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(54) Title: AN APPARATUS FOR WASHING AND DRYING COW TEATS BEFORE MILKING

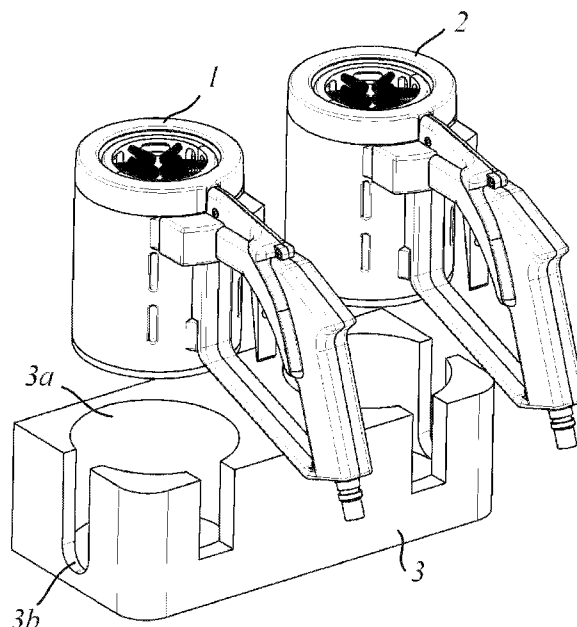


Fig. 1

(57) Abstract: An apparatus for washing and drying milk producing animals' teats like cows, goats and sheep, before milking operation. The apparatus comprises from two similar devices, one for cleaning and the other for drying the teats. Each device has two sets of brushes for completely cleaning and drying the teats, which are mounted in a cup like rotor that is driven with the air power supplied to a number of small wings. During the process, the channel on the top side of the device ensures the proper flowing of the hot water and cleaning agent or warm air, into device center.



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TITLE

AN APPARATUS FOR WASHING AND DRYING COW TEATS BEFORE MILKING

FIELD OF THE INVENTION

- 5 The present invention relates to an apparatus for washing and drying milk producing animals' teats before milking operation.

BACKGROUND OF THE INVENTION

Nowadays, due to increasing growth of market demand for food consumption and importance of food
10 hygiene and health, food producers put more of their time and efforts to produce food productions with high health status. Raw milk is a very good medium for bacterial growth. The harmful dangerous microorganisms can change the properties of the milk and cause serious risks for human health. Also painful inflammation of the mammary glands, or mastitis, is a common disease among dairy animals which affects the produced milk quality. The first action to prevent penetration of pathogenic bacteria in
15 milk should be done before milking lactating animals. Cleanliness of teat of animal is one of the most important issues that need to be considered at the time of milking and is done by cleaning, washing and drying of udder and teat. The pre-milking teat preparation before milking and machine cup attachment, in addition to its effect on milk quality, udder health and decreasing the bacterial total count, has also an important effect on teat stimulating which results in decreasing the milking time due to higher milk flow
20 rates.

Proper cleaning and immediate drying of the teats prior to milking, can decrease the pollution content in the produced milk and germs on the teat, which can reduce the mastitis probability.

Traditionally teats are washed with water and dried with individual paper towels which consumes large amount of water and paper and also energy to provide the hot water. Hence in some countries farmers
25 prefer only washing those teats which are visibly dirty. In recent years some innovators tried to overcome the mentioned problems and make the teat cleaning process less time and resources consuming. In the case of an udder as a biological organ, brushes of device must be able to delicately wash and clean all parts of the teat.

In most of inventions, the brushes have been placed on the outer surface of a cylinder which rotates along
30 its axis. The rotation axis of brushes may be horizontal or vertical.

US 6,394.038 B1 discloses a teat cleaning device comprising a plurality of elongated brushes that each two adjacent brushes rotate in opposite direction about a vertical longitudinal axis. All brushes are located on perimeter of a circle, so there is a space in the middle of brushes for the teat to be cleaned there. Bristles in the lower part of brushes are inclined upwardly to clean adequately the tip of the teat.

35 In this case US 6,343.566 B1 some vertical brushes are arranged to shape a space for the teat to be cleaned there by counter rotating brushes. But these brushes are provided with a cleaning surface which is arranged in a spiral or helical shape. So, as the teat introduces into the device it would be gripped and dragged downward and the skin fold also would be reducing.

40 US 2007/0175405 A1 discloses a device comprising two pair of counter rotating horizontal brushes which used for washing teat. The first pair of brushes is located at the top and the second pair which is located at bottom. While the teat is introduced into the top brushes, water spray starts and continues until it leaves the brushes.

This invention US 6,325.021 B1 discloses an equipment that is used to wash, dry and disinfect animal's teat. The teat introduces in one pair of counter rotating cylindrical brushes which placed horizontally at
45 the top and they are allowed to have lateral movement. As soon as entering the teat in to the brushes, disinfectant and sanitizing solution starts to spray. At the bottom of the device and below the counter rotating brushes, cup-like brushes are located with a rotating axis coincident with the entry of the teat.

The German patent DE69818487 T2 relates to an invention with one pair of counter rotating brushes with a horizontal rotating axis designed to clean the animal's teat. One of brushes is fixed at the place and the
50 other one supposed to move in a curved path to clean all parts of the teat.

