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(54) **SWEEPING ROBOT AND CLEANING MECHANISM THEREOF**

(57) The disclosure discloses a cleaning robot and a cleaning mechanism (100) thereof. The cleaning robot comprises a shell and a cleaning mechanism (100). The cleaning mechanism (100) comprises a flexible roller (10), a motor (13) for driving the flexible roller (10) to rotate, a water squeezing roller (30), a roller brush (40), and a sewage collection tank (20). The sewage collection tank (20) is located above the flexible roller (10). The water squeezing roller (30) is disposed adjacent to the sewage collection tank (20). The center of the water

squeezing roller (30) is disposed in parallel with the center of the flexible roller (10), and the surface of the water squeezing roller (30) is pressed against the surface of the flexible roller (10). The roller brush (40) contacts the flexible roller (10). When the flexible roller (10) rotates, the water squeezing roller (30) presses sewage in the flexible roller (10) into the sewage collection tank (20). The cleaning mechanism (100) of the disclosure has strong squeezing capability, can reduce energy consumption, and reduce noise.

100

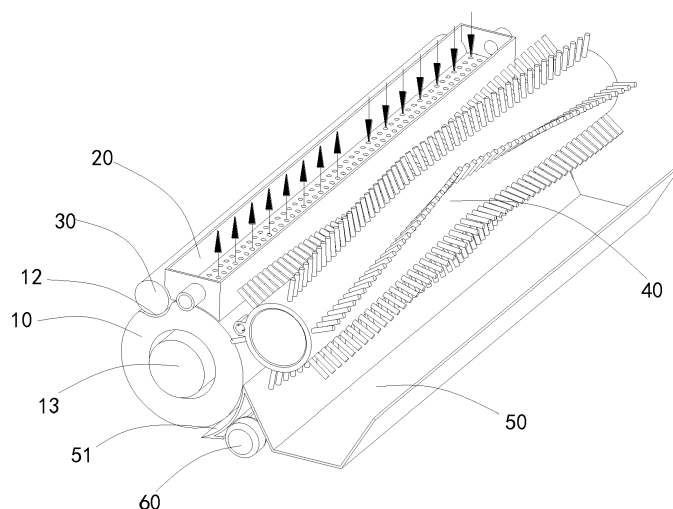


FIG. 1

Description

FIELD OF THE DISCLOSURE

[0001] This invention relates to the technical field of cleaning equipment, in particular to a cleaning robot and a cleaning mechanism thereof.

BACKGROUND OF THE DISCLOSURE

[0002] The sweeping robot is an automatic cleaning device that reduces the pressure on people to clean. The sweeping robot generally adopts the structure of a roller brush, a roller, a sewage collection tank, and a clean water tank. The clean water is supplied from one end of the sewage collection tank to the roller, and sewage squeezed from the roller is absorbed into the sewage tank through negative pressure. The sewage is generally squeezed by providing a projection at the bottom of the sewage collection tank, which is pressed against the surface of the roller to squeeze the sewage from the roller. Due to the sliding friction between the roller and the projection, the load on the motor of the roller increases, thereby consuming more energy and reducing the battery life of the sweeping robot. The small depth of depression of the projection into the roller limits the ability to squeeze the sewage. Moreover, the friction between the sewage collection tank and the roller is relatively loud.

SUMMARY OF THE DISCLOSURE

[0003] Based on this, it is necessary for the present disclosure to provide a cleaning mechanism that has high squeezing capability, can reduce energy consumption, and reduces noise.

[0004] The present disclosure also provides a cleaning robot.

[0005] In order to achieve the object of the present disclosure, the present disclosure adopts the following technical solutions:

A cleaning mechanism includes a flexible roller, a motor that drives the flexible roller to rotate, a water squeezing roller, a roller brush, and a sewage collection tank. The sewage collection tank is located above the flexible roller, and the water squeezing roller is disposed adjacent to the sewage collection tank. A center of the water squeezing roller is disposed in parallel with a center of the flexible roller, and a surface of the water squeezing roller is pressed against a surface of the flexible roller. The roller brush contacts the flexible roller. When the flexible roller rotates, the water squeezing roller presses sewage out of the flexible roller and into the sewage collection tank.

[0006] The above cleaning mechanism adopts a method of squeezing sewage by a water squeezing roller. Due to rolling friction between the flexible roller and the water squeezing roller instead of sliding friction, the resistance to the flexible roller is reduced, thereby reducing the energy consumption in the squeezing process. The noise

due to rolling friction is also reduced accordingly compared to the noise due to sliding friction. The water squeezing roller can be installed at a pressing depth according to what is needed and is not restricted by the sewage collection tank. As the depth of the water squeezing roller is increased, and the squeezing capability is enhanced.

[0007] In some embodiments, the water squeezing roller is made of a hard material.

[0008] In some embodiments, the water squeezing roller presses the flexible roller to form a depressed portion on the surface of the flexible roller. About one-fourth to one-half of the water squeezing roller is located in the depressed portion.

[0009] In some embodiments, one third of the water squeezing roller is located in the depressed portion.

[0010] In some embodiments, the number of water squeezing rollers is one, and the water squeezing roller and the roller brush are respectively located at two sides of the sewage collection tank.

[0011] In some embodiments, the number of water squeezing rollers is two and are respectively disposed on both sides of the sewage collection tank.

[0012] In some embodiments, the cleaning mechanism further includes a garbage collection box. The garbage collection box is located at one side of the flexible roller and directly under the roller brush. One side of the garbage collection box abuts the flexible roller.

[0013] In some embodiments, the cleaning mechanism further includes a scraper disposed in an arc shape and having one end connected to a side of the garbage collection box abutting the flexible roller.

[0014] In some embodiments, the cleaning mechanism further includes a load bearing wheel that is located between the garbage collection box and the scraper and abuts the garbage collection box and the scraper, respectively.

