



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
26.04.2017 Bulletin 2017/17

(51) Int Cl.:
D06F 7/04 (2006.01)

(21) Application number: **15809561.2**

(86) International application number:
PCT/CN2015/077300

(22) Date of filing: **23.04.2015**

(87) International publication number:
WO 2015/192689 (23.12.2015 Gazette 2015/51)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(30) Priority: **17.06.2014 JP 2014124148**

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(54) **STAIN REMOVING DEVICE AND STAIN REMOVING UNIT**

(57) Provided is a stain removing device which can perform a stain removing operation at constant beating force and constant beating speed without causing fatigue of a hand, and can stably provide liquid required for stain removal. The stain removing device (100) includes: a head part (1) having a beating surface (111), a vibration unit (2) enabling the head part (1) to vibrate in a direction substantially orthogonal to the beating surface (111) by

power supply, a liquid containing part (3) containing liquid, and a water supply path (4) having one end (41a) connected with the liquid containing part (3) and the other end (1121h) opened in the periphery of the head part (1). Along with vibration of the head part (1) caused by the vibration unit (2), the liquid is supplied to the periphery of the head part (1) from the other end (1121h) of the water supply path (4).

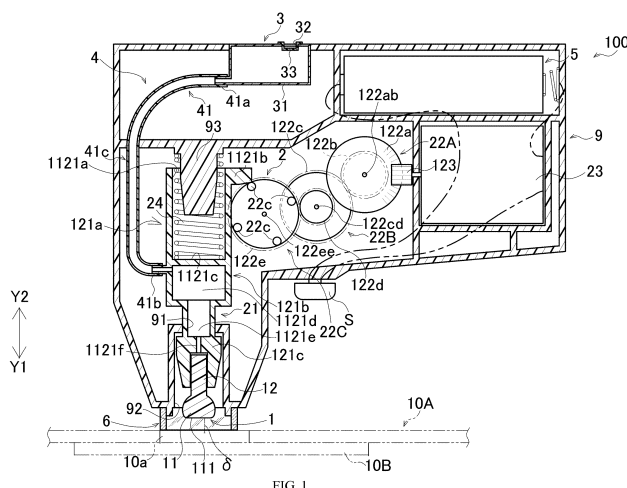


FIG. 1

Description**TECHNICAL FIELD**

[0001] The present disclosure relates to a stain removing device and a stain removing unit, which remove stains generated by adhesion of cosmetics or food residues to a cloth product by virtue of beating and washing, and which can automatically perform an action for beating a stained portion of the cloth product and supply water to the stained portion.

BACKGROUND

[0002] In the case where the stain is locally attached to a cloth product, in the aspects of convenience and efficiency in cleaning the stain, cleaning treatment is preferably performed only on the stained portion, as compared with cleaning of the cloth product as a whole; and a device for locally cleaning the cloth product may be, for example, a stain removing device disclosed in the Patent Literature 1. The stain removing device is provided with a solvent ejection unit for ejecting solvent for removing the stain, and an absorption unit capable of absorbing the solvent. The stain removing device ejects the solvent towards the stained portion of clothes and the like from the solvent ejection unit and absorbs dirt and the solvent from the stained portion by the absorption unit. However, such stain removing device can remove the solvent and instantly-dissolved dirt, but has low ability for removing solid dirt which is for example massively attached onto the cloth product and difficult to be blended with the solvent, and its stain removing effect is not very good.

[0003] In addition, as a device for removing the stain, a stain removing system (Non-patent Literature 1) including a bottle containing a detergent and an absorption sheet is additionally known. In the stain removing system, the stained portion contacting with the absorption sheet can be beaten below by the top end of the bottle, and the detergent is supplied to the stained portion from pores formed in the top end by using the beating action. The detergent is impregnated into the clothes under the beating action and is absorbed into the absorption sheet together with the dirt substituting the stained portion.

[0004] As to the stain removing system disclosed in the non-patent literature 1, since the detergent is supplied while the beating is carried out, the massively attached solid dirt is physically decomposed to be easily dissolved in the detergent and the ability of removing the solid dirt can be improved.

Existing Technical Literature**Patent Literature**

[0005] Patent Literature 1: Japanese Laid-Open Patent Publication No. 2003-996

Non-patent Literature

[0006] Non-patent Literature 1: network (URL: http://product.rakuten.co.jp/product/-/93dbf4a642737b4f28312cd6847ec47c/?sc2id=gmc_100647_93dbf4a642737b4f28312cd6847ec47c&scid=s_kwa_pla)

SUMMARY**Problems to be solved by the invention**

[0007] However, in the stain removing system disclosed in the non-patent literature 1, in the case where the solid dirt separated from the clothes by the stain removing action is not instantly dissolved in the detergent, there exist problems that the solid dirt is blocked in the pores in the top end of the bottle, the supply amount of the detergent is reduced, and the stain removing efficiency is lowered. In addition, since the stain removing action is performed by rapidly raising and lowering of a hand which holds the bottle, problems exist that the beating force and the beating speed are unstable, the decontamination degree has a deviation or the hand is fatigued.

[0008] The present disclosure aims at effectively solving the above problems. An object of the present disclosure is to provide a stain removing device and a stain removing system which can always perform the stain removing operation at stable beating force and beating speed without causing the fatigue of a hand, and can stably provide liquid required for stain removal.

Solution for solving the problems

[0009] In view of the above problems, the present disclosure provides solutions as follows.

[0010] That is, the stain removing device of the present disclosure is characterized by including a head part formed with a beating surface, a vibration unit enabling the head part to vibrate in a direction substantially orthogonal to the beating surface by power supply, a liquid containing part for containing liquid and a water supply path having one end connected with the liquid containing part and the other end opened in the periphery of the head part, wherein along with the vibration of the head part caused by the vibration unit, the liquid is provided to the periphery of the head part from the other end of the water supply path.

[0011] Furthermore, the present disclosure is also provided with a non-flexible waterproof cover part encircling the side surface of the head part, the vibration unit comprises an elastic member capable of extending and retracting in the direction substantially orthogonal to the beating surface, the head part is protruded by an elastic force of the elastic member, and an action end on one side of the head part is set at a position which is slightly protruded from a protruding end of the waterproof cover

part.

[0012] Furthermore, the waterproof cover part of the present disclosure comprises a heater which generates heat by power supply.

[0013] Furthermore, the present disclosure has a liquid amount adjusting portion, which allows the liquid to drip from the other end of the water supply path by using the vibration caused by the vibration unit, and which can adjust the dripping amount of the liquid.

[0014] Furthermore, the present disclosure is also provided with a detergent containing part for holding a liquid detergent, and a detergent supply unit for supplying the detergent in the detergent containing part to the periphery of the head part.

[0015] Furthermore, the present disclosure is provided with a steam injection unit capable of injecting steam towards the head part.

