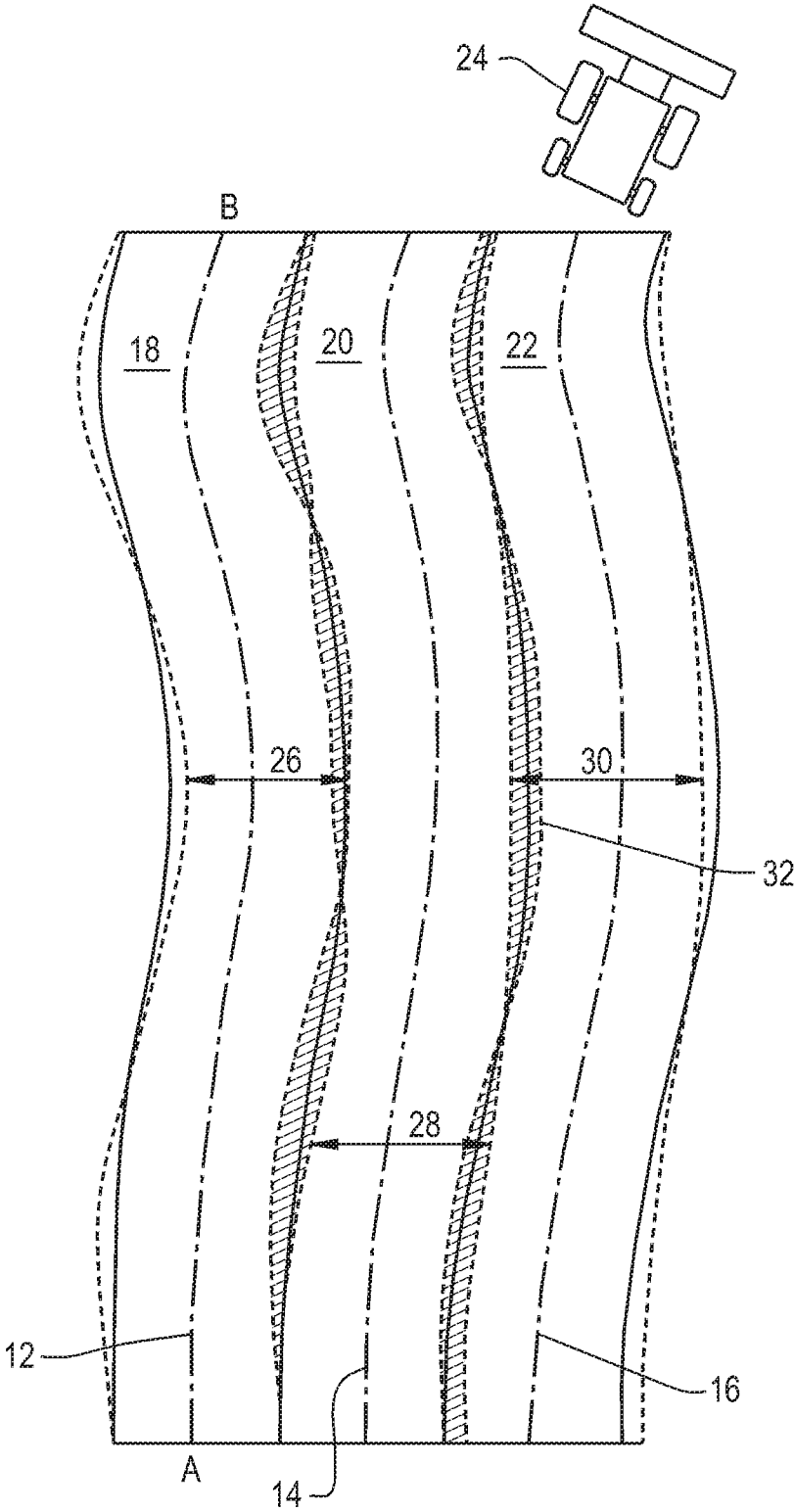


Fig. 2

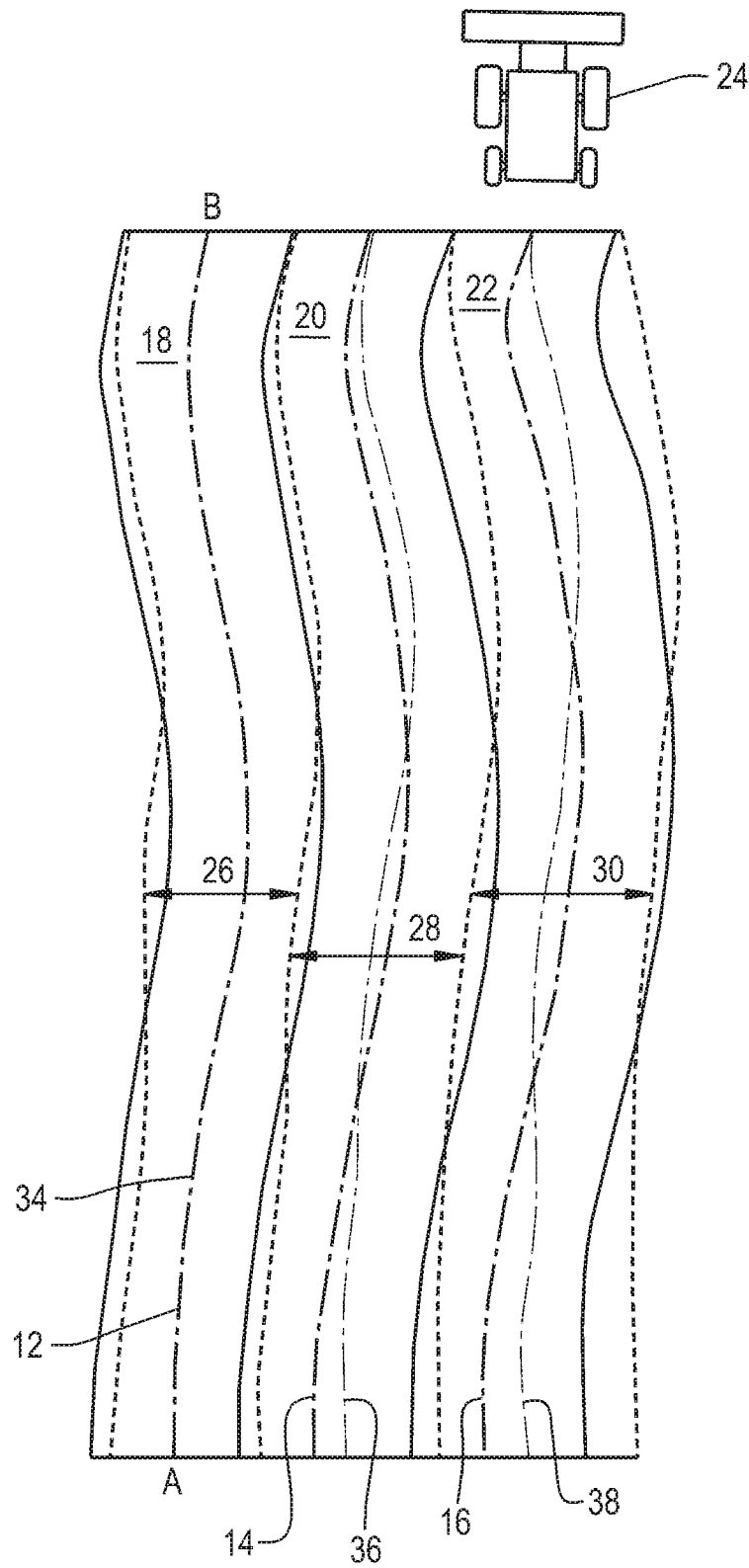


Fig. 3

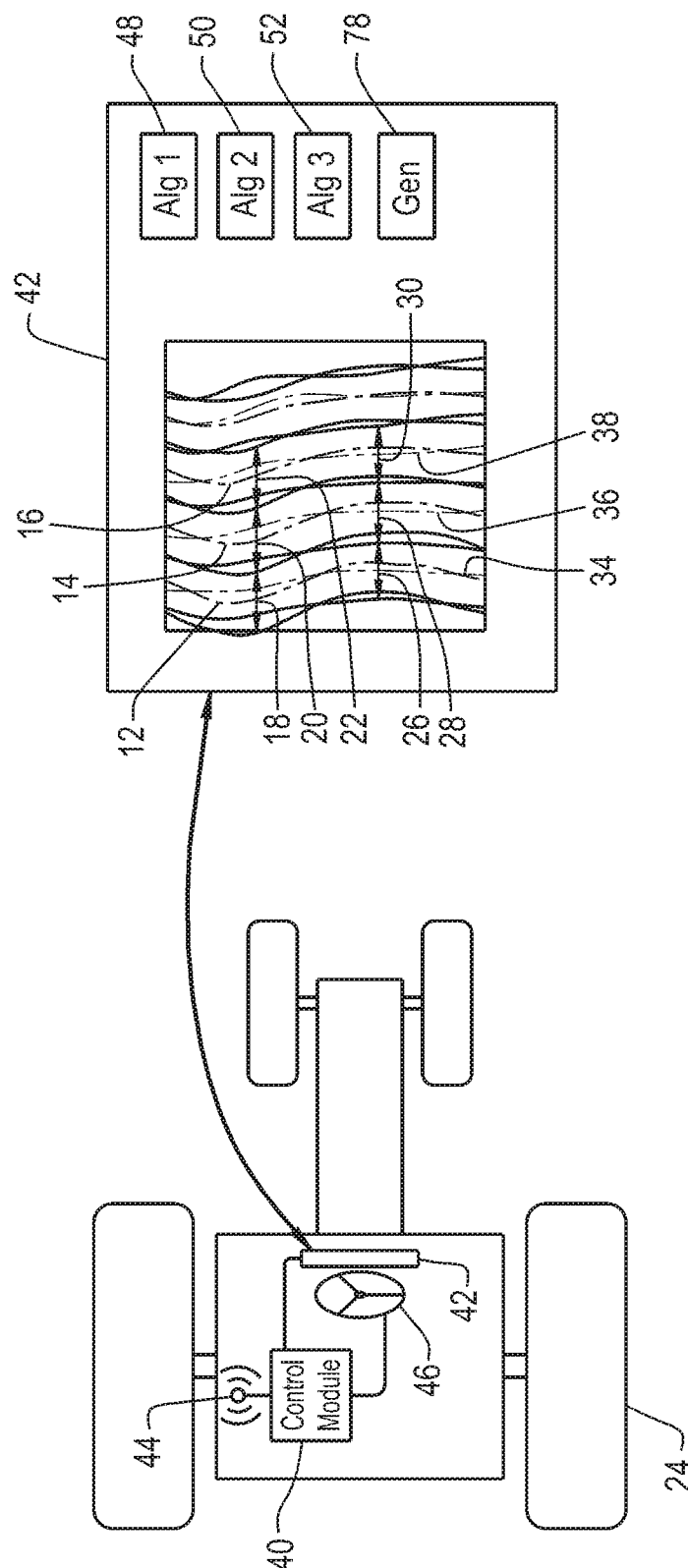


Fig. 4

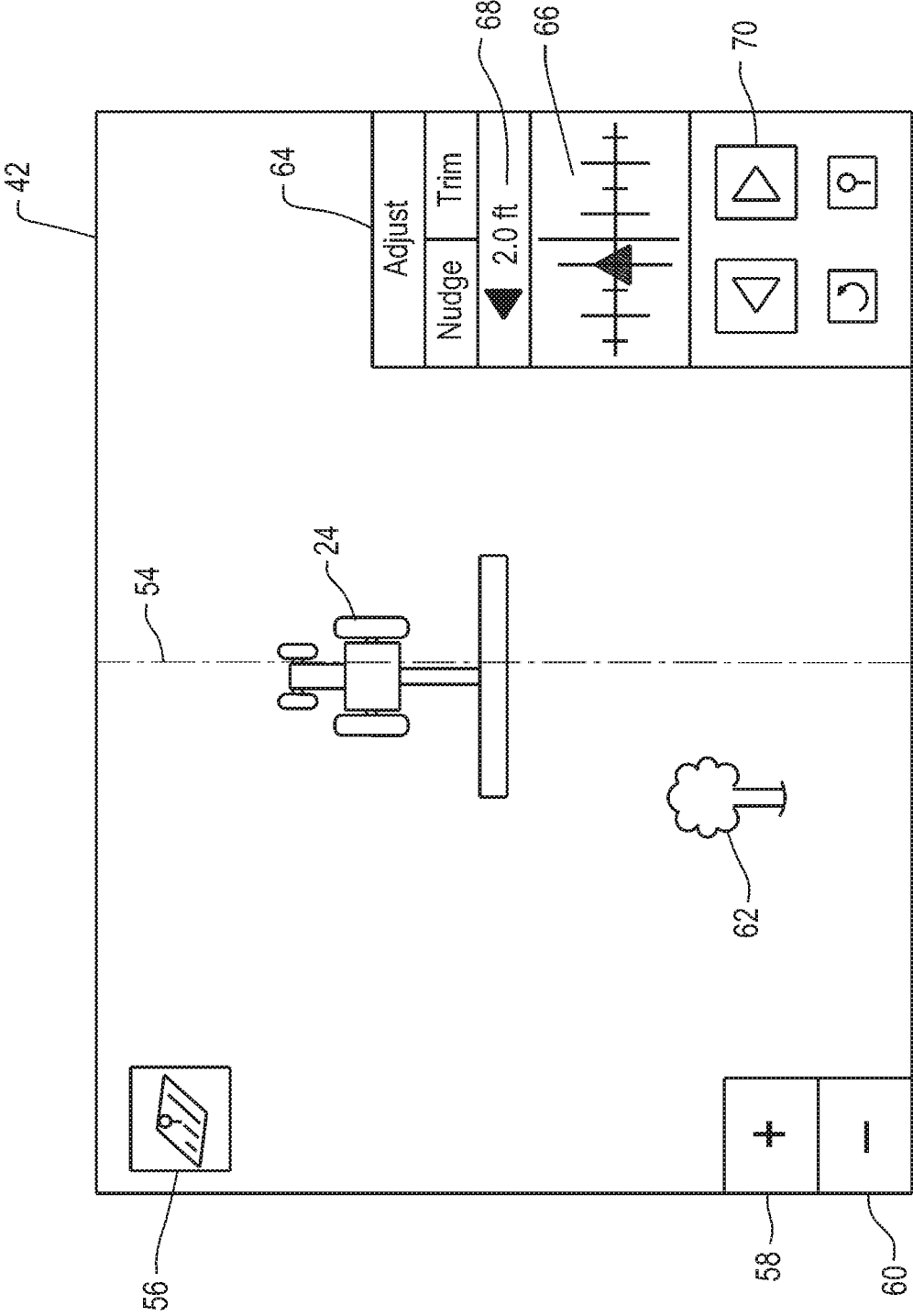


Fig. 5

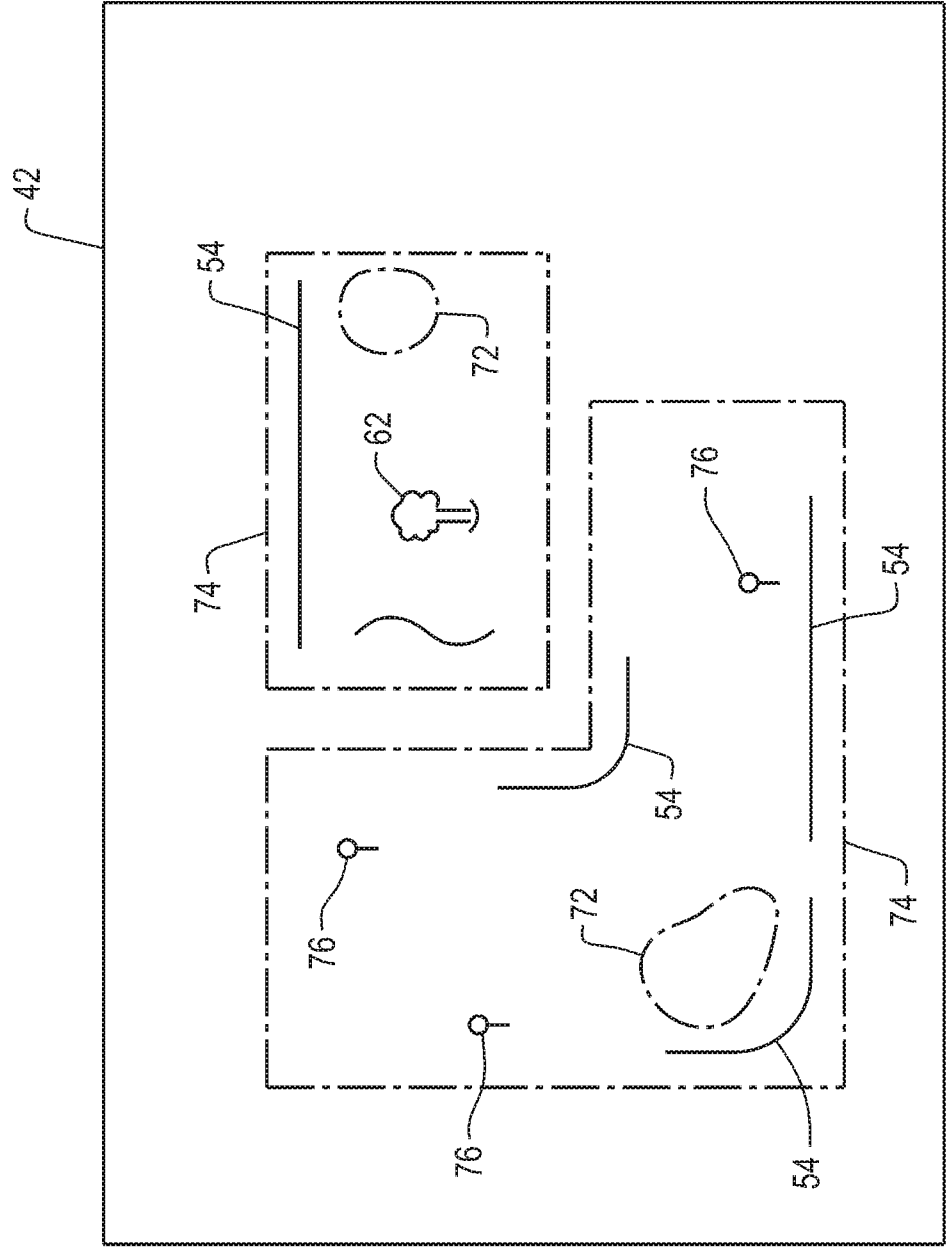


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/058458

A. CLASSIFICATION OF SUBJECT MATTER INV. A01B69/00 A01B69/04 A01B79/00 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A01B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/262342 A1 (DIX PETER J [US] ET AL) 14 October 2010 (2010-10-14) paragraph [0016] - paragraph [0017] paragraph [0026] paragraph [0033] - paragraph [0034] figures 1,2,6	1-23
X	----- WO 2013/090883 A1 (AGCO CORP [US]; SWENSON EDWARD [US]; MATTHEWS PAUL [US]) 20 June 2013 (2013-06-20) paragraph [0018] paragraph [0023] paragraph [0031] paragraph [0043] figure 2 ----- -/-	1-23
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 9 January 2017		Date of mailing of the international search report 24/01/2017
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Leblanc, Romain

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/058458

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 730 819 A1 (AMAZONEN WERKE DREYER H [DE]) 11 September 1996 (1996-09-11) column 2, line 5 - line 19; figure 1 -----	1-23
A	US 2006/175541 A1 (EGLINGTON MICHAEL L [US] ET AL) 10 August 2006 (2006-08-10) claims 1,2 the whole document -----	1-23

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Information on patent family members

International application No

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