[0015] It is also a need of the present disclosure to provide a cleaning robot that includes the cleaning mechanism described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] In order to more clearly explain the embodiments of the present disclosure or the technical solutions relative to the prior art, the drawings to be used in the description of the embodiments or the prior art will be briefly described below. Obviously, the drawings in the following description are only some embodiments of the present disclosure. For those skilled in the art, drawings of other embodiments can also be obtained based on these drawings without any creative work.

Fig. 1 is a schematic view of the overall structure of the cleaning mechanism according to a preferred embodiment of the present disclosure.

Fig. 2 is a schematic view of the structure of the

cleaning mechanism of Fig. 1.

Fig. 3 is a schematic view of the overall structure of the cleaning mechanism according to another preferred embodiment of the present disclosure.

Fig. 4 is a schematic view of a cleaning mechanism according to another preferred embodiment of the present disclosure.

Fig. 5 is a schematic view of the structure of the cleaning mechanism of Fig. 4.

Fig. 6 is a schematic view of a cleaning mechanism according to another preferred embodiment of the present disclosure.

Fig. 7 is a schematic view of a cleaning mechanism according to another preferred embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] To facilitate an understanding of the present disclosure, the present disclosure will be described more fully hereinafter with reference to the accompanying drawings. The preferred embodiments of the disclosure are given in the accompanying drawings. However, the present disclosure may be embodied in many different forms and is not limited to the embodiments described herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete. It should be noted that when an element is referred to as being "fixed" to another element, it may be directly on the other element or there may also be an intervening element. When an element is considered to be "connected" to another element, it can be directly connected to the other element or there may be an intervening center element. Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. The terminology used in the description of the present disclosure herein is for the purpose of describing particular embodiments only and is not intended to limit the present disclosure.

Embodiment 1

[0018] Referring to Fig. 1 and Fig. 2, a cleaning robot according to a preferred embodiment of the present disclosure includes a shell and a cleaning mechanism 100 located in the shell. The cleaning mechanism 100 includes a flexible roller 10 and a sewage collection tank 20 located above the flexible roller 10. A water squeezing roller 30 is located on one side of the flexible roller 10, a roller brush 40 is located on the side of the flexible roller 10 and contacts the flexible roller 10, and a garbage collection box 50 is located on the side of the flexible roller

10 and under the roller brush 40. A motor 13 drives the flexible roller 10 to rotate, and the flexible roller 10 can remove dirt on the ground when rotated. When the flexible roller 10 rotates, the water squeezing roller 30 presses sewage in the flexible roller 10 into the sewage collection tank 20 to collect the sewage. The roller brush 40 is driven by a roller brush motor to remove the dirt on the flexible roller 10, and the dirt falls into the garbage collection box 50 below the roller brush 40 to remove the dirt.

[0019] The rotating shaft of the flexible roller 10 is made of a hard material, and a peripheral portion is made of a flexible material, for example, a sponge, a cotton cloth or the like, so that water is easily absorbed and the cleaning function is easily achieved. The flexible roller 10 is driven to rotate by a motor, and the motor is mounted inside the shell.

[0020] The sewage collection tank 20 is located above the flexible roller 10 for collecting the sewage discharged from the flexible roller 10 and for guiding clean water onto the flexible roller 10 to supply the flexible roller 10 with clean water. The bottom of the sewage collection tank 20 is provided with a plurality of small holes for discharging clean water and receiving sewage. In this embodiment, there is a small gap between the sewage collection tank 20 and the flexible roller 10, which facilitates the flow of sewage into the sewage collection tank 20 and facilitates the rotation of the flexible roller 10.

[0021] The water squeezing roller 30 has a cylindrical shape, and the water squeezing roller 30 is disposed close to the sewage collection tank 20 to press the sewage into the sewage collection tank 20. The surface of the water squeezing roller 30 is pressed against the surface of the flexible roller 10. In the present embodiment, there is a gap between the water squeezing roller 30 and the side surface of the sewage collection tank 20. The water squeezing roller 30 presses the flexible roller 10 such that the surface of the flexible roller 10 forms a depressed portion 12, and one-fourth to one-half of the water squeezing roller 30 is located in the depressed portion 12. This will not affect the normal rotation of the flexible roller 10, but enables the sewage to be squeezed out of the flexible roller 10. Of course, the flexible roller 10 can also be rotated when the portion of the water squeezing roller 30 located in the depressed portion 12 is larger. In the present embodiment, one-third of the water squeezing roller 30 is located in the depressed portion 12, which is the optimum press down size.

[0022] It can be understood that the number of water squeezing rollers 30 may be one or more, and a plurality of water squeezing rollers 30 may be used without affecting the normal operation of the cleaning mechanism 100. In the present embodiment, the number of water squeezing rollers 30 is one, and the water squeezing roller 30 and the roller brush 40 are respectively located on two sides of the sewage collection tank 20.

[0023] The water squeezing roller 30 is made of a hard material to facilitate the pressing of the flexible roller 10. For example, the water squeezing roller 30 is made of a

wood material, a plastic material, a metal material, or the like, and the above objects can be achieved. The water squeezing roller 30 is mounted in the shell, for example, connected to the shell, or is mounted in the shell through a mounting bracket near the sewage collection tank 20.

[0024] The garbage collection box 50 is located to one side of the flexible roller 10 and directly under the roller brush 40. One side of the garbage collection box 50 abuts the flexible roller 10 so that the garbage being brushed by the flexible roller 10 can fall into the garbage collection box 50. The garbage collection box 50 is U-shaped, but the corners are arranged in a square shape.

[0025] Further, a scraper 51 is provided on the side of the garbage collection box 50 close to the flexible roller 10 for scraping the garbage onto the flexible roller 10. A load bearing wheel 60 is disposed between the garbage collection box 50 and the scraper 51 for increasing the load-bearing capacity of the garbage collection box 50. The scraper 51 is disposed in an arc shape and has one end connected to one side of the garbage collection box 50 abutting the flexible roller 10.

