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(54) METHOD OF PREPARING A WIRELESS FLOOR CONVEYOR CONTROL SYSTEM

(57) The present invention relates to a method of performing a preparation a wireless floor conveyor remote control system. The system comprising a floor conveyor (2) and a wireless floor conveyor remote control (20). The distance between the remote control (20) and the floor conveyor (2) is used as a paring condition. The present invention also relates to a remote control system (1) comprising the floor conveyor (2) and the remote control (2). The present invention also relates to a first and second computer readable software for performing the presented method by the floor conveyor and the remote control.

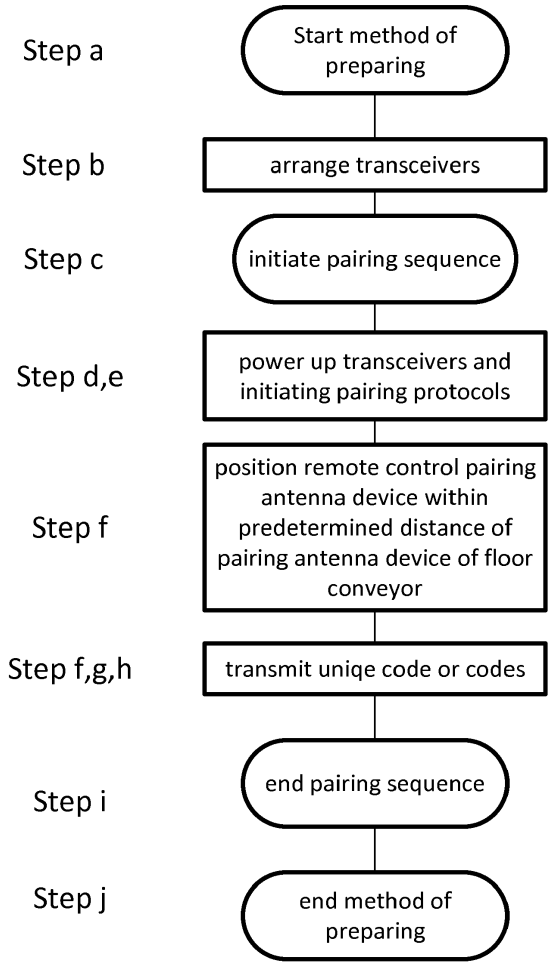

Figure 1

EP 3 270 363 A1

Description

[0001] The present invention relates to a method of preparing a wireless floor conveyor control system according to claim 1, a floor conveyor remote control system according to claim 8 and a first and a second computer readable software according to claim 12.

PRIOR ART

[0002] The document EP2079065 A2 describes a method of synchronizing a transmitter and a receiver in a supplemental remote control system for a materials handling vehicle.

BRIEF DESCRIPTION OF THE INVENTION

[0003] The synchronization performed by the prior art is not optimized to be as easy as possible for the operator, it merely discussed the pairing itself not in view of the practise for the operator. Thus on of the objects of the present invention is to make this process more efficient and easier for the operator, and also making the process more fail safe.

[0004] The object of the present invention is achieved by a method of preparing a wireless floor conveyor remote control system comprising a floor conveyor and a wireless floor conveyor remote control both comprising a respective transceiver with a respective pairing antenna device, comprising the steps of:

a. Start method of preparing a wireless floor conveyor remote control system,
b. arrange the transceivers such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol,
c. initiate a pairing sequence of the system,
d. initiate a pairing communication protocol on the transceiver of the floor conveyor,
e. initiate the pairing communication protocol on the remote control,
f. position the remote control pairing antenna device at a predetermined distance from the pairing antenna device of the floor conveyor, wherein the predetermined distance is at most 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm,
g. transmit a unique code of the remote control to the floor conveyor, or
h. transmit a unique code of the floor conveyor to the remote control, or
i. exchange a unique code of the remote control to the floor conveyor and a unique code of the remote control to the floor conveyor,

thereby achieving a unique pairing of the remote control to the floor conveyor,
then,

j. end the pairing sequence
k. end method of preparing a wireless floor conveyor remote control system.

[0005] This method will simplify the pairing of a floor conveyor to a remote control by using the distance between the floor conveyor and the remote control as a determining factor for the pairing sequence, and the method as a whole.

[0006] It is also suggested a floor conveyor remote control system comprising a floor conveyor and a wireless floor conveyor remote control,
wherein the floor conveyor comprises, a transceiver, a paring antenna device and a control unit,
wherein the remote control comprises transceiver, a pairing antenna device and a control unit,
wherein the transceivers are arranged such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol controlled by respective control unit, wherein the transceivers of the floor conveyor and the remote control are able to execute the method according to the above.

[0007] As discussed for the method a much more simplified operation of the floor conveyor will be achieved. The preparation for operations by an operator can be made very simple, without interaction of keys, codes to be performed to a keyboard etc.

[0008] Further it is also suggested a first and second computer readable software according to claim 12.

[0009] Other aspects of the present invention will be discussed further in the detailed description, and understood from the drawings as listed below.

LIST OF DRAWINGS

[0010]

Figure 1	Discloses a method of preparing a wireless floor conveyor remote control system according the invention.
Figure 1a	Discloses a method of preparing a wireless floor conveyor remote control system according the invention according to Figure 1 with a further method step j11.
Figure 2	Discloses a method of preparing a wireless floor conveyor remote control system according the invention with further method steps.