US 2015/0059657 A1 introduces a kind of apparatus which is used to clean, sanitize, wash and dry diary animal teat by a twin drive belt. This handheld apparatus used a mechanism including an air motor which is driven by compressed air. The power is transferred to twin belt through a planetary gear system. As soon as pressing trigger it results in dispensation of liquid and air in addition to driving belts.

55 In comparison to similar cases, the present invention has been designed taking into account the biological and mechanical properties of the teats. In most of the invented devices the cleaning means drag the teat in one direction all the time, and some of them have not the ability to completely cover and clean the teats. Cleaning and drying all parts of the teats in a gentle manner will cause better stimulation and cattle health improvement.

SUMMARY OF THE INVENTION

The present invention is an apparatus for washing and drying a dairy animals' teats like cows, goats and sheep, before milking operation. The device comprises from two similar devices, one for cleaning and the
65 other for drying the teats. The difference between the two devices is based on the direction of rotation, hot water with washing agent insertion in to the cleaning device but warm air insertion for the drying device and the brush filaments thickness and density.

Each device has two sets of brushes. The first set has two separated bristle holders, in which the bristle tufts are arranged in some lines elongated along the walls with regular intervals, one after the other. These
70 two bristle holders together make a cylinder are installed in a rotor which has the ability of rotating around the teat. The brush filaments are flexible, so as the teat introduced into the device, they can adjust to the teat size and ensure from more teat coverage. The second set of bristles is foreseen to make the teat tip proper washing and cleaning possible. The filaments on this brush holder are also flexible and circularly mounted near each other. The holders of the brushes are specially designed to have the least
75 weight and easily lead the washing liquid or the warm air outside the brushing area.

The brush holders can be installed in a cup like rotor equipped with some small wings, which are driven with the compressed air supplied to the device. The wings orientation is opposite in the cleaning and drying devices. Twisting the teats in the same direction all the time, may result in the deformation of the teats. The opposite rotation of the brushes in the cleaner and dryer will prevent the teats deformity in a
80 long time usage. The rotor has some holes on its inside floor so the washing liquid or the warm air can easily exit from the rotor. The extension of the holes downward to the bottom of the rotor, form some half channels to lead even streams of fluids to outside of the rotor. The compressed air which provides the essential power to rotate the rotor, and hence the brushes via pushing the small wings, flows between the outside wall of the rotor and inside wall of the main body. The main body of the device is a cylinder
85 (open in both first and end) with some slots and two emerged portions on its surface for fastening the gun assembly.

Some of the slots are vertical and some of them are diagonal. The role of these slots is to reduce the sound causing by compressed air motion.

During the process, the special channel on the top side of the device ensures the proper flowing of the hot
90 water and cleaning agent mixture or warm air, exactly into the device center. Thanks to immobility of this channel assembly and its independence from brushes rotation, the washing liquid and warm air do not spread as a result of centrifugal force.

BRIEF DESCRIPTION OF THE FIGURES

95 The above-mentioned and other features and advantages of this invention will be more apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 shows a schematic perspective view of the apparatus according to this invention, illustrating the main cleaning and drying devices and the related base

FIG. 2 shows a perspective exploded assembly view of the embodiment shown in FIG. 1;

100 FIG. 3 shows the rotor of the apparatus of FIG. 1, wherein:

- (a) is cleaner rotor front view,
- (b) is dryer rotor front view,
- (c) is cleaner rotor top view,
- (d) is dryer rotor top view.

105 FIG. 4 shows a perspective view of the brushes arrangements and their holders of apparatus of FIG. 1;

FIG. 5 shows perspective exploded view of the washing liquid or warm air channel assembly of apparatus shown in FIG. 1;

FIG. 6 shows a perspective view of the main body of apparatus of FIG. 1 from two different side views;

110 DETAILED DESCRIPTION

The following description with reference to the accompanying drawings is provided to enable a person of ordinary skill in the art in a comprehensive understanding of various embodiments of the present disclosure.

115 The apparatus according to the present invention has a rectangular cube shaped base **3** for installing the cleaning **1** and drying **2** devices to the wall or any desired surface. It has two holes **3a** with open first and close end to well mount the devices on the base. There are two grooves per each device (totally four grooves) on the base for the steel fastening strip **21** crossing. The additional two grooves enable the worker to mount the devices in two desired directions, perpendicular to each other, according to his/her or the dairy animal position. Three simple belt fasteners (not shown) may be used to fixate the base on the
120 wall.

There are two main devices related to the invention, which one of them has the role of cleaning the teats **1** and the other one is foreseen to dry the teats **2**. The two devices are similar in most cases, but in the rotor **7** and brushes **12** and **13**, there are some differences which will be described in the following paragraphs. Each device has a main body **8** which is a cylinder open in first and end. Most parts of the device are
125 assembled in to this part. The body **8** thickness is at least 5 mm. The bottom inside of the said main body is threaded to join with ball bearings holder **4**. The main body also has another threaded part on the top outside of its surface to join the channel cap **16**. In order to decrease the sound produced by device because of compressed air insertion, there are 11 slots on the main body, 3 of which are diagonal **8d** and the other 8 slots **8a** are vertically perforated, through all thickness. The two emerged portions **8b** and **8c**
130 are for fastening the gun assembly. The fitting **9** is also used at the place the gun introduces to the main body. In addition, the emerged portion **8c** has the role to bring the compressed air into the device through its central hole.