[0016] Furthermore, the present disclosure is provided with the above stain removing device and a heating device, wherein the heating device is at least provided with a heater, which generates heat by power supply, and a heating plate having a beaten surface, to which the head part constituting the stain removing device applies an external force, and transferring the heat generated by the heater.

Effects of the invention

[0017] According to the present disclosure described above, since the vibration unit drives the head part to vibrate by power supply, the action of the head part for beating a stain removing object can be automatically carried out. Therefore, the beating force is uniform, the hand is not required to move rapidly, and the hand is not fatigued even if the stain removing operation is performed for a long time. Furthermore, since the other end of the water supply path with one end connected with the liquid containing part is opened in the periphery of the head part rather than on the beating surface of the head part, the liquid is supplied to the periphery of the head part. Therefore, even if the solid dirt constituting the stained portion of the stain removing object is attached onto the beating surface, the water supply path is not blocked, and the stain removing effect can be stably maintained. In particular, an appropriate amount of liquid can be continuously supplied to the stain removing object along with the vibration by appropriately designing the cross section of a flow path of the water supply path, thereby improving the stain removing effect. The liquid described herein can be, for example, water, a mixture of water and detergent, a dedicated detergent for stain removal, and the like.

[0018] In particular, according to the present disclosure having the waterproof cover part, the stain removing operation is carried out in a state that the protruding end of the waterproof cover part is pushed against the stain removing object, so that the waterproof cover part shields the liquid scattered by the vibration of the head part to prevent the liquid from being scattered in a large range;

thus, a wetting area of the stain removing object can be reduced, and the stain removing object can be used immediately after the stain removing operation. Furthermore, during the stain removing operation, a distance from an device main body to the stain removing object can be always kept constant, and an external force (beating force) applied by the head part to the stain removing object can be kept moderate and uniform. Further, since the action end on one side of the head part is arranged at the position which is slightly protruded from the protruding end of the waterproof cover part, and the head part may press the stain removing object when protruding due to the elasticity of the spiral spring, the action for beating (pressing) the stained portion by the hand can be automatically simulated.

[0019] Further, as long as the waterproof cover part comprises the heater energized to generate the heat in the present disclosure, the waterproof cover part can be heated by the heat of the heater; and the stained portion and its vicinity of the stain removing object can be always heated via the waterproof cover part during the stain removing operation, so that the stain removing effect can be further improved.

[0020] In particular, according to the present disclosure having the liquid amount adjusting portion, which allows the liquid to drip by means of the vibration and is capable of adjusting the dripping amount of the liquid, the structure allowing the liquid to drip by means of the vibration is simpler than the structure using, for example, a liquid pump to send out the liquid. In this structure, in the case where the detergent mixture formed by mixing water and detergent is used as the liquid, the viscosity of the liquid is higher than that of the water and the liquid is difficult to drip sometimes, but the liquid can be prevented from excessively or insufficiently dripping to the stain removing object by using the liquid amount adjusting portion. Therefore, the reduction of the stain removing effect caused by the insufficient supply of the liquid can be prevented, and the circular stains caused by the supply of a great amount of liquid to the stain removing object at one time can be prevented.

[0021] Furthermore, according to the present disclosure having the detergent containing part and the detergent supply unit, in the case where the liquid containing part only contains water, the water in the liquid containing part and the detergent in the detergent containing part can be respectively supplied to the stain removing object at different time. Therefore, the detergent supplied by the detergent supply unit can be used for removing the stains, and only the water supplied by the water supply path can be used for rinsing the stain removing object.

[0022] In particular, according to the present disclosure having the steam injection unit, since the steam can be used for heating the stained portion of the stain removing object and for performing the stain removing operation, the dirt is in a state of being easily dissolved in the detergent, and the stain removing effect can be improved.

[0023] In another aspect, according to the present disclosure having the above stain removing device and the heating device, since the heat from the heater can be used for continuously heating the stained portion of the stain removing object and for performing the stain removing operation, the dirt is in a state of being more easily dissolved in the detergent, and the stain removing effect can be further improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

Fig. 1 is a longitudinal sectional view illustrating a stain removing device of a first embodiment of the present disclosure.

Fig. 2 is a longitudinal sectional view illustrating the stain removing device shown in Fig. 1 in a state of allowing a head part to be protruded.

Fig. 3 is a longitudinal sectional view illustrating the stain removing device shown in Fig. 1 in a state of not in use.

Fig. 4 is a perspective view illustrating a local portion of a barrel and a head part constituting a stain removing device of a second embodiment of the present disclosure.

Fig. 5 is a view schematically illustrating the head part and supply holes shown in Fig. 4(b).

Fig. 6 is a longitudinal sectional view illustrating a stain removing device of a third embodiment of the present disclosure.

Fig. 7 is a longitudinal sectional view illustrating a stain removing device of a fourth embodiment of the present disclosure.

Fig. 8 is a longitudinal sectional view illustrating the stain removing device shown in Fig. 7 in a state of allowing a head part to be protruded.

Fig. 9 is a longitudinal sectional view illustrating a stain removing device of a fifth embodiment of the present disclosure.

Fig. 10 is a longitudinal sectional view illustrating a stain removing unit of a sixth embodiment of the present disclosure.

Fig. 11 is an exploded view illustrating a heating device of the stain removing unit shown in Fig. 10.

Fig. 12 is a view illustrating a stain removing device of a seventh embodiment of the present disclosure.

Fig. 13 is a circuit diagram schematically illustrating circuits for supplying power to a motor and a heater of the stain removing device shown in Fig. 12.

Fig. 14 is a view illustrating a variation example of the head part shown in Fig. 1.

DETAILED DESCRIPTION

(First embodiment)

[0025] The first embodiment of the present disclosure

is described below with reference to the drawings.

[0026] Figs. 1 and 2 are longitudinal sectional views illustrating a stain removing device 100 of the first embodiment of the present disclosure. As shown in Figs. 1 and 2, the stain removing device 100 of the present embodiment is a handheld-size device capable of locally cleaning clothes 10A as a stain removing object, and includes a head part 1, a vibration unit 2, a liquid containing part 3, a water supply path 4, a battery 5, a waterproof cover part 6 and a shell main body 9 of a split structure with all parts assembled therein.

[0027] The head part (head of a barrel) 1 includes a beating portion 11 having a beating surface 111 and a longitudinal section in a substantially semicircular shape and more specifically in a shape more approximate to a circle than the semicircle; and a barrel insertion portion 12 extending from the beating portion 11. The head part 1 is made of resin (such as nylon) and vibrates in a direction substantially orthogonal to the beating surface 111 in a state of protruding from the shell main body 9 into a head part containing portion 92 recessed in the shell main body 9 via an opening 91, so as to apply a beating force to the clothes 10A used as the stain removing object and opposed to the beating surface 111. The direction substantially orthogonal to the beating surface 111 is referred to as a vibration direction hereinafter. In addition, in the vibration direction, a direction where the head part 1 faces the clothes 10A is referred to as a protruding direction Y1, and an opposite direction is referred to as a returning direction Y2. Furthermore, the material of the head part 1 is not limited to the resin and can also be metal (such as stainless used steel (SUS) and the like.