Figure 2a Discloses a method of preparing a wireless floor conveyor remote control system according the invention according to Figure 2 with a further method step j11.

Figure 3 Discloses further optional method steps of the method of preparing a wireless floor conveyor remote control system according the invention.

Figure 4 Discloses a floor conveyor remote control system according to the invention.

Figure 4a Discloses a floor conveyor remote control system according to the invention.

Figure 5 Discloses a Floor conveyor remote control system according to the invention.

Figure 6 Discloses a floor conveyor remote control system according to the invention.

Figure 7 Discloses a wireless floor conveyor remote control of the wireless floor conveyor remote control system according to the invention.

Figure 7a Discloses an alternative wireless floor conveyor remote control of the wireless floor conveyor remote control system according to the invention.

DETAILED DESCRIPTION

[0011] The present disclosure relates to a method of pairing a wireless floor conveyor remote control to a floor conveyor. Pairing means in the context of the disclosure to permit a floor conveyor to be controlled by a particular wireless floor conveyer remote control, and no other wireless floor conveyor remote control.

[0012] The wireless floor conveyor remote control is operable with a floor conveyor for controlling the functions of the floor conveyor. In general the function that is most relevant is the repositioning of the floor conveyor at order picking operations. In general the operator will step off the floor conveyor and walk up to the goods that are to be picked. In that situation it is of interest for the operator to reposition the floor conveyor without going back to the floor conveyor. In this situation a short repositioning of the floor conveyor by means of a wireless floor conveyor remote control is of great help and increases the efficiency of the order picker operation.

[0013] A floor conveyor can be any floor conveyor that is suitable for remote control. Figure 4 discloses an order picker truck, figure 5 a reach truck, and figure 6 a stacker truck. But the present disclosure are not limited for these particular floor conveyors, also any type of tow tractor could be used. This means that a load carrier in the form of forks is not essential for the present disclosure. However the present disclosure is related to material handling vehicles that mainly operate inside a warehouse. In general it is to be applied to electrically powered floor conveyors. It is preferred that the floor conveyor can detect and avoid objects when operated by means of the remote control. Thus the remote control is preferably a simple device that can control start and forward travel, and not make more advanced travel manoeuvres. The sensor device is preferably a centrally positioned laser sensor. The sensor device is preferably able to detect objects by means of a plane that is angled to the horizontal plane. The sensor device preferably transmits the sensor data to a control unit of the floor conveyor, wherein the control unit is operable to control the travel function of the floor conveyor. The travel function of the floor conveyor is to be understood to mean the motor, and brakes, and other devices needed for driving the floor conveyor.

[0014] In general the floor conveyor 2, Figures 4-6, of the present disclosure comprises a transceiver 3. The transceiver 3 in general comprises an emitter and a receiver. The floor conveyor 2 comprises further a control unit 4 of the transceiver 3. In addition a pairing antenna device 5 is also comprised in the floor conveyor 2. In general floor conveyors 2 comprise a control handle 7 or steering controls 7a. In general floor conveyors also comprise a main control unit 8. The control handle 7 or the steering controls 7a are used by the operator for operating the floor conveyor 2 in material handling situations as known to the person skilled in the art. The transceiver control unit 4 can be incorporated with the main control unit 8, not disclosed in the Figures. There is also an internal bus and a travel motor etc. that is common to the person skilled in the art for controlling the functions of the floor conveyor. The floor conveyor further comprises in general an operation protocol antenna device 6. It is possible to use the pairing antenna device 5 for operation protocol radio transmissions, but in general a further antenna device is preferable for easy adaptation to the operation protocol transmission. Figure 4a discloses an example of a Floor conveyor 2 with a sensor device 40 for detecting objects as a part of a remote control system 1.

[0015] The wireless floor conveyor remote control 20 of the present disclosure, Figure 7, 7a, comprises a pairing antenna device 26, and a control unit 24, and a transceiver 23. The wireless floor conveyor remote control 20 further comprises in general an operation protocol antenna device 26. It is possible to use the pairing antenna device 25 for operation protocol radio transmissions, but in general a further antenna device 26 is preferable for easy adaptation to the operation protocol transmission. The remote control 20 also comprises an operator interaction device 27, preferably a button.

[0016] The present disclosure refers to a method of preparing a floor conveyor remote control system, see Figure 1. The system requires a floor conveyor and a wireless floor conveyor remote control with a respective transceiver and a respective pairing antenna device. The

method involves the steps of:

a. Start method of preparing a wireless floor conveyor remote control system,

In general the start can be performed manually by an operator; it can also be executed automatically by a floor conveyor control unit, for example at start-up of floor conveyor.

b. arrange the transceivers such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol,

Please note that if the floor conveyor is not adapted for the method by for example having a transceiver. It is not possible to perform the method. The transceiver is in general arranged by being present in the floor conveyor and a corresponding one in the remote control. The pairing protocol uses the wave length λ with the length of the pairing antenna device in such a way that the radio signals will not transmit further, than the given ranges.

c. initiate a pairing sequence of the system,

The pairing sequence is initiated by the control unit of the floor conveyor. That is the transceiver control unit. But it could also be initiated by the main control unit of the floor conveyor, sending signals to the transceiver control unit.