The compressed air employed to rotate the part we will call the rotor **7**. This rotor is like a cylinder that its diameter slightly decreases in a curved form from about its lower half. From the position the decreasing in
135 diameter begins, there is a plate or floor **23** inside the rotor with 8 holes **22** on it. These holes extend to form the same number half channels **7a** which have the role to lead the washing liquid or warm air toward the ball bearing holder part **4** and finally outside of the device. There are at least 20 right trapezoid shaped wings on outer surface of the rotor, near the top, which are arrayed each after the other in a circumferential direction at regular intervals around the rotor. The wings oppose against the air power and
140 hence cause to spin the rotor.

As it could be seen in the figure no. 3 there is an obvious different between the rotors, which has been used for the cleaner device **fig.3 (a)** and the one for the dryer **fig.3 (b)**. The difference is based on the wings orientation. Since the wings are installed in the opposite direction in the two devices, the cleaner rotates clockwise while the dryer rotates counterclockwise. The inner wall of the rotor grooved in two
145 positions. These vertical sliding guide grooves **7** cause to fix the bristle holders **13** in the correct position and prevent their movement. There is a round space (not shown) under the rotor in which the ball bearings **5** and **6** fit in to the rotor. Also there is a small gap on the highest level of this round space which makes a small oil reservoir for lubricating the ball bearings. The oil could be injected into the device through the ball bearing holder **4** center shaft hole.

150 The ball bearings' holder **4** is a round shape part which has a short shaft **4b** for mounting the ball bearings. This shaft has a narrow hole along its length for the oil insertion. There are some holes **4a** on ball bearings' holder bottom. These holes are to lead the compressed air, washing liquid or warm air outside the device. The ball bearings holder **4** is threaded on its outer wall to install this part to the main body **8**.

There are two sets of the bristles **12** and **13** for each device. One set **13** is foreseen for cleaning the teat sides which the filaments **13a** of this set of bristles are mounted on two separated bristle holders. These bristles have the ability of rotating around the teat due to the rotor rotation. Each of these bristle holders is a half round cylinder, which the bristle filament bundles of tufts are vertically mounted on its inner wall, in three lines. So the totally six vertically lines of bristles are mounted in such a way that the filaments tips make a hollow conical frustum space which is the place for introducing the teat into the device. The length of the filaments from top to bottom increases slightly, in other words the said hollow space has larger diameter at the top comparing to the bottom, so the teat can easily enter into the space between the filaments tips. The length of the filaments can be adjusted according to the size of the diary animal teat e.g. for a goat, sheep or a cattle. On bristle holders **13** cylinder, the places not used for mounting the filaments are omitted as much as possible (like a set of shelves), to decrease the weight and to ease passing the washing liquid or warm air out of the devices.

The other set of the bristles are mounted on another brush holder **12**. This part holds the bottom bristles **12a** which has the task of cleaning the teat tip. The bottom bristle holder **12** is also a short-wall cylinder or cup in which the filaments of brushes are mounted on its floor center, in a round layout. Like what has been mentioned about the part **13**, the bottom bristle holder body is also eliminated in some portions to reduce the weight and to cause the washing liquid or warm air exit outside of the brushing area easier.

Another difference between the cleaner and the dryer device is relying on the bristle filaments thickness, which can be finer in the dryer. For example, the filament thickness for the cleaner could be 0.2 mm and 0.1 mm for the dryer.

In this invention throwing the washing liquid, evenly right to the center of the device is very important. The parts **14**, **15** and **16** together make a kind of channel assembly to ensure the washing liquid will be thrown directly to the center of the device which the teat is presented for washing, and hence some jet like streams of washing liquid will wet all round of the teat during the cleaning process. The round channel has some small outlets **14a** on its inner rim. These outlets are circumferentially distributed on the inner rim of the channel, so there would be water spraying from each side. The washer **15** is to seal the channel, and the channel cap **16** which is threaded from inside edge, so it can be fastened on to the main body **8**. This channel assembly has the similar task in the drying device to provide uniform airflow into the device center. A brass fitting **17** is used to insert small essential amount of washing liquid or warm air into the device.

The compressed air inserts to the air gun **18** via a fitting **20**. Thanks to the gun, the worker can control the amount of air which goes through the device and hence the rotation speed of the rotor is controllable. The

compressed air coming from the gun, enters to the main body via another fitting **9**. Both fittings **9** and **20** are made from brass. The gun covers **19** are to coat the metal parts of the guns and its fastening parts, like **21** and **10**.

190 In use, the worker just needs to pick up the cleaning device. Press the air gun trigger to let the compressed air, blow into the device. He/she can adjust the amount of blowing air into the device by simply change his/her hand pressure on the trigger. So the rotation speed of the rotor and the bristles thereof can be adjusted easily. Then the worker introduces the animal teat into the device by raising the cleaner to the level in which the teat completely enters into the device, wait for a second and then pull down the device. Only one time raising and pulling down the device is sufficient to completely clean the teat. Just about 4
195 to 5 seconds is required to clean each teat, and hence about 20 seconds for each cow. The washing liquid for the cleaning device could be the mixture of water-chlorine or any other preferred liquid. The sufficient volume of washing liquid for each udder (4 teats) is less than one liter (about 800 ml). The liquid temperature may be adjusted between 35 to 40 degrees centigrade.