[0028] The vibration unit 2 comprises a motor 23 which is rotated by the power supply from the battery 5 used as an electric power supply portion, a first to third gears 22A-22C for transferring a rotating force of the motor 23, a barrel 21 for holding the head part 1 in a way that the beating surface 111 is disposed at the top end and being capable of moving in the vibration direction, and a spiral spring 24 used as an elastic component contained in the barrel 21.

[0029] The first gear 22A has a large-diameter portion 122a engaging with a drive gear 123 of the motor 23 and capable of rotating around a shaft 122ab, and a small-diameter portion 122b coaxially integrated with the large-diameter portion 122a. The second gear 22B is disposed between the first gear 22A and the third gear 22C, and has a large-diameter portion 122c engaging with the small-diameter portion 122b of the first gear 22A and capable of rotating around a shaft 122cd, and a small-diameter portion 122d coaxially integrated with the large-diameter portion 122c and engaging with the third gear 22C. The third gear 22C is configured to rotate around a shaft 122ee (refer to Fig. 1) in a clockwise direction in the figure, and four bulges 22c which are formed in parallel with the shaft 122ee in the circumferential direction at equal intervals are arranged on an edge portion of the

third gear. Furthermore, the number of the bulges 22c is not limited to 4 and may also be 1 to 3 and may also be 5 or more.

[0030] The barrel 21 comprises a cylindrical closed-end spiral spring containing portion 121a containing the spiral spring 24 in a state of extending and contracting in the vibration direction, an inserted portion 121c into which the barrel insertion portion 12 of the head part 1 is inserted, and a liquid storage portion 121b disposed between the inserted portion 121c and the spiral spring containing portion 121a and capable of storing liquid therein.

[0031] The spiral spring containing portion 121a is inserted by a fixed portion 93, which extends in a boss shape from the shell main body 9 towards the protruding direction Y1, through the opening 1121 a, and contains the other end of the spiral spring 24 supported by a basic end of the fixed portion 93. Furthermore, a snap-fitting claw 1121b in snap fit with the bulge 22c of the third gear 22C is provided on the side surface of the spiral spring containing portion 121a. With regard to this barrel 21, when the bulge 22c is not in snap fit with the snap-fitting claw 1121b (refer to Fig. 2), the spiral spring 24 applies an elastic force in the protruding direction Y1 to the bottom surface 1121c of the spiral spring containing portion 121a abutted by the other end of the spiral spring 24, and the head part 1 is pushed out.

[0032] On the other hand, in the state where the bulge 22c is in snap fit with the snap-fitting claw 1121b (refer to Fig. 1), the barrel 21 applies a compressive force to the spiral spring 24 via the bottom surface 1121c along with the rotation of the third gear 22C and moves towards the returning direction Y2. Then, when the bulge 22c is disengaged from the snap-fitting claw 1121b, the barrel moves towards the protruding direction Y1 through the elasticity of the compressed spiral spring 24. The head part 1 is vibrated (vibration movement) by repeating the actions. In the present embodiment, as described above, the third gear 22C is provided with four bulges 22c, and the head part 1 is reciprocated four times by one-time rotation.

[0033] The liquid storage portion 121b comprises a wide portion 1121d wider than the opening 91 of the shell main body 9 and a narrow portion 1121e narrower than the opening 91 of the shell main body 9 and protruding from the opening 91, wherein the wide portion 1121d is got stuck at the edge portion of the opening 91 to limit a moving range of the barrel 21 in the protruding direction Y1. With regard to this liquid storage portion 121b, the wide portion 1121d is connected with a liquid supply tube 41 described below, the liquid supplied from the liquid containing part 3 is stored by the liquid supply tube 41, and the liquid is supplied to the inserted portion 121c via the narrow portion 1121e.

[0034] The inserted portion 121c comprises a water supply hole 1121f extending from the narrow portion 1121e, and an inserted segment 1121g (refer to Fig. 2) as a hole for inserting the barrel insertion portion 12 of

the head part 1 in a relatively light pressure. A water supply groove (slot) 12a extending in the axial direction is intermittently formed on the periphery of the barrel insertion portion 12. The liquid in the narrow portion 1121e is supplied to the inserted segment 1121g via the water supply hole 1121f; in the state where the vibration unit 2 vibrates and the head part 1 vibrates, as shown in Fig. 2, the liquid is discharged little by little in a small amount (such as 1-1.5 cc/min) from a discharging port 1121h of the water supply groove 12a of a specified depth (about 0.1-0.3 mm in the present embodiment) disposed in a gap between the inserted segment 1121g and the barrel insertion portion 12.

[0035] On the other hand, in the state where the head part 1 does not vibrate, due to surface tension, the liquid is not discharged from the discharging port 1121h but stored between the barrel insertion portion 12 and the inserted portion 121c. As a result, since the water supply groove 12a is adjusted to a size capable of discharging a small amount of liquid due to the vibration of the head part 1, the consumption of the liquid is less than that of other cleaning ways such as a spray cleaning or a brush cleaning; and therefore, the liquid is difficult to splash to places other than the stained portion 10a of the clothes 10A.

[0036] Furthermore, the barrel insertion portion 12 is not limited to the structure of being inserted into the inserted portion 121c by pressure and can also be fixed and inserted by a screw. Furthermore, the inserted portion 121c is configured so that the head part 1 can be unplugged, and other head parts can be installed on the inserted portion 121c. Therefore, in the stain removing device 100, in the case for example where the dirt is attached onto the beating surface 111 in direct contact with the stained portion of the clothes 10A, the head part 1 can be removed for cleaning, or the head part 1 itself can be replaced with a new one. Further, the water supply groove 12a may be formed in the inserted segment 1121g rather than in the barrel insertion portion 12. Still further, the structure is not limited to applying the surface tension to the liquid at the discharging port 1121h, but can also be configured to adjust the water supply hole 1121f of the barrel 21 to a predetermined diameter (such as 0.3 mm), so that in the state where the head part 1 does not vibrate, the liquid is prevented from dripping by the surface tension acting on the opening end of the water supply hole 1121f.

[0037] The liquid containing part 3 comprises a containing portion main body 31 for containing the liquid discharged from the inserted portion 121c and supplied to the periphery of the head part 1, and a cover component 33 for blocking a liquid supply hole 32 formed in the containing portion main body 31. An air hole which is not shown in the figure is formed in the cover component 33. Therefore, a negative pressure is not formed inside the liquid containing part 3 even if it is closed by the cover component 33, so that the liquid can smoothly flow into the water supply path 4, and the liquid can drip from the

discharging port 1121h immediately after the vibration is started.