d. initiate a pairing communication protocol on the transceiver of the floor conveyor,

e. initiate the pairing communication protocol on the remote control,

Steps d and e should not be confused to be mandatory to be executed one before the other. They could be executed at the same time, or e could be executed before d.

f. position the remote control pairing antenna device at a predetermined distance from the pairing antenna device of the floor conveyor, wherein the predetermined distance is at most 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm,

The by using this technology for the pairing sequence a particularly easy pairing is achieved. It is particularly convenient that the both the quickness and the easiness of the pairing can be performed by this step.

g. transmit a unique code of the remote control to the floor conveyor,

h. transmit a unique code of the floor conveyor to the remote control,

i. exchange a unique code of the floor conveyor to the remote control and a unique code of the floor conveyor to the remote control,

Steps g, h and i are options to each other. In general the step i. is the most common step to perform the pairing. In general the code of the floor conveyor and the remote control are both saved by the respective control unit. For the floor conveyor the transceiver control unit can send the code of the remote control to the main control unit. The transmission of the codes in steps g. h. i. are possible to be made with the pairing radio protocol or it could be performed with a further radio protocol, for example an operation communication protocol. This would be made for example by introducing step j11, (see below) after step f. and then alter steps g., h. i. to:

ga. transmit a unique code of the remote control to the floor control by means of the operation communication protocol,

ha. transmit a unique code of the floor conveyor to the remote control by means of the operation communication protocol,

ia. exchange a unique code of the floor conveyor to the remote control and a unique code of the floor conveyor to the remote control by means of the operation communication protocol,

A combination of steps g. h. i. and ga. ha. ia, is also possible, for example to exchange the unique codes during the operation of the floor conveyor with the remote control. This would allow a continuous check of the pairing, which improves the reliability and avoids disturbances from other sources using the operation communication protocol.

A unique pairing is there by achieved of a wireless floor conveyor remote control. This safe guards that the remote control or the floor conveyor will not disturb other floor conveyors or remote controls that is operating in the vicinity of the paired floor conveyor remote control system.

j. end the pairing sequence

k. end method of preparing a wireless floor conveyor remote control system

[0017] The pairing sequence is ended by step j. The complete method is ended by step k. and after this the floor conveyor and the remote control can operate together as a paired system.

[0018] As a further option to the method a step j1 can be comprised:

j1. close down the pairing communication protocol on the floor conveyor and on the remote control.

[0019] This step only closes down the communication protocol for the pairing. This means that no further exchange of the codes is momentarily performed through this protocol. This does however not mean that pairing of the system should be considered to be ended as a whole. Thus the aim of the step j1. is primarily to save energy, and not continuously run the pairing sequence itself. The remote control and the floor conveyor are still

operable with each other.

[0020] The pairing antennas of the transceivers are arranged in cooperation with the pairing communication protocol such that no standing wave can be achieved, preferably by arranging the pairing antennas with a length that mismatch with the radio wave length λ of the pairing communication protocol. This explains how the pairing can be limited to the distances that are required for the method. It is of course important that the pairing radio signals are not received by a further floor conveyor for example. This could lead to serious consequences in the warehouse. The mismatch in general means that no standing wave is to be achieved. Generally a standing wave is desired by a transmitter/transceiver in order to safe guard a good distribution range of the radio waves. In this case the desire is the opposite. It is required that the pairing protocol, e.g. wave length λ, does not match with the length of the antenna such that the range is only up to 20 cm. For example the technology used could be Near Field Communication or NFC.

[0021] As an option the pairing of the floor conveyor and the remote control is ended after a predetermined time t of inactivity of the floor conveyor and/or the remote control or the pairing is ended if a new pairing sequence is initiated, after pairing is ended the floor conveyor is no longer associated with the remote control.

[0022] This saves energy and also safe guards that two remote controls are not paired at the same time to the same floor conveyor.

[0023] The method further comprises the step of:

j11 initiate an operation communication protocol on the floor conveyor and on the remote control.

[0024] The pairing radio protocol itself is not particularly well adapted for remote controlling the floor conveyor over a longer distance for reasons given above. The initiation of the operation communication protocol provides for a better operation, when using the remote control. It is thinkable that the operation communication protocol uses the pairing antenna devices of the floor conveyor. By having the operation communication protocol better adapted to the pairing antenna devices a much further range is achieved, than the limit for the pairing sequence. On preferred technology for this is Bluetooth, but other radio protocols is thinkable. Bluetooth is well suited as it is very energy efficient. Preferably respective operation antenna devices are used by the operation protocol. These antenna devices can be optimized in a favourable manner for the best function of the operation radio protocol. The operation communication protocol must be able to communicate at distances above 5 meters, for example above 10 meters. However it is not desired that the operation radio protocol can communicate over 100 meters.

a1. provide a floor conveyor operator with a dedicated remote control that is unique to the operator

a2. determine that the pairing of the floor conveyor to the dedicated remote control also identifies the operator, preferably by means of identifying the code of the remote control by the floor conveyor,

a3. determine that by pairing the floor conveyor with the unique remote control, a login to the floor conveyor is also performed by the operator.