Embodiment 2

[0026] Referring to Fig. 3, the cleaning mechanism 200 of the present embodiment is different from the first embodiment in that the number of water squeezing rollers 30 is two, which are respectively disposed on two sides of the sewage collection tank 20. That is, one of the water squeezing rollers 30 is located on the left side of the sewage collection tank 20 and is disposed near the sewage collection tank 20, and another water squeezing roller 30 is located on the right side of the sewage collection tank 20 and is disposed near the sewage collection tank 20. The roller brush 40 is disposed below the water squeezing roller 30 and is disposed adjacent to the water squeezing roller 30 to reduce the volume of the entire cleaning mechanism 200.

Embodiment 3

[0027] The cleaning mechanism of this embodiment differs from the first embodiment in that the number of water squeezing rollers 30 is three, which are respectively disposed on two sides of the sewage collection tank 20. That is, one of the water squeezing rollers 30 is located on the left side of the sewage collection tank 20 and is disposed near the sewage collection tank 20, and another water squeezing roller 30 is located on the right side of the sewage collection tank 20 and is disposed near the sewage collection tank 20. The roller brush 40 is disposed below the water squeezing roller 30 and is disposed near the water squeezing roller 30 to reduce the volume of the entire cleaning mechanism 100. The last water squeezing roller 30 is disposed below the water squeezing roller 30 on the left side of the sewage collection tank 20 and can also act to squeeze sewage.

Embodiment 4

[0028] Referring to Fig. 4 and Fig. 5, the cleaning mechanism 300 of the present embodiment is different from the first embodiment in that the cleaning mechanism 300 further includes a water tank 70 that is used for containing the clean water for the cleaning flexible roller 10 and the sewage generated by the flexible roller 10. The water tank 70 is a closed structure.

[0029] The cleaning mechanism 300 includes a water tank body 71 and a partitioning member 72 disposed in the water tank body 71. The partitioning member 72 divides the water tank body 71 into a first chamber 73 and a second chamber 74. The first chamber 73 communicates with the first pipe 75. The second chamber 74 communicates with the second pipe 76. The first chamber 73 is for containing clean water or sewage, and the second chamber 74 is for containing sewage or clean water. The partitioning member 72 can be moved along the inner wall of the water tank body 71 by external force or water pressure to adjust the capacity of the first chamber 73 and the second chamber 74 making the water tank body 71 flexible during use. An external force, such as force of a user, directly toggles the partitioning member 72. The first pipe 75 and the second pipe 76 communicate with the sewage collection tank 20, respectively.

[0030] When the first chamber 73 is used to hold clean water, the second chamber 74 is used to hold sewage. When the first chamber 73 is used to hold sewage, the second chamber 74 is used to hold clean water. In this embodiment, the first chamber 73 is for holding clean water, and the second chamber 74 is for holding sewage. That is, the first pipe 75 is a clean water pipe, the first chamber 73 is a clean water cavity, the second pipe 76 is a sewage pipe, and the second chamber 74 is a sewage cavity. The first pipe 75 and the second pipe 76 are both connected to the sewage collection tank 20. The first pipe 75 provides clean water to the sewage collection tank 20, and the second pipe 76 receives the sewage in the sewage collection tank 20.

[0031] In this embodiment, the partition member 72 includes a piston 720 and a guiding member 721. The piston 720 abuts against an inner wall of the water tank body 71. The guiding member 721 is movably connected to the water tank body 71. The piston 720 is moved along the inner wall of the water tank body 71 due to water pressure to adjust the capacity of the first chamber 73 and the second chamber 74. For example, when the volume of clean water entering the water tank body 71 is greater than the volume of the sewage entering the water tank body 71, the piston 720 is subjected to the water pressure of the clean water and moves toward the sewage chamber. In contrast, when the volume of the sewage entering the water tank body 71 is larger than the volume of clean water entering the water tank body 71, the piston 720 is subjected to the water pressure of the sewage and moves toward the clean water chamber.

[0032] In this embodiment, the side wall of the water

tank body 71 defines a guide hole 77. The guiding member 721 is sealingly mounted in the guide hole 77 to guide the piston 720 to move. The guiding member 721 is sealingly mounted in the guide hole 77 to make sure that water leakage can be prevented. For example, a sealing rubber ring is disposed on the periphery of the guide hole 77. Preferably, the guide hole 77 is disposed at a position near the top of the water tank body 71, so that water can be prevented from leaking out of the water tank body 71 through the guide hole 77. In other embodiments, the guide hole 77 is formed at other positions of the water tank body 71.

[0033] In this embodiment, the guiding member 721 is movably connected to the left side or the right side of the water tank body 71. That is, the guide hole 77 is formed on the left side or the right side of the water tank body 71. The first pipe 75 communicates with the right side of the water tank body 71, and the second pipe 76 communicates with the left side of the water tank body 71.

[0034] Further, a clean water pump 78 is disposed on the first pipe 75 to provide power for the clean water to be pumped into the sewage collection tank 20. The second chamber 74 is connected to a vacuum pump 79 through a pipe. The vacuum pump 79 can increase the negative pressure of the second chamber 74 to pull the sewage in the sewage collection tank 20 into the second chamber 74.

[0035] Further, a water level sensor is disposed on the inner wall of the second chamber 74, and an alarm is disposed on the cleaning robot. The alarm is electrically connected to the water level sensor. When the second chamber 74 is full of sewage, the water level sensor senses the water level signal, and sends the water level signal to the alarm. The alarm triggers to remind the user to clean the sewage tank.

Embodiment 5

[0036] Referring to Fig. 6, the cleaning mechanism 400 of the present embodiment is different from the fourth embodiment in that the guiding member 721 is movably connected to the top or bottom of the water tank body 71. That is, the guide hole 77 is opened at the top portion of the water tank body 71 or the bottom portion. The first pipe 75 communicates with the lower portion of the water tank body 71, and the second pipe 76 communicates with the upper portion of the water tank body 71.