[0038] Here, water, a detergent mixture formed by mixing water and detergent according to a certain ratio, dedicated detergent for stain removal and the like can be used as the liquid, and the detergent mixture is used in the present embodiment. When the detergent mixture is used as the liquid, since the detergent is continuously supplied to the clothes 10A, the detergent cannot disappear from the stained portion 10a due to gasification, splashing and the like during the stain removing operation, and a high stain removing effect can be maintained. Further, it is unnecessary to additionally arrange a unit for supplying the detergent, so the structure of the device becomes simple.

[0039] The water supply path 4 supplies the liquid in the liquid containing part 3 to the periphery of the head part 1, and comprises a flexible liquid supply tube 41 with one end 41a connected with the liquid containing part 3 and the other end 41b connected with the wide portion 1121d of the liquid storage portion 121b, the liquid storage portion 121b, the water supply hole 1121f and the inserted segment 1121g of the inserted portion 121c, and the water supply groove 12a of the head part 1. Here, one end of the water supply path 4 is formed by one end 41a of the liquid supply tube 41, and the other end of the water supply path 4 is formed by the discharging port 1121h formed by the opening end of the water supply groove 12a disposed between the inserted segment 1121g and the barrel insertion portion 12.

[0040] The stain removing device 100 is used in a state in which the shell main body 9 is held in such a manner that an absorption liner 10B used as a backing is abutted against the bottom of the stained portion 10a of the clothes 10A, and the beating surface 111 of the head part 1 is opposite to the stained portion 10a.

[0041] When a power supply switch S arranged at the outside of the shell main body 9 is operated, the motor 23 is rotated by the power supply from the battery 5, and the rotation is decelerated via the first gear 22A and the second gear 22B and transferred to the third gear 22C. When the bulge 22c is in snap fit with the snap-fitting claw 1121b, the barrel 21 and the head part 1 are raised by a predetermined size δ (about 5 mm in the present embodiment) (refer to Fig. 1); and when the bulge 22c is disengaged from the snap-fitting claw 1121b, the barrel 21 is pushed out by the elasticity of the spiral spring 24, so that the head part 1 beats the stained portion 10a (refer to Fig. 2). At this time, the liquid supply tube 41 absorbs the vibration of the barrel 21 by virtue of the flexible deformation of a central portion 41c, and the liquid slowly drips from the discharging port 1121h along with the vibration to be supplied to the stained portion 10a along the side surface of the beating portion 11.

[0042] The dirt constituting the stained portion 10a is dissolved in the liquid supplied to the stained portion 10a and beaten from the clothes 10A by moving the shell main body 9 along the clothes 10A and repeating such

an action, and absorbed by the absorption liner 10B. That is, the stain removing device 100 of the present embodiment removes the stains by collectively transferring the dirt of the clothes 10A and the liquid to the absorption liner 10B. The absorption liner 10B is not particularly limited, and various absorption liners can be used as long as it is a component having high absorption speed of liquid. For example, a folded kitchen paper can be used as the absorption liner 10B. Furthermore, since the dripping liquid can be stably absorbed by the absorption liner 10B when the position where the head part 1 is abutted against the absorption liner 10B during the stain removing operation is periodically changed, it is possible to maintain high stain removing efficiency. Since the detergent mixture is used as the liquid in the present embodiment, even if the abutting position of the head part 1 is changed, the detergent can also be easily and continuously supplied to the stained portion 10a.

[0043] When the structure described above is used, since the vibration unit 2 can vibrate the head part 1 by supplying power, and the beating action of the head part 1 on the clothes 10A can be automatically carried out, the beating force is uniform, the hand is not required to move rapidly, and the hand is not fatigued even if the stain removing operation is performed for a long time. Further, since the other end, i.e. the discharging port 1121h, of the water supply path 4 with one end 41a connected with the liquid containing part 3 is opened in the periphery of the head part 1 rather than on the beating surface 111 of the head part 1, and the liquid is supplied to the periphery of the head part 1, even if the solid dirt constituting the stained portion 10a is attached onto the beating surface 111, the water supply path 4 does not be blocked, and the stain removing effect can be stably maintained. In particular, since an appropriate amount of liquid can be continuously supplied to the stain removing object along with the vibration by, for example, appropriately designing the cross section of a flow path of the water supply path 4, the stain removing effect can be improved. Moreover, since the liquid is allowed to drip by vibration, the structure is simpler than that using a liquid pump to pump out the liquid.

[0044] As a result, the stain removing device 100 in the present embodiment is small in size and good in portability; and when food residues or cosmetics are attached onto the cloth product when people are out of home, stains become unapparent after being immediately cleaned. In addition, articles which are not easy to clean as a whole, such as curtains or carpets, can be locally and properly cleaned.

[0045] As shown in Fig. 2, the waterproof cover part 6 is detachably installed on the shell main body 9 via a rib 9a at a position encircling the side surface of the beating portion 11 of the head part and is a non-flexible cylindrical transparent component made of acrylic acid in the present embodiment. The vibration unit 2, as described above, is a component for allowing the head part 1 to be protruded by the elastic force of the spiral spring 24; and

by adjusting the travelling distance of the head part 1, an action end on one side of the head part 1 is arranged at a position which is slightly protruded from a protruding end 61 of the waterproof cover part 6. In particular, the distance t in the vibration direction from the beating surface 111 of the head part 1 disposed at the protruding position to the protruding end 61 of the waterproof cover part 6 is a predetermined distance (about 1-2 mm in the present embodiment).

[0046] Since the waterproof cover part 6 performs the stain removing operation in the state where the protruding end 61 of the waterproof cover part 6 is pushed against the clothes 10A, the liquid which is splashed due to the vibration of the head part 1 is blocked and is prevented from being scattered in a wide range. Therefore, the wetting area of the clothes 10A can be reduced, and the clothes 10A can be put on immediately after the stain removing operation. Furthermore, during the stain removing operation, the distance from the device main body to the clothes 10A can be always kept constant, and the external force (beating force) applied by the head part 1 to the clothes 10A is appropriate and uniform. Furthermore, since the action end on one side of the head part 1 is arranged at the position which is slightly protruded from the protruding end 61 of the waterproof cover part 6, and the head part 1 presses the clothes 10A when protruding out due to the elasticity of the spiral spring 24, the action for beating (pressing) the stained portion by hand can be automatically simulated. Further, since the waterproof cover part 6 is transparent, the decontamination state of the stained portion can be confirmed via the waterproof cover part 6 during the stain removing operation.

[0047] In addition, the shape of the waterproof cover part 6 is not limited to a cylindrical shape as long as it can cover the whole side surface of the beating portion 11, and may be, for example, a substantially conical shape (a shape that the protruding end 61 expands towards the clothes 10A). Furthermore, the waterproof cover part 6 may be fixed to the shell main body 9 rather than detachably arranged on the shell main body.