The procedure for drying the teats is almost the same as cleaning. The worker uses the drying device,
200 presses the air trigger to provide desired rotor speed, and introduces the animal's teat into the device. One time raising and pulling down the drying device would be enough also for drying. The differences between the cleaner and the dryer devices are: the warm air insertion into the dryer device instead of washing liquid in the cleaning device, the direction of rotation of bristles which is opposite of the other device, and the bristles' filaments thickness and fineness which is softer and finer in the dryer.

205 The enough temperature for the drying device is only about 15 to 20 degrees centigrade. So there is no need to warm up the dryer inlet air in summers.

Almost all parts of the invented apparatus are made off polymeric materials like polypropylene, without any sharp edges, to prevent any animal injuries during the cleaning and drying process (instead of the gun and its fastening parts which are also have plastic covering parts **19**).

210 Thanks to not using any electrical parts such as electric motors in the invented apparatus, there is no risk of electric shock for the worker or the animal, during the process.

It is very important to behave with the teats in such a manner not hurting them. Applying the force for cleaning or drying always in the same direction may cause teats elongation or deformity in a long continued usage. Cows with udder or teat deformities must be given longer milking time than the average.
215 Available teat cleaning mechanisms in the art provide the cleaning force in constant direction, mostly

downward along the teat which may cause elongation in the teats. In this invention the effect of the torque applied by the cleaner device, will be neutralized by the dryer which rotates in opposite direction.

220 The effect of pre-milking mechanical stimulation of teats on milk yield and milking performance of dairy animals is well known in the art. As stimulating the udder by massaging the teats, the time of milking will be decreased. Since the teat is wholly covered with the bristles, and being treated with a gentle behavior, a proper stimulating is expected with this invention.

What is claimed is:

1. An apparatus for washing and drying dairy animals' teats like cows comprising:

a cleaning device, comprising:

a cylinder as a main body, with some vertical and some diagonal slots on its surface; and

5 a rotor comprising a cylinder with at least 20 wings mounted on the outer wall one after another along a circumferential direction and a plate on its lower half with at least 8 holes in a circumferential direction at regular intervals, wherein the said holes extend down to bottom of the rotor to form at least 8 half channels, and wherein the rotor cylinder diameter decreases from the said plate location in a curved form; and

10 a ball bearing holder with a plurality of holes in a lower surface in a circumferentially direction distributed around a central axis, and a small shaft with a hole in center;

two bristle holders each one comprising: a half cylinder which holds at least 3 lines of bristle tufts wherein the said lines of bristles being elongated along a bristle longitudinal direction; and

15 a brush holder comprising a cup in which a tuft of plural bristle filaments are fixed to a floor center, in a round layout;

two ball bearings;

a channel assembly;

an air gun assembly;

a drying device;

20 and a rectangular cube shaped base with two holes with open first and close end with the same diameter as said main body, and two grooves in front and one groove on each left and right side.

2. The apparatus of claim 1, wherein said drying device has all parts the same as said cleaning device but a rotor with the wings oriented in opposite direction from the ones on said rotor of said cleaning device; and wherein said drying device equipped with finer bristle filaments comparing with said bristle filaments
25 in said cleaning device.

3. The apparatus of claim 1, wherein said rotor has two opposite sliding guide grooves on its inner wall which said grooves are elongated along its longitudinal direction till said plate.

4. The apparatus of claim 1, wherein each of said two bristle holders has a narrow horizontal ledge elongated along each edge.
- 30 5. The apparatus of claim 5, wherein said two bristle holders can slide in said sliding guide grooves to fix the bristle holders to the rotor.
6. The apparatus of claim 5, wherein each of said two bristle holders walls are omitted in some portions and only the essential portions are kept in order to decrease the weight, thus providing a rotor having a smaller rotation inertia and to ease passing the washing liquid or warm air to the outside of the devices.
- 35 7. The apparatus of claim 1, wherein said brush holder cup walls are omitted in some portions and only the portions essential to keep the cup structure sustainable and for brushes fixture, are remained.
8. The apparatus of claim 1, wherein said channel assembly comprising:
- a channel with some small outlets circumferentially distributed on its inner rim;
 - a washer to seal the channel; and
 - 40 a channel cap.
9. The apparatus of claim 9, wherein said channel cap has a hole to place a brass fitting, through which the washing liquid in said cleaning device or the warm air in said drying device enters into the device.
10. The apparatus of claim 1, wherein a supply of compressed air through said air gun flows through a brass fitting into said main body, and consequently the rotation speed of said rotor is controllable with
- 45 said air gun trigger.
11. The apparatus of claim 5, wherein the bristles on said two bristle holders are mounted in such a way that the filaments tips make a hollow conical frustum space, which said conical frustum space ends with another flat bristle filaments tips of said brush holder, in which a dairy animal teat introduced into said cleaning or drying devices and exposed to bristle tips in all parts.
- 50 12. The apparatus of claim 1, wherein all parts of said apparatus instead of said air gun assembly, ball bearings and brass fittings are made from polymeric materials like polypropylene with no sharp edges to prevent from any animal injuries.