[0025] It is well known in the art that modern floor conveyors have a log in function that is dedicated to each operator of respective floor conveyor. In general this login is performed by entering a code on a key board of the floor conveyor. However by performing the steps a1. a2. a3. the pairing sequence could also be used for logging in of the operator to the floor conveyor such that the floor conveyor can be operated. This would dispense with the need for the operator to separately log in to the floor conveyor itself, before being able to operate the floor conveyor with or without the remote control. The steps a1, a2 and a3 can be positioned at any position in the method as described above. It is preferred that the step a1 is performed already before step a. step a2 could be executed after step f. Step a3 could be executed after step j.

[0026] The present disclosure as discussed above relates to a remote control system 1 comprising a floor conveyor 2 and a wireless floor conveyor remote control 20, wherein the floor conveyor 20 comprises, a transceiver 3, a paring antenna device 5 and a control unit 4, wherein the remote control 20 comprises transceiver 23, a pairing antenna device 25 and a control unit 24, wherein the transceivers 3, 23 are arranged such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol controlled by respective control unit 4, 24, wherein the transceivers 3, 23 of the floor conveyor 2 and the remote control 20 are able to execute the method according to any described methods above. Thus it should be understood that the smallest part of the disclosed system is one floor conveyor 2 and one wireless floor conveyor remote control 20 The floor conveyor 20 needs of course to be adapted with a transceiver and respective antenna device. The control unit itself should be understood as discussed above to be either a particular transceiver control unit 4 or the control unit 4 is incorporated into the main control unit 8 of the floor conveyor 2.

[0027] Further the disclosure relates to a remote control system 1 according to the above wherein, the pairing antenna devices 5, 25 of the transceivers 3, 23 are arranged together with the pairing communication protocol such that no standing wave can be achieved, preferably by arranging the pairing antenna devices 5, 25 with a length that mismatch with the radio wave length λ. This is a convenient way of achieving the desired range of the pairing operation.

[0028] Further the disclosure relates to a floor conveyor remote control system 1 according to the above, wherein the floor conveyor 2 and the remote control 20 comprise a further communication protocol, that can be initiated after the pairing communication protocol, wherein the further communication protocol is an operation communication protocol arranged such that it is able to transmit operation signals over at least a distance of 5 meters, such that the wireless remote control 20 and floor conveyor 2 are able to execute the method according to the above. Preferably the operation communication protocol is based on Bluetooth technology. This further operation communication protocol is more optimal for performing the operation of the floor conveyor 1 as it can operate outside the very limited range of the pairing protocol. As stated with the method above Bluetooth is a preferred protocol of communication. A distance of 5 meters is at least desirable, but above 10 meters is better, however not longer than 100 meters of communication is desired for the operation communication protocol.

[0029] Further the disclosure relates to a floor conveyor remote control system 1 according to the above, wherein the floor conveyor 2 and the remote control 20 comprise dedicated operation antenna devices 6, 26, different from the pairing antenna devices 5, 25. As has been discussed above with regard to the method steps a dedicated operation antenna device provides for the possibility of a better optimization of the operative communication.

[0030] The disclosure also relates to a first computer readable software that when stored on a control unit of a floor conveyor and a second computer readable software that when stored on a control unit of a wireless floor conveyor remote control are able to in cooperation execute the method according to any of the method steps described above. It must be understood that step a1 is executed by dedicating particular codes as identification of a person. Thus the software will need to store the codes in the control unit of the floor conveyor, and also optionally in the remote control. That is in order to provide a dedicated remote control.

Claims

1. Method of preparing a wireless floor conveyor remote control system comprising a floor conveyor and a wireless floor conveyor remote control both comprising a respective transceiver with a respective pairing antenna device, comprising the steps of:

a. Start method of preparing a wireless floor conveyor remote control system,
b. arrange the transceivers such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol,
c. initiate a pairing sequence of the system,
d. initiate a pairing communication protocol on the transceiver of the floor conveyor,
e. initiate the pairing communication protocol on the remote control,
f. position the remote control pairing antenna device at a predetermined distance from the pairing antenna device of the floor conveyor, wherein the predetermined distance is at most 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm,
g. transmit a unique code of the remote control to the floor conveyor, or
h. transmit a unique code of the floor conveyor to the remote control, or
i. exchange a unique code of the remote control to the floor conveyor and a unique code of the remote control to the floor conveyor,

thereby achieving a unique pairing of the remote control to the floor conveyor,
then,

j. end the pairing sequence
k. end method of preparing a wireless floor conveyor remote control system.

2. Method according to claim 1, comprising the step of after the pairing sequence is ended:

j1. close down the pairing communication protocol on the floor conveyor and on the remote control.

3. Method according to any of the claims above wherein, the pairing antennas of the transceivers are arranged in cooperation with the pairing communication protocol such that no standing wave can be achieved, preferably by arranging the pairing antennas with a length that mismatch with the radio wave length λ of the pairing communication protocol.

4. Method according to any of the claims above wherein, the pairing of the floor conveyor and the remote control is ended after a predetermined time t of inactivity of the floor conveyor and/or the remote control or the pairing is ended if a new pairing sequence is initiated, after pairing is ended the floor conveyor is no longer associated with the remote control.

5. Method according to any of the claims above wherein, the pairing communication protocol and the pairing antennas are based on NFC technology.