Embodiment 6

[0037] Referring to Fig. 7, the cleaning mechanism 500 of the present embodiment is different from the fourth embodiment in that the partition member 72 includes a leaf 722 and a rotating shaft 723. The leaf 722 includes a first partition 724 and a second partition 725. The first partition 724 and the second partition 725 are respectively pivotally connected to the rotating shaft 723 to respectively rotate along the rotating shaft 723 due to water

pressure. The first partition 724 and the second partition 725 respectively about the water tank body 71, and the rotating shaft 723 is connected to the water tank body 71, so that the first partition 724 and the second partition 725 form a first chamber 73 and a second chamber 74. When the water pressure on one side is large, the first partition 724 and the second partition 725 move in opposite directions to adjust the capacity of the first chamber 73 and the second chamber 74.

[0038] The above-mentioned embodiments are merely illustrative of several embodiments of the present invention, and the description thereof is more specific and detailed, but is not to be construed as limiting the scope of the invention. It should be noted that a number of variations and modifications may be made by those skilled in the art without departing from the spirit and scope of the invention. Therefore, the scope of the invention should be determined by the appended claims.

Claims

1. A cleaning mechanism, comprising:

a flexible roller;
a motor that drives the flexible roller to rotate;
a water squeezing roller;
a roller brush; and
a sewage collection tank, wherein:

the sewage collection tank is located above the flexible roller,
the water squeezing roller is disposed adjacent to the sewage collection tank,
a center of the water squeezing roller is disposed in parallel with a center of the flexible roller,
a surface of the water squeezing roller is pressed against a surface of the flexible roller,
the roller brush contacts the flexible roller, and
when the flexible roller rotates, the water squeezing roller presses out sewage in the flexible roller into the sewage collection tank.

2. The cleaning mechanism according to claim 1, wherein the water squeezing roller is made of a hard material.

3. The cleaning mechanism according to claim 1 or 2, wherein:

the water squeezing roller presses the flexible roller to form a depressed portion on the surface of the flexible roller,
the water squeezing roller is located in the de-

- pressed portion, and
one-fourth to one-half of the water squeezing roller is located in the depressed portion.
4. The cleaning mechanism according to claim 3, wherein one-third of the water squeezing roller is located in the depressed portion. 5
5. The cleaning mechanism according to claim 1, wherein water squeezing roller and the roller brush are respectively located at opposite sides of the sewage collection tank. 10
6. The cleaning mechanism according to claim 1, comprising:
a second water squeezing roller, wherein the water squeezing roller and the second water squeezing roller are respectively located at opposite sides of the sewage collection tank. 15
7. The cleaning mechanism according to claim 1, comprising:
a garbage collection box, wherein:
the garbage collection box is located on one side of the flexible roller and located directly below the roller brush, and
a side of the garbage collection box abuts the flexible roller. 20
8. The cleaning mechanism according to claim 7, comprising:
a scraper, wherein the scraper is disposed in an arc shape and has one end connected to the side of the garbage collection box abutting the flexible roller. 25
9. The cleaning mechanism according to claim 8, comprising:
a load bearing wheel, wherein the load bearing wheel is located between the garbage collection box and the scraper and abuts the garbage collection box and the scraper. 30
10. A sweeping robot comprising the cleaning mechanism of any one of claims 1-9. 35
11. The cleaning mechanism according to claim 1, comprising:
a second water squeezing roller, wherein the roller brush contacts the second water squeezing roller. 40
12. The cleaning mechanism according to claim 11, wherein, in a direction of rotation of the flexible roller, the sewage collection tank is located between the second water squeezing roller and the water squeezing roller. 45
13. The cleaning mechanism according to claim 11, wherein, in a direction of rotation of the flexible roller, the second water squeezing roller is located between the roller brush and the second water squeezing roller. 50
14. The cleaning mechanism according to claim 1, comprising:
a garbage collection box, wherein the garbage collection box is located adjacent the flexible roller and located below the roller brush. 55