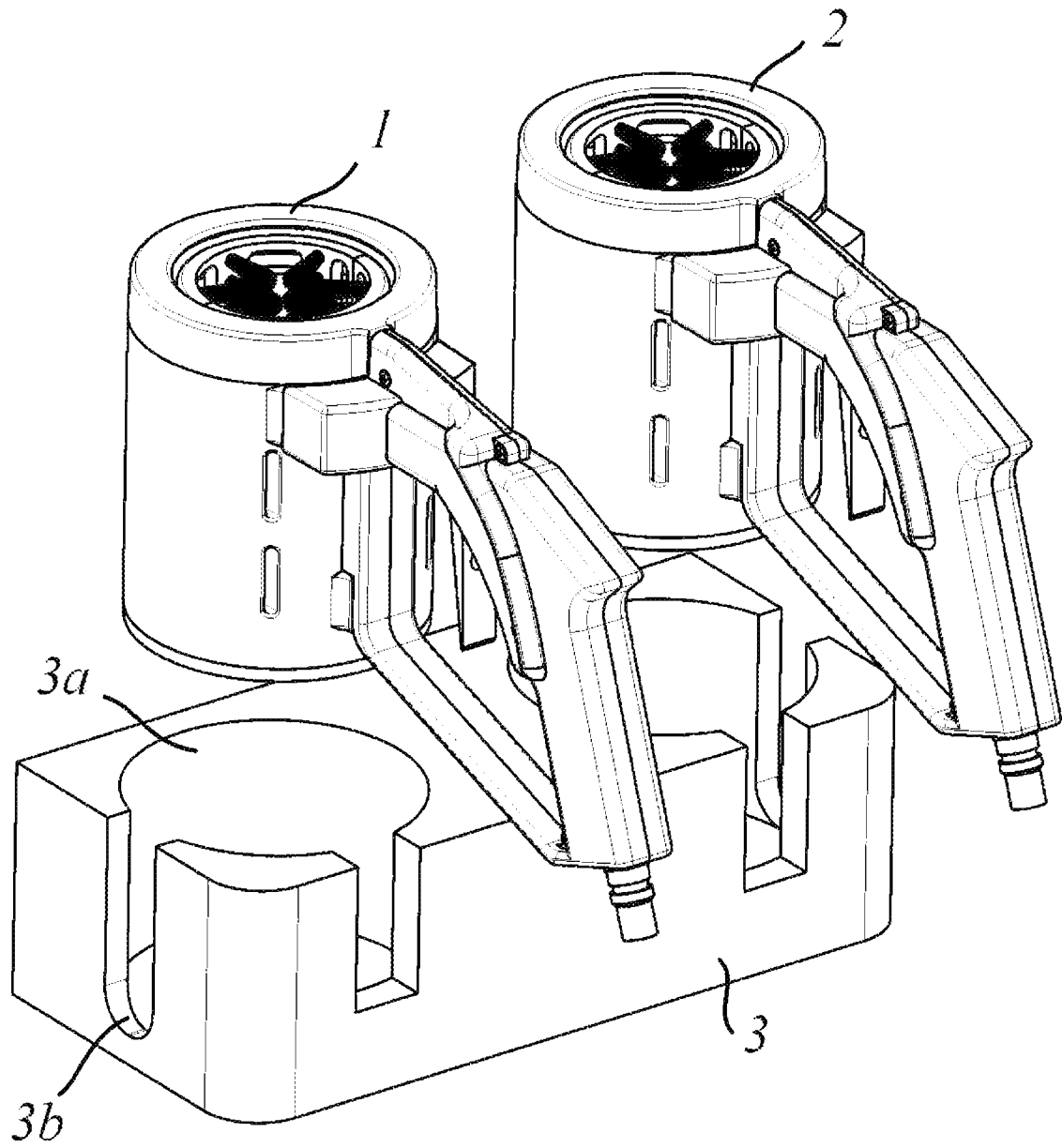


Fig.1

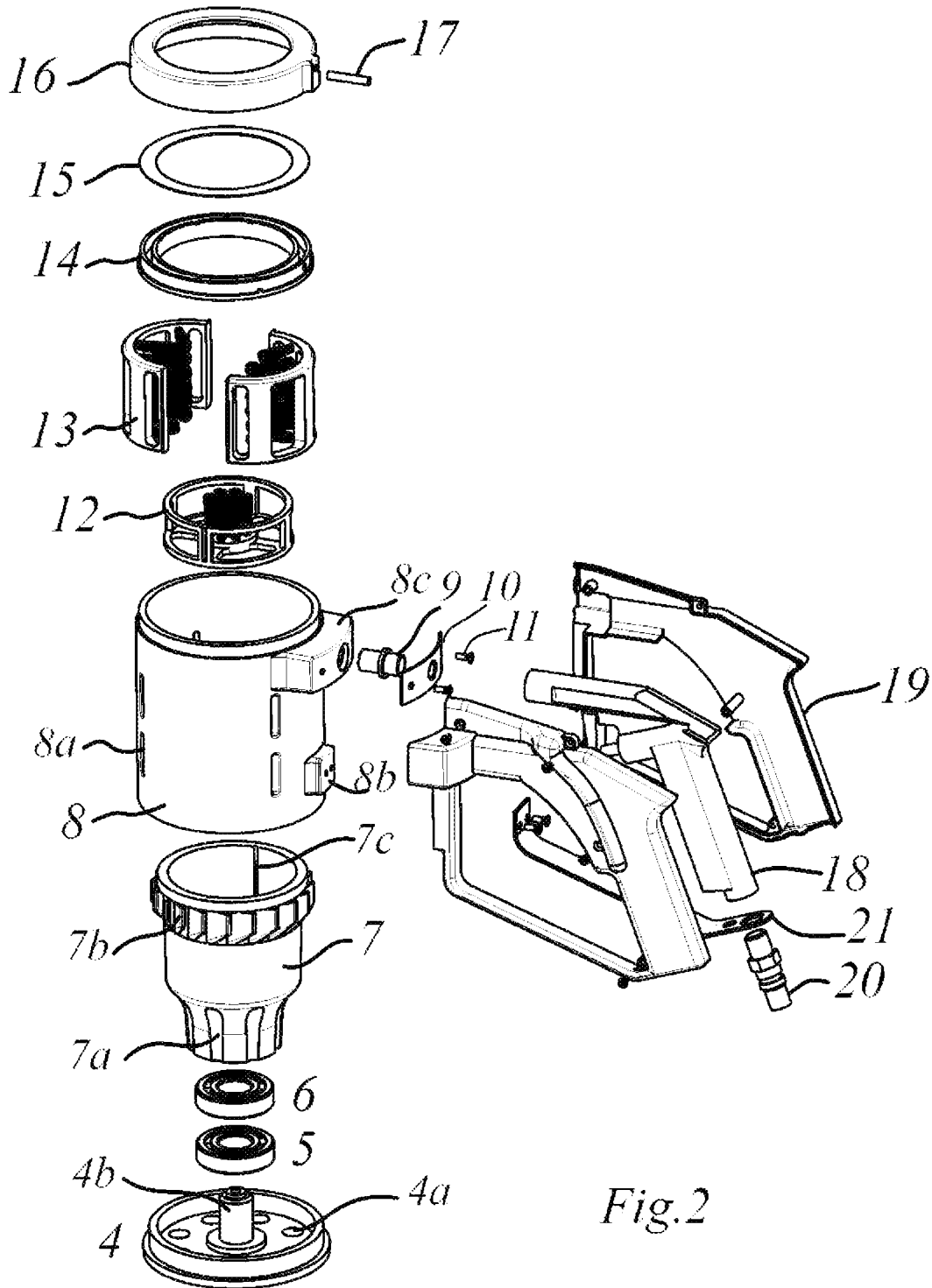


Fig.2

Fig.3a

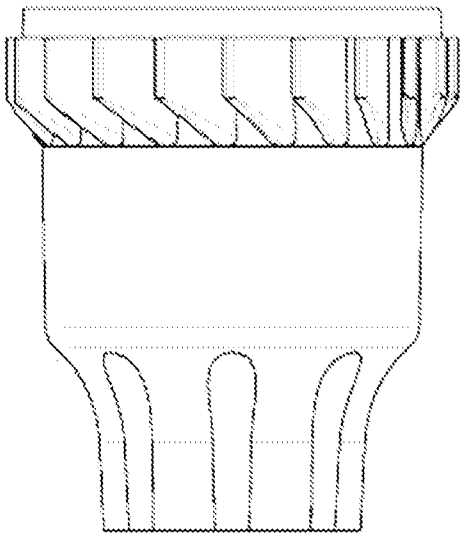


Fig.3b

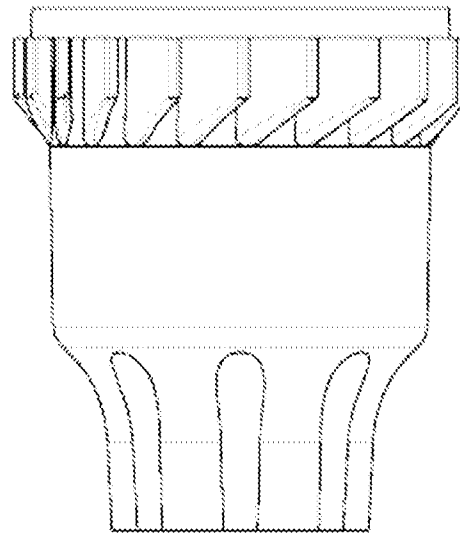


Fig.3c

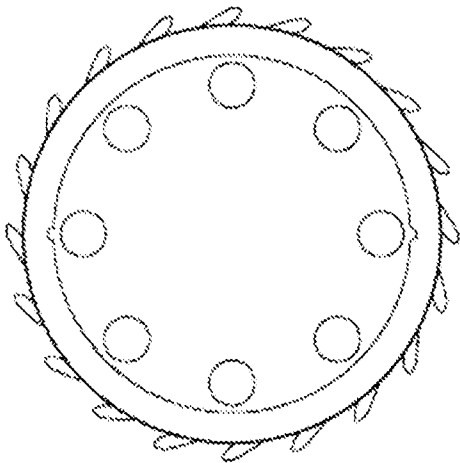


Fig.3d

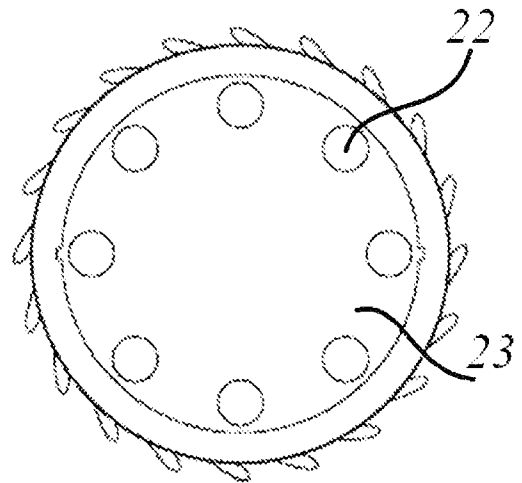