[0048] Fig. 3 is a longitudinal sectional view illustrating the state that the stain removing device 100 of the present embodiment is not in use; Fig. 3(a) is a longitudinal sectional view illustrating a liquid-drip-prevention head part 1X; and Fig. 3(b) is a longitudinal sectional view illustrating an anti-leakage cover body 6X. The stain removing device 100 of the present embodiment is configured to install the liquid-drip-prevention head part 1X shown in Fig. 3(a) to the inserted portion 121c in which the head part 1 is removed. The liquid-drip-prevention head part 1X is provided with an insertion portion 12X, which is designed in an insertable shape and size and not formed with a gap such as the water supply groove 12a (refer to Fig. 2) between the inserted segment 1121g of the inserted portion 121c. When the insertion portion 12X is inserted into the inserted segment 1121g, the liquid supplied via the water supply hole 1121f is intercepted by

the inserted portion 12X, so that the liquid can be prevented from dripping out of the device main body. The liquid-drip-prevention head part 1X is used when carrying the stain removing device 100, the liquid can be prevented from leaking from the device main body due to shaking or vibration, and convenience in carrying can be achieved.

[0049] Furthermore, the stain removing device 100 of the present embodiment is configured to install the anti-leakage cover body 6X shown in Fig. 3(b) on the shell main body 9 with the waterproof cover part 6 removed. The anti-leakage cover body 6X comprises a cylindrical portion 6Xa with one end 6Xa1 in snap fit with the rib 9a of the shell main body 9 and a bottom 6Xb disposed at the other end 6Xa2 of the cylindrical portion 6Xa, and the liquid dripping from the discharging port 1121h is stored in a space S_p encircled by the cylindrical portion 6Xa and the bottom 6Xb. Therefore, even if the state that the head part 1 is inserted into the inserted portion 121c is maintained, the stain removing device 100 can be carried without leakage of the liquid. Furthermore, the shell main body 9 may also be a structure that the anti-leakage cover body 6X is installed while the waterproof cover part 6 is installed.

(Second embodiment)

[0050] Fig. 4 is a perspective view illustrating a portion of a barrel 155 and a head part 151 constituting a stain removing device of a second embodiment of the present disclosure. Fig. 4(a) illustrates the state before the head part 151 is inserted into the barrel 155; and Fig. 4(b) illustrates the state after the head part 151 is inserted into the barrel 155. The stain removing device of the present embodiment differs from that of the first embodiment in comprising a liquid amount adjusting portion 159 capable of adjusting the dripping amount of the liquid. In the following description, since the structure is the same as the first embodiment except for the following structure, the description thereof will be omitted.

[0051] The liquid amount adjusting portion 159 shown in Fig. 4 comprises a barrel 155 and a head part 151. The barrel 155 is adjacent to a liquid storage portion 156 and an inserted segment 1121g of an inserted portion 158 via a partition portion 157, and a first to third supply areas 157a-157c which are formed at equal intervals are provided on the edge portion of the partition portion 157. Different number of supply holes 157x penetrating through the partition portion 157 are respectively formed in the supply areas 157a-157c; and in the present embodiment, one supply hole is formed in the first supply area 157a, three supply holes are formed in the second supply area 157b, and 5 supply holes 157x are formed in the third supply area 157c. Furthermore, the number of the supply holes 157x is not limited to the above description. Furthermore, the head part 151 is formed with an incision 1152 at the end of an insertion portion 152, and a plurality of water supply grooves 1153, which ex-

tend from the incision 1152 towards the beating portion 11, are provided at the side of the insertion portion 152.

[0052] Fig. 5 is a view schematically illustrating the head part 151 and the supply holes 157x shown in Fig. 4(b). In Fig. 5, the incision 1152 is indicated by a slash. As shown in Fig. 5, the incision 1152 is formed in the insertion portion 152 over a range corresponding to one supply area 157a (157b, 157c). The liquid in the liquid storage portion 156 shown in Fig. 4 flows into the incision 1152 from the water supply hole(s) 157x formed in any supply area 157a (157b, 157c) opposed to the incision 1152 and drips to the range of the beating portion 11 through the water supply grooves 1153. Therefore, the dripping amount of the liquid may be changed according to the supply area 157a (157b, 157c) opposed to the incision 1152; and the dripping amount of the liquid is sequentially increased according to the state shown in Fig. 5(a) where the incision 1152 is opposed to the first supply area 157a, according to the state shown in Fig. 5(b) where the incision 1152 is opposed to the second supply area 157b, and according to the state shown in Fig. 5(c) where the incision 1152 is opposed to the third supply area 157.

[0053] So, the stain removing device of the present embodiment is a device allowing the liquid to drip from the other end of a water supply path 158, i.e. gaps between the water supply grooves 1153 and the insertion portion 152 of the head part 151, by virtue of the vibration of the vibration unit 2, and is provided with the liquid amount adjusting portion 159 shown in Fig. 4 capable of adjusting the dripping amount of the liquid.

[0054] The liquid may excessively drip in the case of only setting the depth of the water supply groove 12a, resulting in the formation of circular stains sometimes. However, the liquid can appropriately drip to the clothes 10A by using the liquid amount adjusting portion 159. Therefore, the reduction of the stain removing effect caused by the insufficient liquid supply can be prevented, and the circular stains caused by the supply of a great amount of liquid to the stained portion 10a at one time can be prevented.

[0055] Furthermore, the structure of the liquid amount adjusting portion 159 is not limited to the above structure as long as it can adjust the dripping amount of the liquid. In addition, the structure of the liquid amount adjusting portion 159 may also be applied to the stain removing devices of the following third to fifth embodiments. Further, although the water supply grooves 1153 in the present embodiment are formed in the insertion portion 152, they may also be formed in the inserted portion 158.

(Third embodiment)

[0056] Fig. 6 is a longitudinal sectional view illustrating a stain removing device 300 of a third embodiment of the present disclosure. A shell main body 309 of the stain removing device 300 of the present embodiment is substantially in a cuboid shape; the configuration positions

of key elements embedded in the shell main body 309 and partial structure are different from those in the first embodiment, and the shell main body 9 in the first embodiment is used substantially in a horizontal posture, while the shell main body 309 in the present embodiment is used substantially in a vertical posture. In the following description, since the structure is the same as the first embodiment except for the following structure, the same reference numerals in the figures are used, and the description thereof will be omitted.