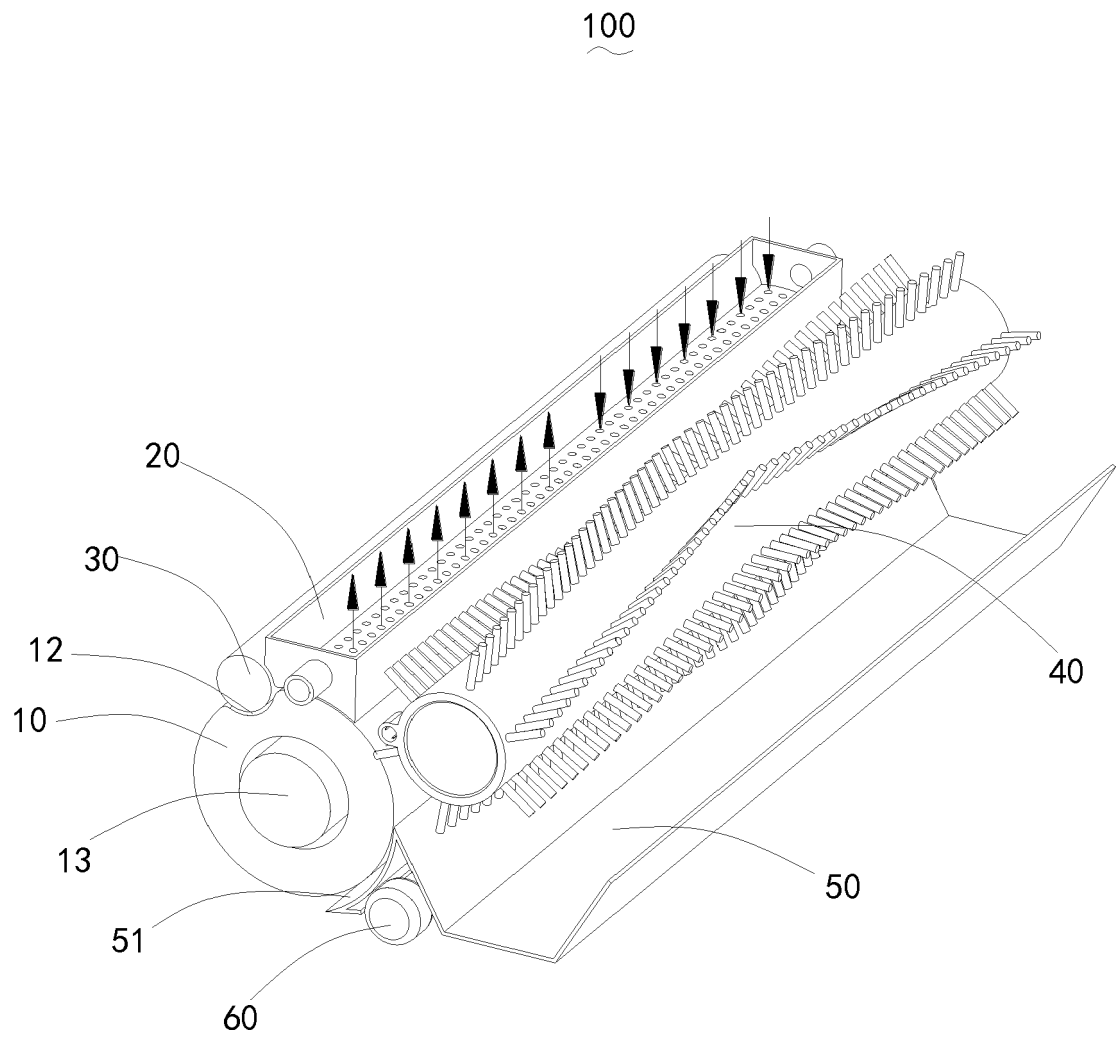


FIG. 1

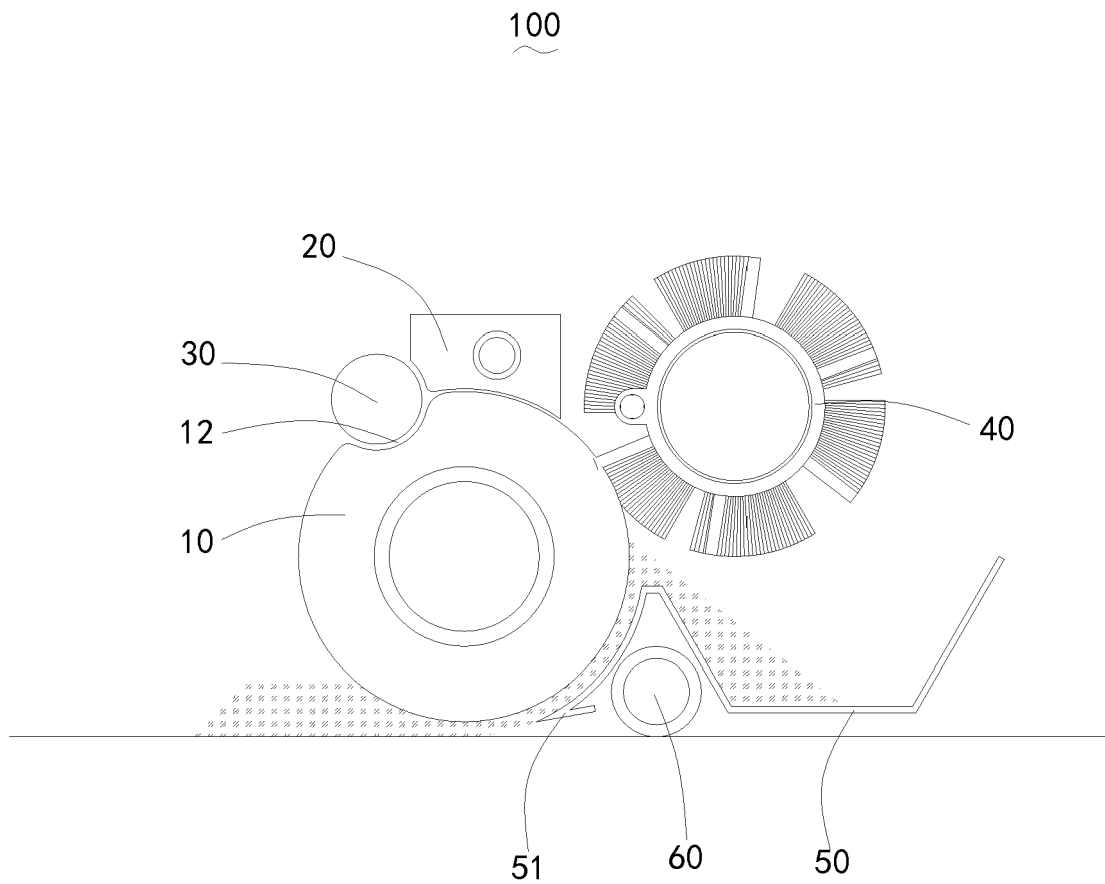


FIG. 2

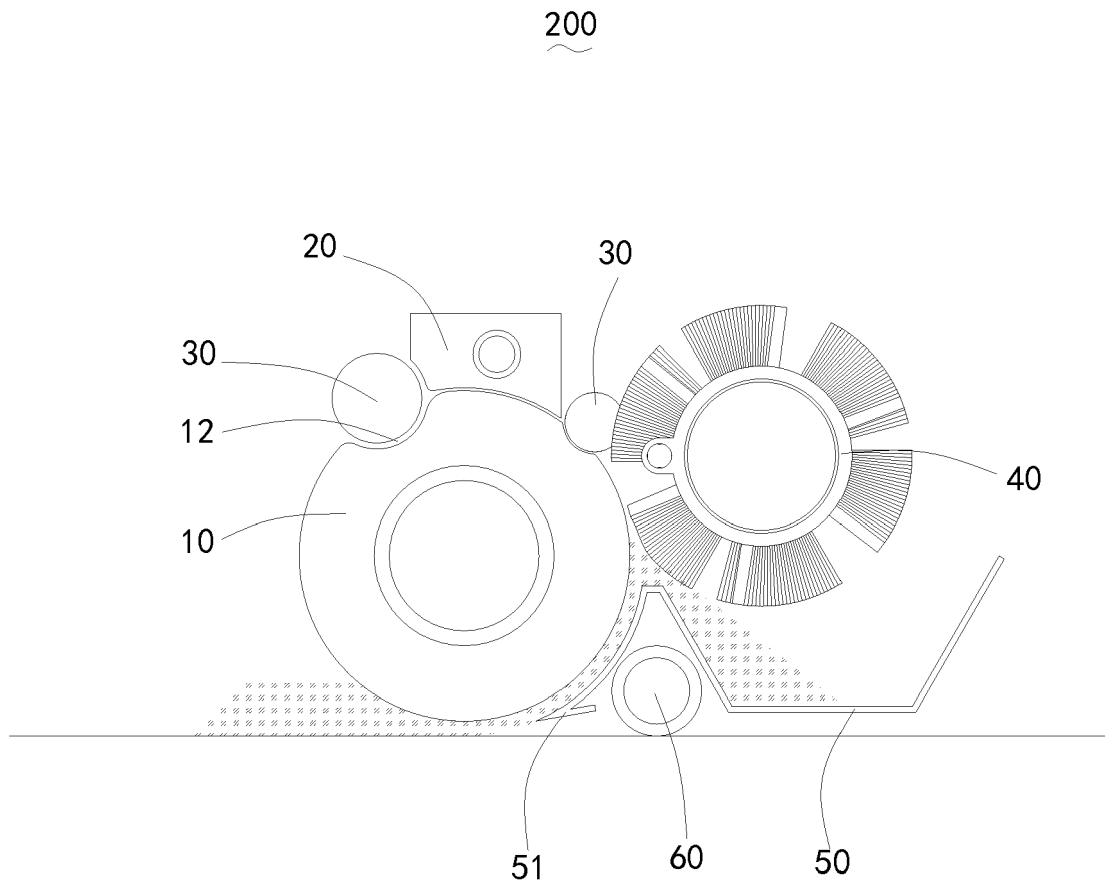


FIG. 3

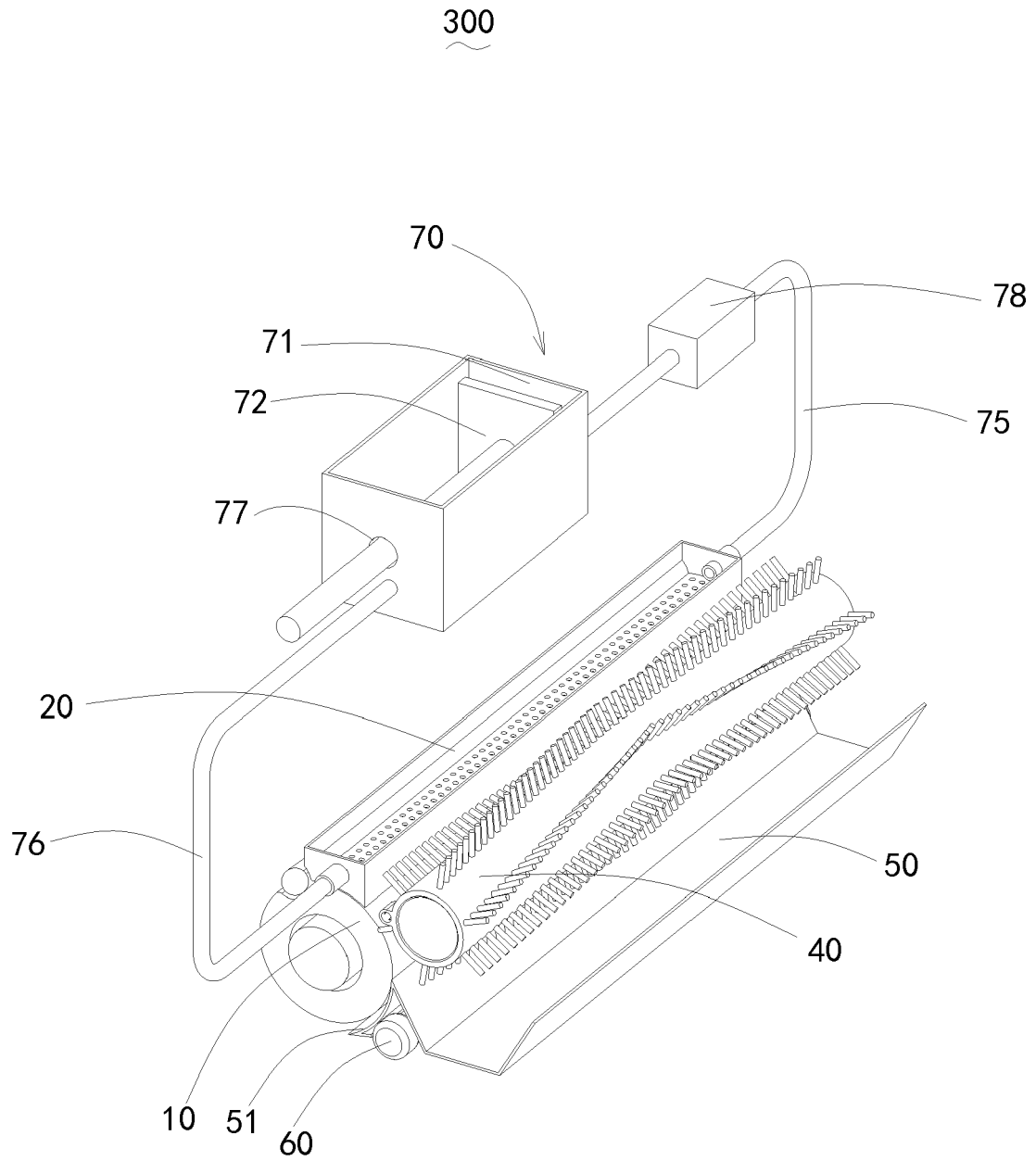


FIG. 4

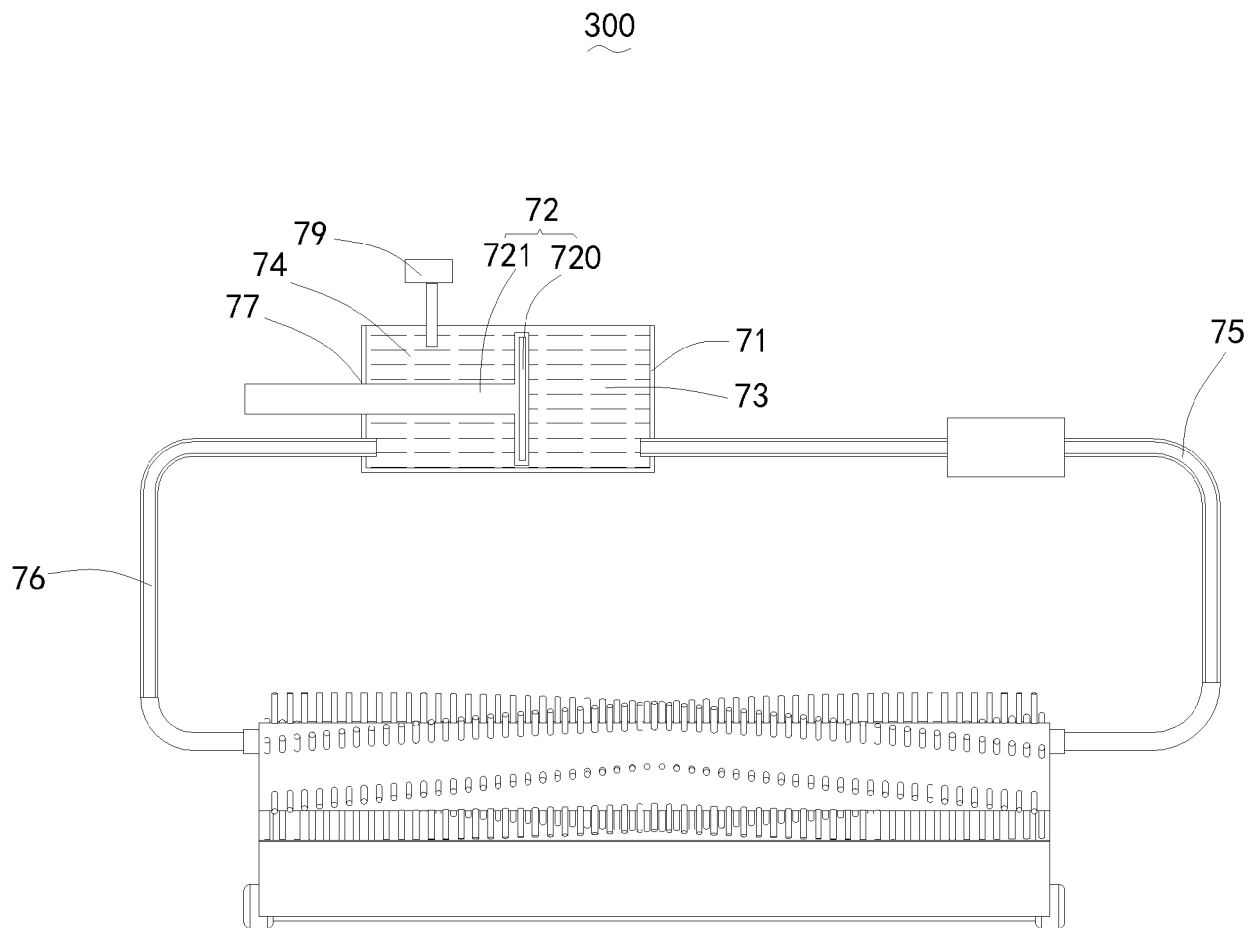


FIG. 5

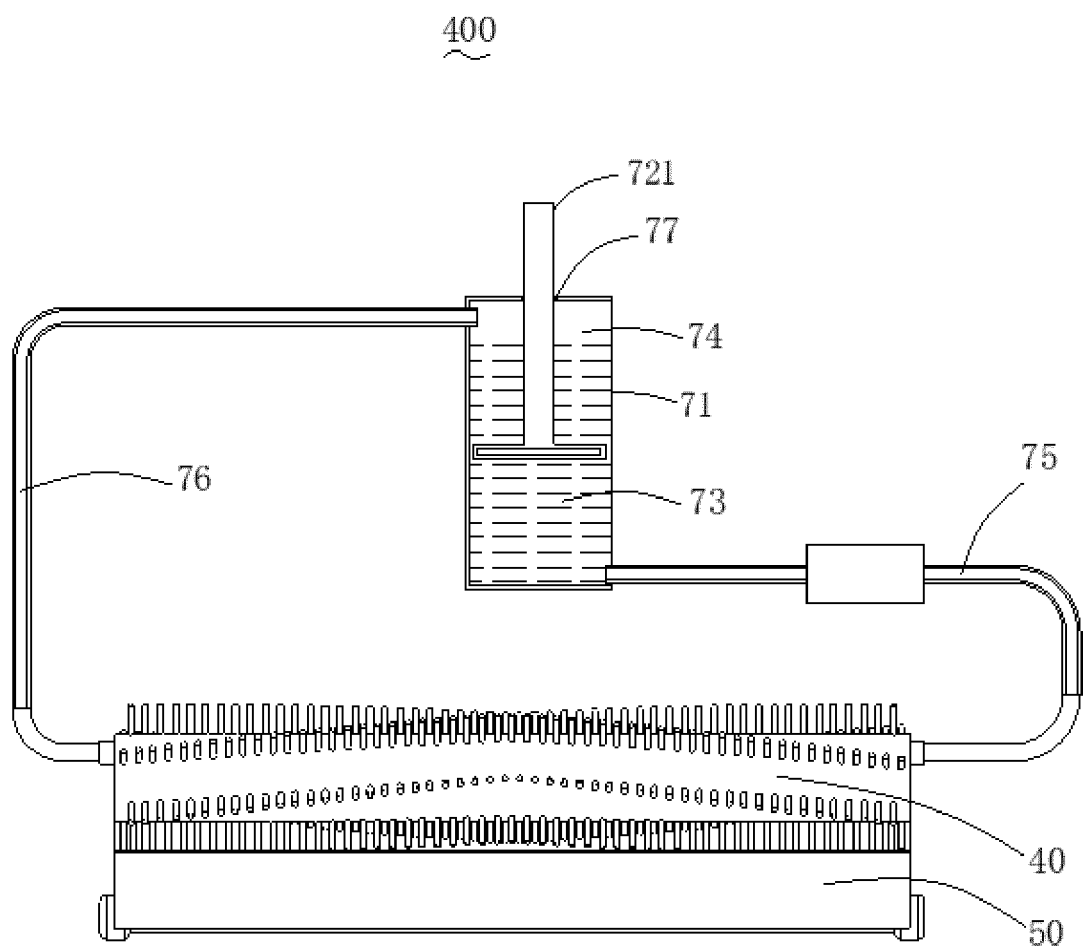


FIG. 6