6. Method according to any of the claims above, com-

prising the steps of after end of the pairing sequence:

j11 initiate an operation communication protocol on the floor conveyor and on the remote control.

wherein the operation communication protocol is able to transmit operation signals over at least a distance of 10 meters, preferably by being based on Bluetooth technology, even more preferred by applying respective operation antenna devices in the floor conveyor and the remote control.

7. Method according to any of the claims above comprising the steps of:,

a1. provide a floor conveyor operator with a dedicated remote control that is unique to the operator,
a2. determine that the pairing of the floor conveyor to the dedicated remote control also identifies the operator, preferably by means of identifying the code of the remote control by the floor conveyor,
a3. determine that by pairing the floor conveyor with the unique remote control, a login to the floor conveyor is also performed by the operator.

8. Floor conveyor remote control system (1) comprising a floor conveyor (2) and a wireless floor conveyor remote control (20),
wherein the floor conveyor (20) comprises, a transceiver (3), a paring antenna device (5) and a control unit (4),
wherein the remote control (20) comprises transceiver (23), a pairing antenna device (25) and a control unit (24),
wherein the transceivers (3, 23) are arranged such that such that radio signals cannot be transmitted further than 20 cm, preferably at most 15 cm, most preferably at most 10 cm, even more preferred at most 5 cm, most preferred at most 2-4 cm, by means of pairing antenna technology and a pairing communication protocol controlled by respective control unit (4, 24), wherein the transceivers (3, 23) of the floor conveyor (2) and the remote control (20) are able to execute the method according to any of the claims 1-7.

9. Remote control system (1) according to claim 8 above wherein, the pairing antenna devices (5, 25) of the transceivers (3, 23) are arranged together with the pairing communication protocol such that no standing wave can be achieved, preferably by arranging the pairing antenna devices (5, 25) with a length that mismatch with the radio wave length λ.

10. Remote control system (1) according to claim 8 or 9, wherein the floor conveyor (2) and the remote control (20) comprise a further communication protocol, that can be initiated after the pairing communication protocol, wherein the further communication protocol is an operation communication protocol arranged such that it is able to transmit operation signals over at least a distance of 10 meters, such that the wireless remote control (20) and floor conveyor (2) are able to execute the method according to claim 6, preferably the operation communication protocol is based on Bluetooth technology.

11. Remote control system (1) according to claim 10, wherein the floor conveyor (2) and the remote control (20) comprise dedicated operation antenna devices (6, 26), different from the pairing antenna devices (5, 25).

12. A first computer readable software that when stored on a control unit of a floor conveyor and a second computer readable software that when stored on a control unit of a wireless floor conveyor remote control are able to in cooperation execute the method according to any of the claims 1- 7.