[0057] As shown in Fig. 6, the stain removing device 300 of the present embodiment is sequentially provided with a barrel 321, a third gear 322C, a second gear 322B, a first gear 322A and a motor 23, which constitute a vibration unit 302, along the vibration direction in the shell main body 309. Furthermore, the barrel 321 comprises a spiral spring containing portion 321a, an inserted portion 321c and a hollow connection portion 321b connecting the spiral spring containing portion 321a and the inserted portion 321c. The structure of the spiral spring containing portion 321a is the same as that of the spiral spring containing portion 121a (refer to Figs. 1 and 2) of the first embodiment except for an opening 1321ab formed on the bottom surface 1321a and communicated with the connection portion 321b. Furthermore, the structure of the inserted portion 321c is the same as that of the inserted portion 121c (refer to Figs. 1 and 2) of the first embodiment except for a hollow connection end 1321b extending from a water supply hole 1121f into the connection portion 321b. Then, a through hole 393a penetrating through in the vibration direction is formed in the fixed portion 393 of the shell main body 309 inserted into the spiral spring containing portion 321 a.

[0058] A water supply path 304 comprises a liquid supply tube 341, a connection end 1321b of the inserted portion 321c, a water supply hole 1121f, an inserted segment 1121g, and a water supply groove 12a arranged at the barrel insertion portion 12 of the head part 1. One end 341a of the liquid supply tube 341 is connected with the liquid containing part 3 and penetrates through the through hole 393a of the fixed portion 393, an axial center portion of the spiral spring 24 and the spiral spring containing portion 321a, and the other end 341b is connected with the connection end 1321b in the connection portion 321b via the opening 1321ab. The liquid supply tube 341 is provided with a deformation portion 341 c, and the deformation portion 341c is connected between the liquid containing part 3 and the connection end 1321b with a length margin and is flexibly deformed (absorbs the vibration) along with vibration of a vibration unit 302. Furthermore, the liquid supply tube 341 can also be connected with the liquid containing part 3 and the connection end 1321b without ensuring the length margin; and at this time, in order to absorb the vibration, a part of the liquid supply tube 341 is preferably in a bellow shape.

[0059] With regard to the stain removing device 300 of this structure, the power supply switch S at the outside of the shell main body 309 is operated, so the motor 23

is rotated by the power supply from the battery 5, the barrel 321 and the head part 1 are driven to vibrate by means of the rotation of the third gear 22C and the elasticity of the spiral spring 24, and the liquid is enabled to drip from the discharging port 1121h, thereby having the same effect as that of the stain removing device 100 of the first embodiment.

(Fourth embodiment)

[0060] Figs. 7 and 8 are longitudinal sectional views illustrating a stain removing device 400 of a fourth embodiment of the present disclosure. The stain removing device 400 of the present embodiment differs from the first embodiment in that a detergent containing part 7 and a detergent supply unit 8 are provided. In the following description, since the structure is the same as the first embodiment except for the following structure, the same reference numerals in the figures are used, and the description thereof will be omitted.

[0061] The detergent containing part 7 comprises a containing portion main body 71 containing the liquid detergent supplied to the periphery of the head part 1, and a cover component 73 which is provided with an air hole (not shown in the figures) and blocks a liquid supply hole 72 formed in the containing portion main body 71.

[0062] The detergent supply unit 8 is a component for supplying the detergent in the detergent containing part 7 to the periphery of the head part 1 and comprises a detergent dripping button 81, a detergent supply tube 82 and a detergent supply portion 409a formed in a shell main body 409 and opened around the head part 1. One end 82a of the detergent supply tube 82 is connected with the detergent containing part 7 at a position where the detergent dripping button 81 applies a pressing force, and the other end 82b is connected with the detergent supply portion 409a. The detergent supply portion 409a is formed in a shape that the detergent is supplied to the beating portion 11 of the head part 1 in a direction slightly inclined downwards relative to the horizontal direction, and an opening end of the detergent supply portion is in a nozzle shape. The detergent dripping button 81 is elastically connected with the spiral spring 81a, which applies an elastic force from a down-pressing position to an up-pressing position.

[0063] In the present embodiment, the liquid containing part 3 is only used for containing water, the detergent is enabled to drip on the periphery of the head part 1 by pressing the detergent dripping button 81 at an appropriate time; and the action of making the lifted head part 1 as shown in Fig. 7 to be protruded (as shown in Fig. 8) is continuously performed, so that the liquid drips. Therefore, the stain removing device 400 can adjust the amount of the detergent according to the fouling degree of the stained portion 10a. Furthermore, the water in the liquid containing part 3 and the detergent in the detergent containing part 7 are respectively supplied to the clothes 10A at different time, the detergent supplied by the detergent

supply unit 8 can be used for removing the stains, and the water supplied by the water supply path 4 is only used for rinsing the clothes 10A.

[0064] Furthermore, the structure in which the detergent is supplied by the detergent dripping button 81 is not limited to the above structure, and may also be, for example, the structure for supplying the detergent by vibration in the same manner as the liquid in the liquid container 3.

[0065] Furthermore, in the present embodiment, since the detergent containing part 7 and the detergent supply unit 8 are provided to inhibit upsizing of the device main body, the structure of the third embodiment is applicable to the water supply path 304, the barrel 321 and the fixed portion 393 of the shell main body 409.

(Fifth embodiment)

[0066] Fig. 9 is a longitudinal sectional view illustrating a stain removing device 500 of a fifth embodiment of the present disclosure. The stain removing device 500 of the present embodiment differs from that of the first embodiment in that a steam injection unit 508 capable of injecting steam to the beating portion 11 of the head part 1 is included and the motor 23 is powered to drive by power supply wire C with a mandrel C1. Since the stain removing device 500 is powered by the power supply wire C, no battery is required to be embedded into the shell main body 509, and the size of the device main body is smaller. Furthermore, the power supply wire C is not limited to the structure having the mandrel C1, and may also be a structure with a USB connector and capable of USB connection. Furthermore, the First to the Fourth embodiments may also be the structure powered by the power supply wire C, and the present embodiment may also be the structure powered by the battery. In the following description, since the structure is the same as that in the first embodiment except for the following structure, the same reference numerals in the figures are used, and the description thereof will be omitted.

[0067] As shown in Fig. 9, the steam injection unit 508 is provided with a steam liquid containing part 507, a steam liquid dripping button 581, a steam generation portion 583 for generating the steam, a steam liquid supply tube 582 supplying the water in the steam liquid containing part 507 to the steam generation portion 583, and a steam injection portion 584 with one end 584a connected with the steam generation portion 583 and the other end 584b being opened around the head part 1. The steam liquid dripping button 581 is elastically connected with the spiral spring 581a, which applies an elastic force from a down-pressing position to an up-pressing position.

[0068] The steam liquid containing part 507 comprises a steam liquid containing part main body 571 configured to contain water for steam, and a cover component 573 configured to block a steam liquid supply hole 572 formed in the steam liquid containing part main body 571 and having an air hole (not shown in the figure). The steam

generation portion 583 comprises a heater switch 586 capable of switching the power supply state to a heater 585, the heater 585 generating heat through the power supply from the power supply wire C, a steam generation portion main body 583 with the heater 585 arranged therein and a temperature regulator 587 arranged at the side wall of the steam generation portion main body 583 and adjusting the power supply state to the heater 585 according to the temperature of the heater 585. The temperature regulator 587 is configured to stop the power supply to the heater 585 when an upper limit temperature is reached so as to cool the heater 585, and to supply power to the heater 585 again when a lower limit temperature is reached.