Fig.3

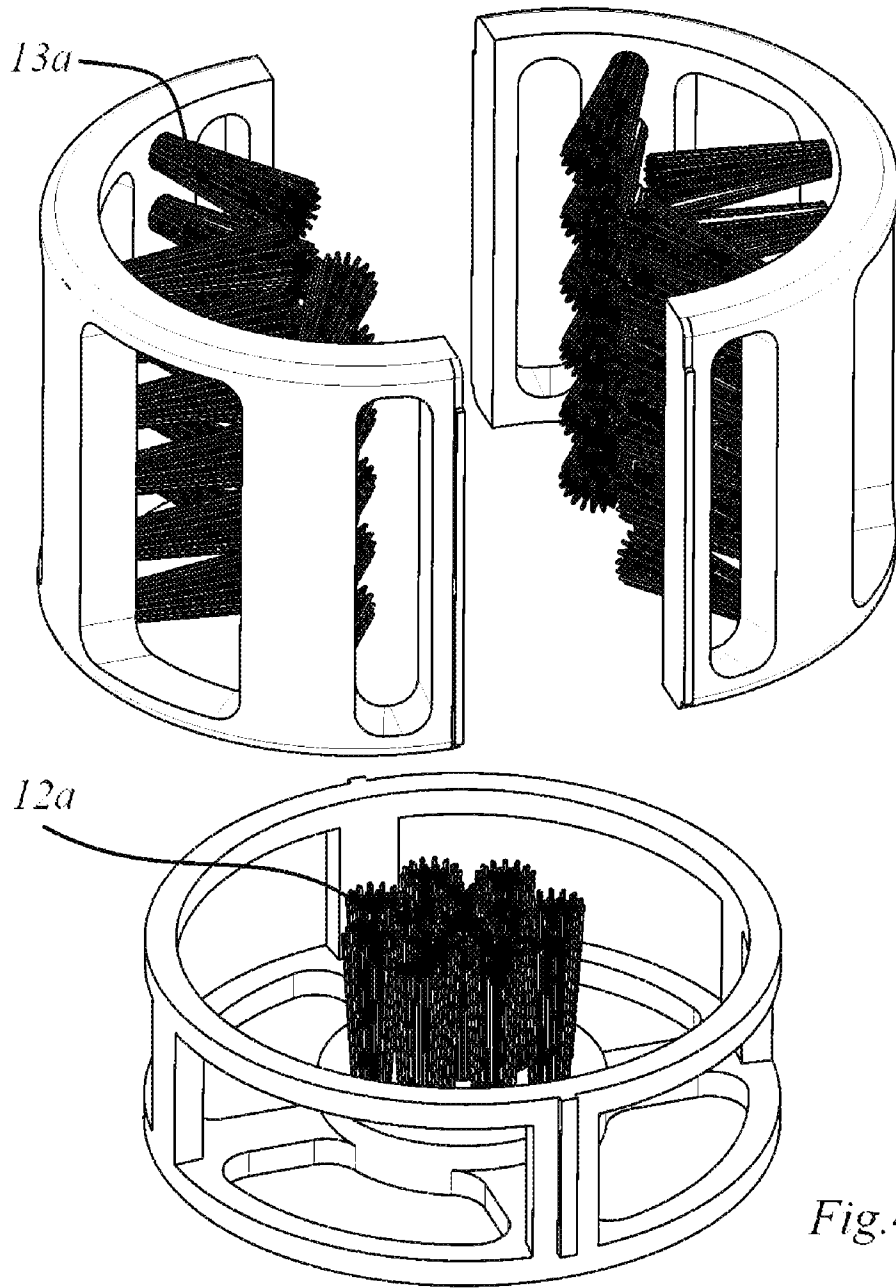


Fig.4

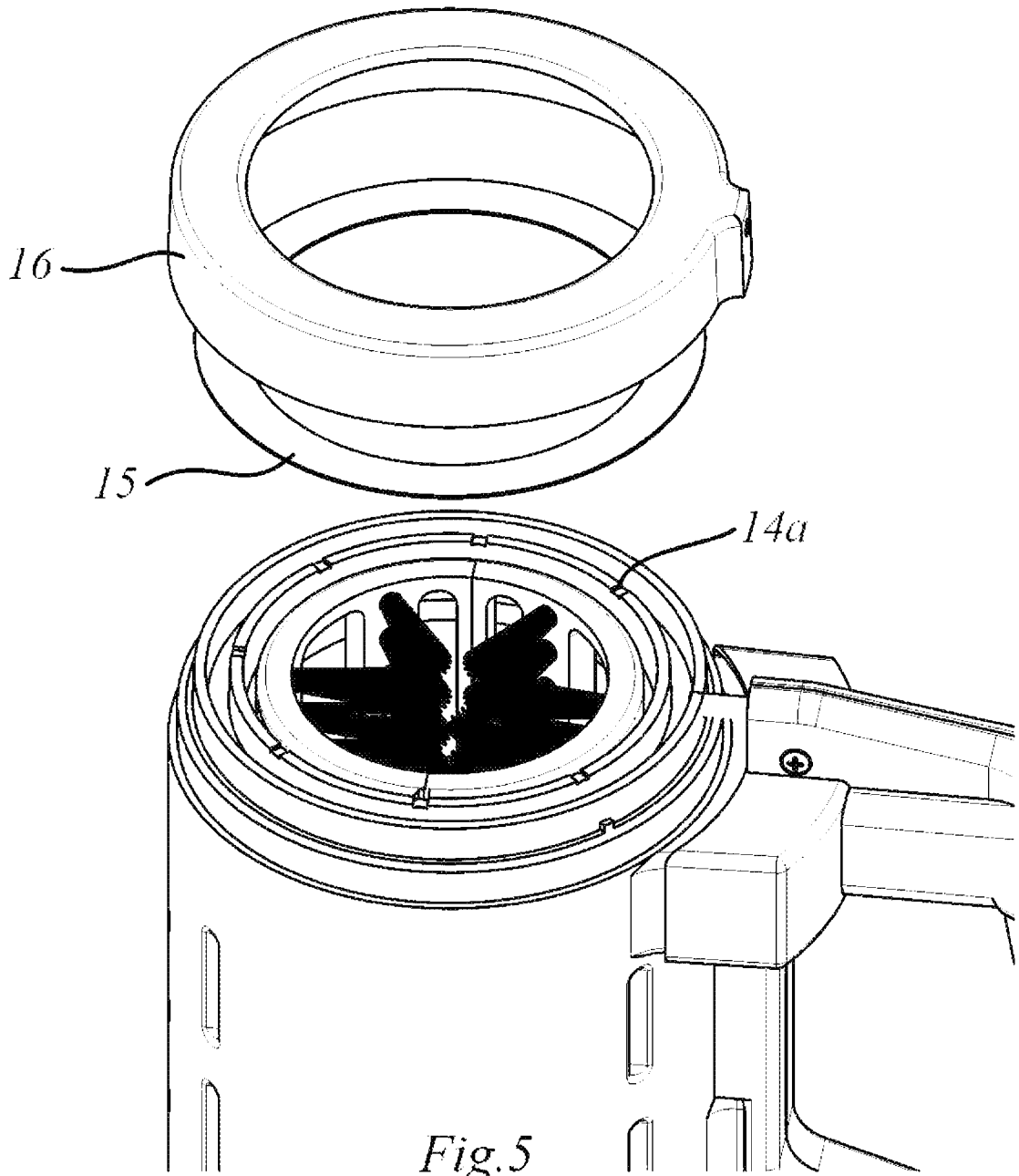


Fig.5

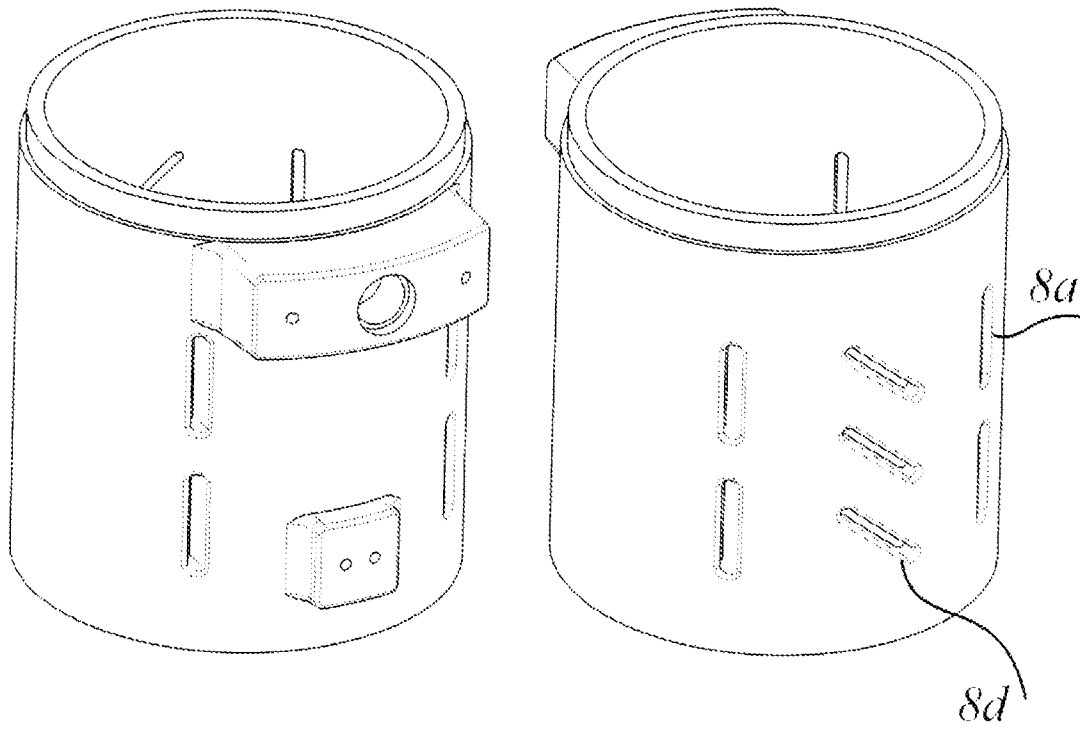


Fig.6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/053071

A. CLASSIFICATION OF SUBJECT MATTER
A01J7/04 Version=2017.01

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)

A01J7/04

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)

Patseer, IPO Internal Database

C. 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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Y	US 2952860 A (GEORGE JAMES C) 20 September 1960 CLAIM-1	1-12

Further documents are listed in the continuation of Box C. See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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Citation	Pub.Date	Family	Pub.Date
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