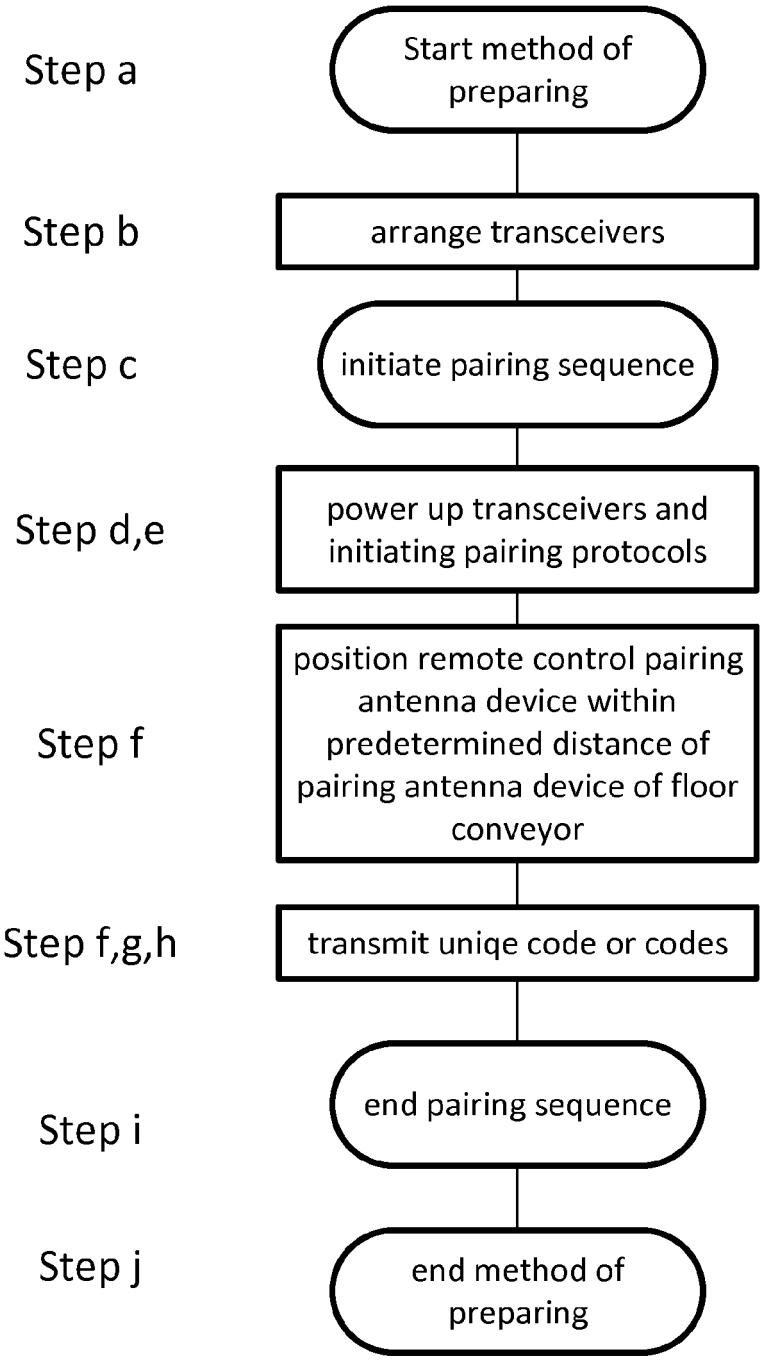

Figure 1

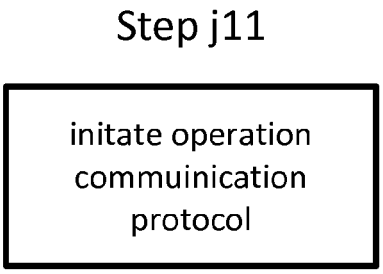

Figure 1a

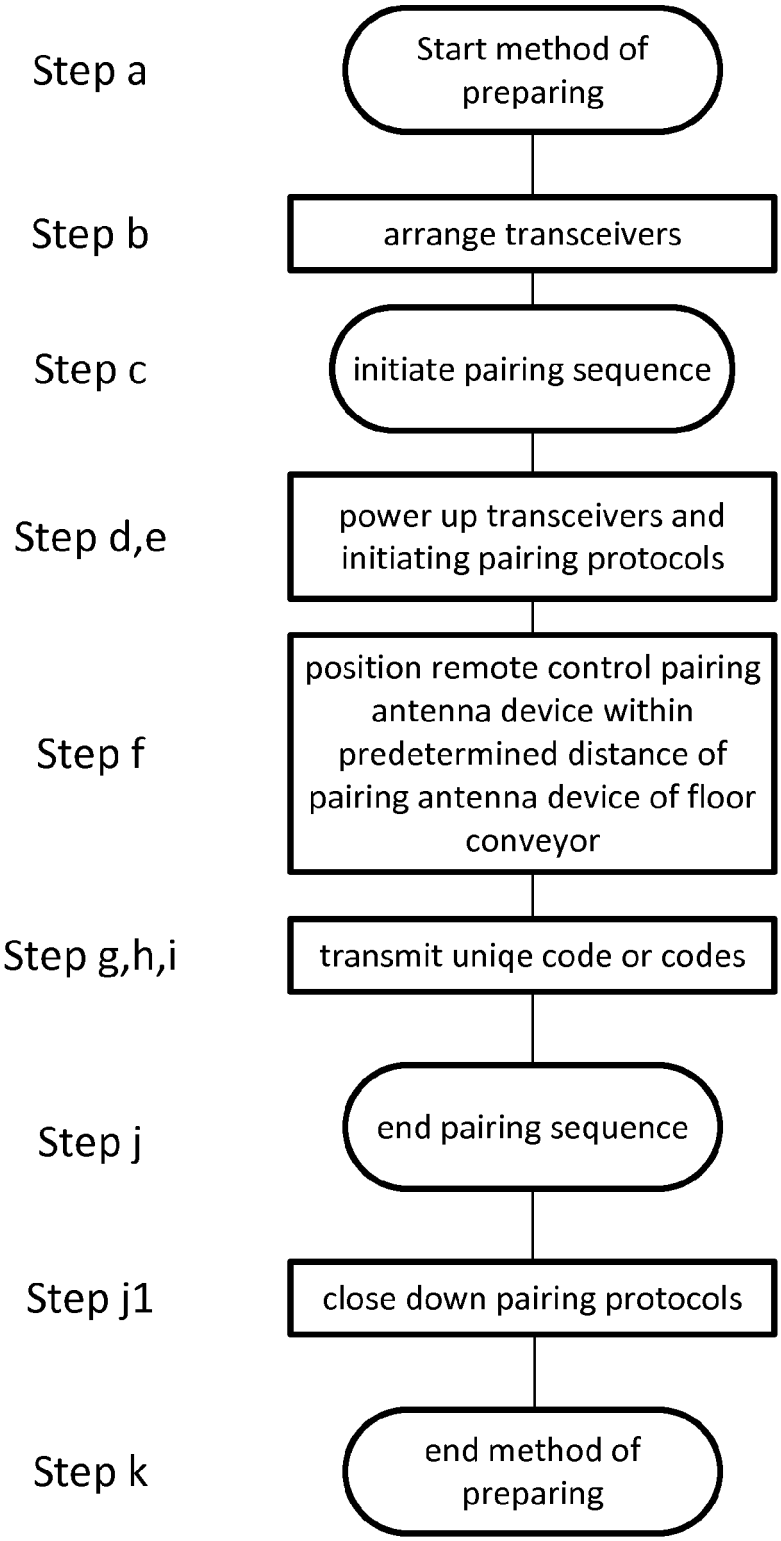

Figure 2

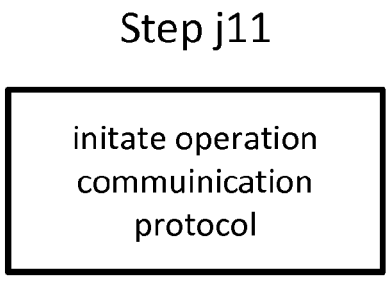