[0069] In the stain removing device 500 of the present embodiment, when the heater switch 586 is operated to supply power to the heater 585 so as to generate heat, and when the liquid drips from the steam liquid containing part 507 onto the heater 585 by pressing the steam liquid dripping button 581 at an appropriate time, steam may be generated and is injected to the head part 1 from the other end of the steam injection portion 584. Since the stain removing device 500 is provided with the steam injection unit 508 injecting the steam to the head part 1, the steam can be used for heating the clothes 10A and for performing the stain removing operation, and the stain removing effect can be improved. Furthermore, since the kinetic energy of the steam is higher than that of the liquid water containing hot water, and the steam is easier to permeate into the solid dirt and the clothes 10A as compared with the liquid water, the solid dirt or the dirt deep in the fibers of the clothes can be dissolved and removed by the steam, which aids in the improvement of the stain removing effect. Further, since a powerful bleaching agent is not required for removing the stains, the color fading of the clothes 10A can be prevented.

[0070] Furthermore, in the present embodiment, since the steam injection unit 508 is provided to inhibit upsizing of the device main body, the structure of the third embodiment is applicable to the barrel 321 and the fixed portion 393 of the shell main body 509.

(Sixth embodiment)

[0071] Fig. 10 is a longitudinal sectional view illustrating a stain removing unit 600 of a sixth embodiment of the present disclosure. Fig. 11 is an exploded view illustrating a heating device 601 of the stain removing unit 600 shown in Fig. 10. The stain removing unit 600 of the present embodiment shown in Fig. 10 comprises the stain removing device 100 of the first embodiment and the heating device 601.

[0072] As shown in Fig. 11, the heating device 601 comprises an absorption liner setting component (absorption liner setting cover) 681, a main body cover 671, a decoration plate 661, a heating plate 651, a first thermal insulation material 641, a heater 631, a second thermal insulation material 621 and a device main body 611.

[0073] The absorption liner setting component 681 and the main body cover 671 are, in a top view, circularly-shaped components which have opening portions 681a and 671a formed at the center thereof, respectively. The absorption liner setting component 681 is installed to the main body cover 671 by rotating in a state that the absorption liner 10B is clamped between one side 681b of the absorption liner setting component and one side 671b of the main body cover 671 and by engagement of the screw portions 671c and 681c thereof. The decoration plate 661 has step differences between a central portion 661a and end portions 661b; in a state where the decoration plate is inserted into the heating device 601, a raised surface 661ab of the central portion 661a is exposed from the opening portion 671a and is substantially parallel to one side 671b of the main body cover 671; and the end portions 661b are clamped between the other side 671d of the main body cover 671 and the device main body 611. The decoration plate 661 is made of, for example, stainless steel. Through holes 661c and 671e penetrating through a safety switch 1614 as described below are formed in the end portion 661b of the decoration plate 661 and the main body cover 671, respectively.

[0074] The heating plate 651 is a component which is configured to be inserted into the central portion of the decoration plate 661, with a beaten surface 651a, which is given external force by the head part 1 of the stain removing device 100, being opposed to the decoration plate 661, and the heating plate is made of, for example, aluminum with high heat conductivity. The thickness of the heating plate 651 is set to about 1-2 mm. Thus, since the heating plate has both strength and high heat conductivity, the heat from the heater 631 can be rapidly and uniformly transferred to the absorption liner 10B, the deformation of the absorption liner 10B caused by the external force applied by the head part 1 during the stain removing operation can be inhibited, and the high stain removing efficiency can be maintained.

[0075] The first thermal insulation material 641 is a thermal insulation material arranged at the back side of the heating plate 651 and configured to adjust the temperature, and made of, for example, silicone rubber. The second thermal insulation material 621 is a component arranged on the device main body 611 and configured to insulate the heat of the heater 631, and made of, for example, glass wool. The heater 631 disposed between these thermal insulation materials can use, for example, a ceramic heater. Furthermore, it is also possible to use a structure in which the appearance of the heating plate 651 is beautified by implementing the coating and the decoration plate 661 is not used.

[0076] The device main body 611 includes a power supply wire 1613, a main switch 1611 capable of switching the power supply state to the heater 631, a temperature regulator 1612 capable of adjusting the power supply state to the heater 631 according to the temperature of the heater 631, and a safety switch 1614. When an upper limit temperature (such as 70□) is reached, the

temperature regulator 1612 stops the power supply to the heater 631 so as to cool the heater 631; and when the temperature is lowered to a lower limit temperature (such as 60□), the heater 631 is supplied power again. The safety switch 1614 is a component protruding from one side 671b of the main body cover 671 via the through holes 661c, 671e and is configured to supply power to the heater 631 in the case where the safety switch is pressed by the absorption liner 10B installed at a predetermined position and to stop the power supply to the heater 631 in the case where the safety switch is not pressed. That is, the heating device 601 can be used by arranging the absorption liner 10B on the predetermined position of the main body cover 671 and closing the absorption liner setting component 681.

[0077] In the heating device 601 of this structure, when the main switch 1611 is operated, the heater 631 can generate heat, and the heat is transferred to the heating plate 651, so that the temperature of the absorption liner 10B is increased. Therefore, when the clothes 10A are carried on the heating device 601, an action of applying beating force to the beaten surface 651a by the head part 1 of the stain removing device 100 can be performed in a state that the heated absorption liner 10B is opposed to the stained portion 10a. Thus, the stain removing unit 600 of the present embodiment continuously heats the stained portion 10a to the temperature about 50□, the stain removing operation can be performed in a state that the dirt is easier to dissolve in the liquid, so that the stain removing effect can be further improved. Further, since a powerful bleaching agent is not required for removing the stains, the color fading of the clothes 10A can be prevented.

[0078] Furthermore, although the heating device 601 is used in combination with the stain removing device 100 of the first embodiment in the present embodiment, it may be used in combination with the stain removing device 200-500 of the second to the fifth embodiments or a stain removing device 700 of the seventh embodiment described below.

[0079] Furthermore, although the heating device 601 is in a circular shape in the top view in the present embodiment, it can also be a rectangular shape in the top view. In this case, one side of the absorption liner setting component is connected with other components (the main body cover, the decoration plate, the heating plate, the first thermal insulation material, the heater, the second thermal insulation material and the device main body) of the heating device via a hinge and the like; and the absorption liner configuring component is preferably configured to clamp the absorption liner relative to other components of the heating device 601 to be foldable.