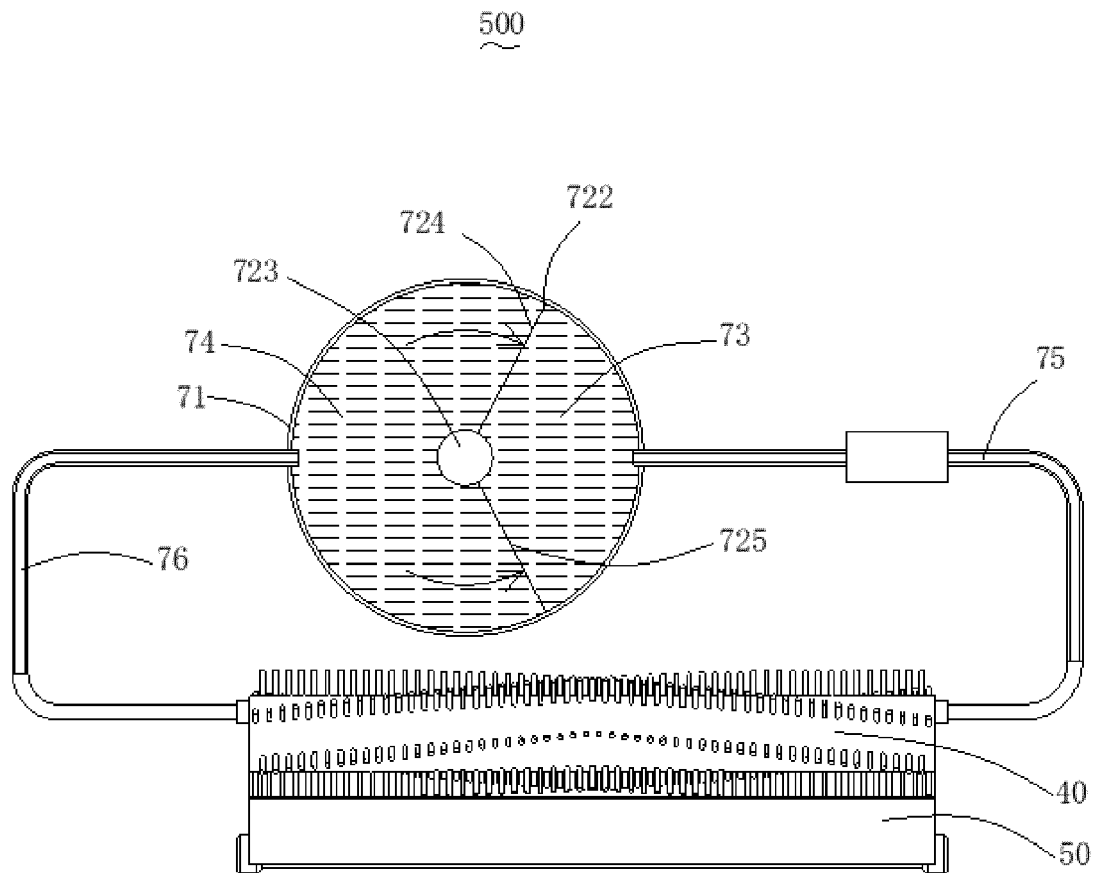


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 18 20 9645

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 238 597 A1 (HIZERO TECH CO LTD [CN]) 1 November 2017 (2017-11-01) * paragraph [0029] - paragraph [0061]; figures 4,9-11 *	1-14	INV. A47L11/292 A47L11/30 A47L11/40
A	----- CN 107 669 214 A (QINGENGYUN INTELLIGENT TECH SHENZHEN CO LTD) 9 February 2018 (2018-02-09) * paragraph [0008] - paragraph [0025]; figures 1,2 *	1-14	

			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 March 2019	Examiner Blumenberg, Claus
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 T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 20 9645

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3238597 A1	01-11-2017	CN 108348124 A	31-07-2018
		EP 3238597 A1	01-11-2017
		JP 2018506414 A	08-03-2018
		US 2018206685 A1	26-07-2018
		WO 2017059602 A1	13-04-2017

CN 107669214 A	09-02-2018	NONE	

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