Figure 2a

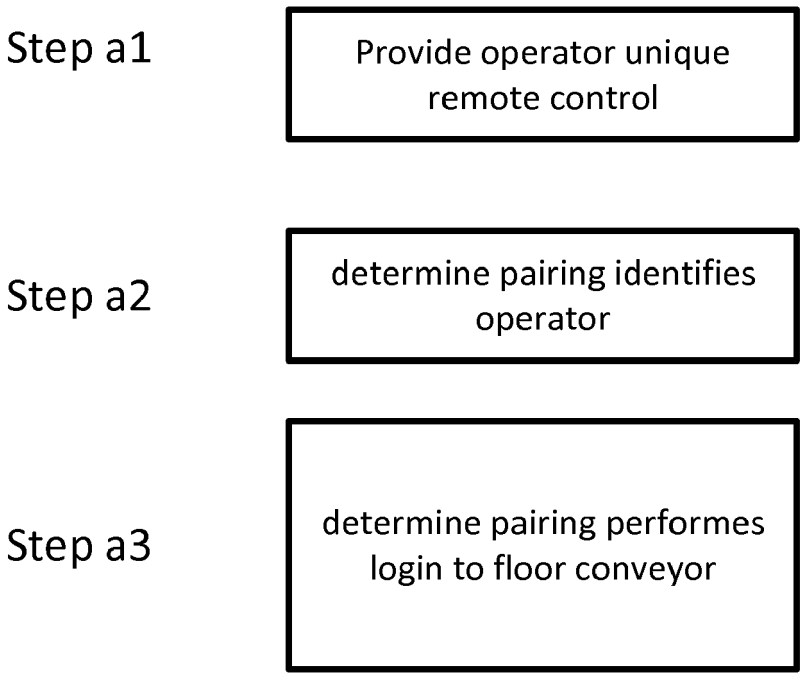
Step a1
Provide operator unique remote control
Step a2
determine pairing identifies operator
Step a3
determine pairing performes login to floor conveyor

Figure 3

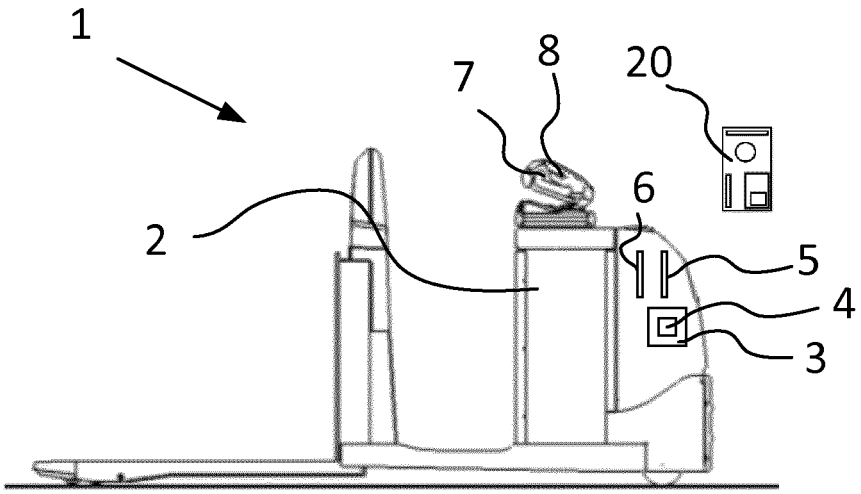

Figure 4

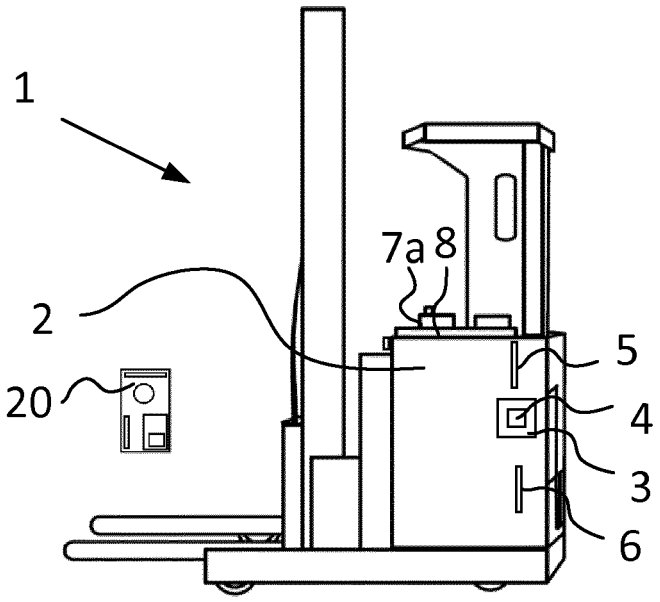

Figure 5

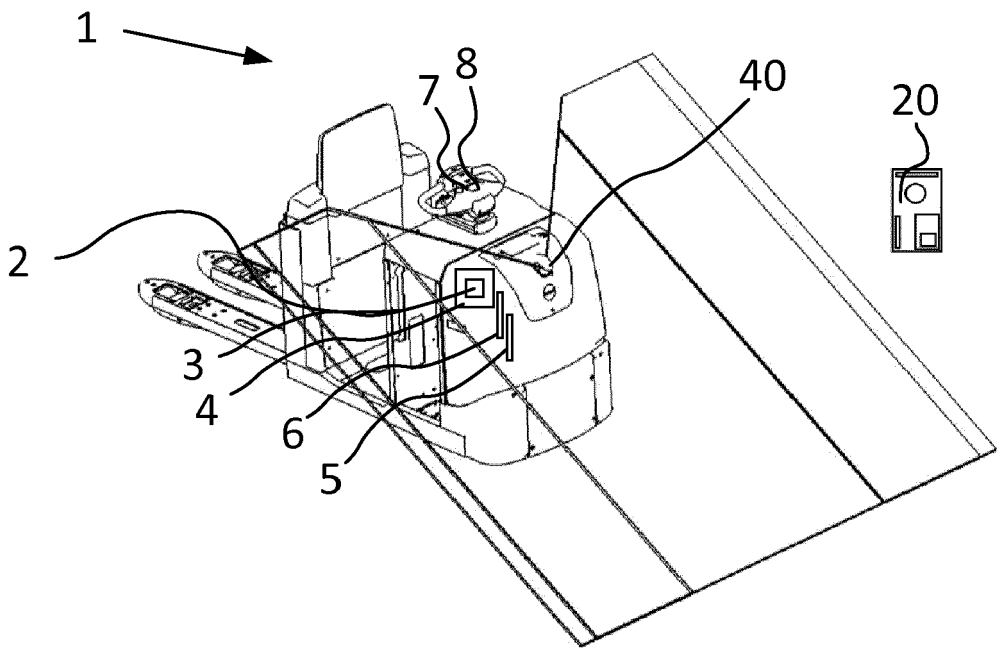

Figure 4a

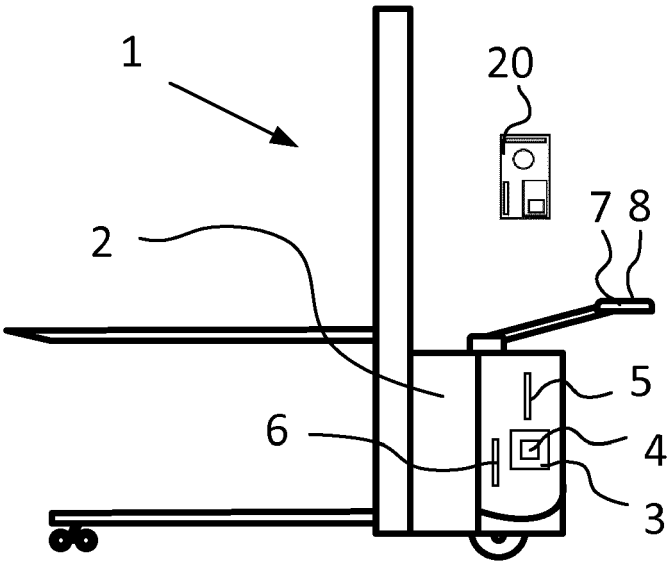

Figure 6

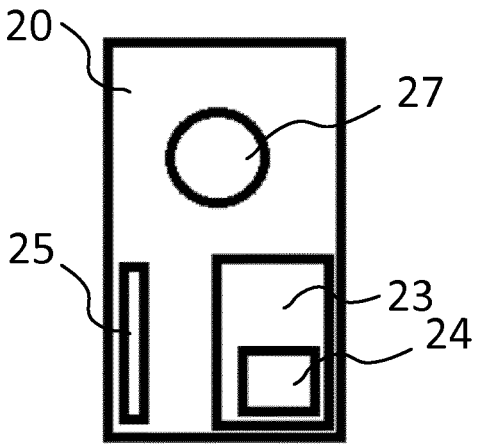

Figure 7

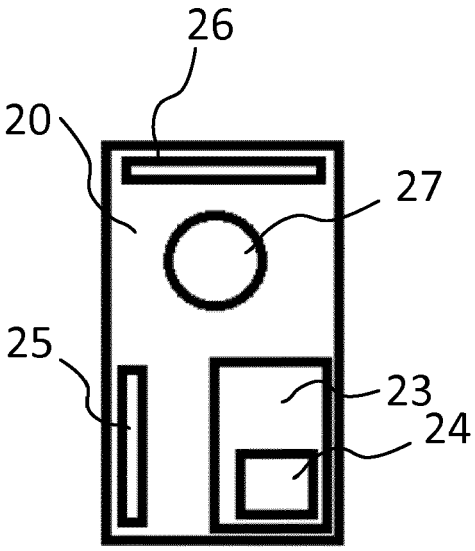

Figure 7a

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9520

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 2015/366124 A1 (KREMMER MARTIN [DE] ET AL) 24 December 2015 (2015-12-24) * paragraph [0027] * * paragraph [0031] - paragraph [0033] * * paragraph [0040] - paragraph [0042] * * claim 3 * -----	1,2,4-8, 10-12	INV. G08C17/02

TECHNICAL FIELDS SEARCHED (IPC)

G08C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 December 2016	Pham, Phong

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