(Seventh embodiment)

[0080] Fig. 12 is a view illustrating a stain removing device 700 of a seventh embodiment of the present disclosure. Specifically, Fig. 12(a) is a longitudinal sectional

view illustrating the stain removing device 700 of the present embodiment; Fig. 12(b) is a perspective view illustrating a waterproof cover part included in the stain removing device 700 of the present embodiment; and Fig. 12(c) is an exploded longitudinal sectional view illustrating the waterproof cover part.

[0081] Furthermore, Fig. 13 is a circuit diagram schematically illustrating circuits for supplying power to a motor 23 and a heater 731 of the stain removing device 700 and illustrates three power supply statuses corresponding to siding positions of an operation portion SS1 of the switch SS. Furthermore, in the circuits of Fig. 13, an energized portion is indicated by a solid line, while a non-energized portion is indicated by a dotted line.

[0082] As shown in Fig. 12, the stain removing device 700 of the present embodiment differs from that in the third embodiment shown in Fig. 6 mainly in the structure of the waterproof cover part 706 and in driving the motor 23 by power supply via a USB connector CC1. The USB connector CC1 is connected with an external power supply BB (refer to Fig. 13) through a USB cable CC2 (refer to Fig. 13). Thus, since the stain removing device 700 in the present embodiment is powered by the external power supply BB, no battery needs to be embedded into a shell main body 709, and the device main body is smaller in size. In the following description, since the structure is the same as that in the third embodiment except for the following structure, the same reference numerals in the figures are used, and the description thereof will be omitted. In addition, wirings such as connecting between the USB connector CC1 and the motor 23 in Fig. 12 are not shown.

[0083] As shown in Figs. 12(a)-(c), the waterproof cover part 706 includes a guiding frame 732, a heater 731, a pressing component 733, a thermal insulation liner 734 and a power supply connector 735. The waterproof cover part 706 is the same as that of the above-mentioned embodiments and can be detached from the shell main body 709 via a rib 709a at a position encircling the side surface of the beating portion 11 of the head part 1.

[0084] The guiding frame 732 has a flat annular bottom area 732c, an inner cylindrical area 732a extending from an inner circumference of the bottom area 732c, and an outer cylindrical area 732b coaxial with the inner cylindrical area 732a and extending from an outer circumference of the bottom area 732c, and an inner space Is is formed by these areas 732a-732c. Herein, as shown in Fig. 12(c), an inner surface of the bottom area 732c is configured to be bent according to the shape of the heater 731, and length L1 of the inner cylindrical area 732a in the extending direction is shorter than length L2 of the outer cylindrical area 732b in the extending direction. The heater 731, the pressing component 733 and the thermal insulation liner 734 are successively arranged in the internal space Is from the bottom area 732c to an opening 732d. During the stain removing operation, an outer surface 732e of the bottom area 732c is pushed against the clothes 10A. The guiding frame 732 is made of, for ex-

ample, aluminum with high heat conductivity. Therefore, since heat from the heater 731 can be rapidly transferred to the clothes 10A, and the temperature can be rapidly lowered after use, the stain removing device 700 can be stored and carried immediately after use.

[0085] The heater 731 is an annular component formed by coiling a nickel-chromium electric heating wire and is powered by the USB connector CC1 and a power supply connector 735 to generate the heat. Furthermore, the electric power supplied to the heater 731 is, for example, about 5W; and the temperature of the heater 731 when generating the heat is set to about 80°-100°. Furthermore, the heater 731 can also be other heaters such as a ceramic heater.

[0086] The pressing component 733 is an annular component having a pressing surface 733a, the shape of which is bent according to the shape of the heater 731 with a circular longitudinal section. The pressing component 733 restricts the movement of the heater 731 by abutting the pressing surface 733a against the heater 731 in the internal space 1s, and prevent the heat of the heater 731 from being transferred to the rib 709a.

[0087] The thermal insulation liner 734 is a silicon-made annular component having a gap with the inner cylindrical area 732a of the guiding frame 732 in the internal space 1s and installed along the outer cylindrical area 732a, and comprises a cylindrical area 734a abutted against the outer cylindrical area 732a and the pressing component 733 and a flange area 734b extending outwardly from the end of the cylindrical area 734a.

[0088] The power supply connector 735 shown in Figs. 12(b) and 13 protrudes from the internal space 1s, is installed on an opening end surface of the guiding frame 732 and embedded with a main body side connector (not shown in the figure) arranged at the side of the shell main body 709, and the heater 731 is electrically connected with the external power supply BB via the power supply connector 735.

[0089] The rib 709a is inserted into the waterproof cover part 706 through the internal space 1s, so that the inserted rib 709a is abutted against the inner circumferential surface 734c of the thermal insulation liner 734 and the waterproof cover part is installed on the shell main body 709. At this time, the end surface of the outer cylindrical area 732b of the guiding frame 732 is abutted against the shell main body 709 via the flange area 734b of the thermal insulation liner 734, thereby the waterproof cover part 706 is positioned in the vibration direction; and moreover, the flange area 734b plays a role in separating the shell main body 709 from the outer cylindrical area 732b. Further, as shown in Fig. 12(c), length L3 of the rib 709a in the vibration direction is shorter than length L4 of the thermal insulation liner 734 in the vibration direction, and the top end of the rib 709a is disposed at a position separated from the pressing component 733. Moreover, the thermal insulation liner 734 is disposed between the outer cylindrical area 732b of the guiding frame 732 and the rib 709a, and a thermal insulation

space Gp is formed between the inner cylindrical area 732a of the guiding frame 732 and the rib 709a (refer to Fig. 12(a)). Further, since the length L1 of the inner cylindrical area 732a is shorter than the length L2 of the outer cylindrical area 732b of the guiding frame 732 as described above, in combination with the situation that the shell main body 709 and the outer cylindrical area 732b of the guiding frame 732 are separated by the flange area 734b, the top end of the inner cylindrical area 732a is disposed at a position separated from the shell main body 709. In this way, when the waterproof cover part 706 is installed to the shell main body 709 by using the internal space 1s with the heater 731 built-in, since the pressing component 733 and the guiding frame 732, which become high temperature due to the heat of the heater 731, do not directly contact with the shell main body 709 including the rib 709a, the main body of the stain removing device 700 is prevented from being damaged by the heat from the waterproof cover part 706.

[0090] Furthermore, in order to prevent the guiding frame 732 and the clothes 10A from being overheated, the waterproof cover part 706 may also be provided with a temperature regulation portion such as a temperature regulator for adjusting the power supply state to the heater 731 according to the temperature of the heater 731. In addition, the waterproof cover part 706 may also be provided with a temperature display portion such as a thermosensitive tape for displaying the temperature of the guiding frame 732. Therefore, the temperature of the waterproof cover part 706 can be controlled by a user.

[0091] On the other hand, although the functions of a vibration unit 702, a liquid containing part 703 and a water supply path 704 are the same as those of the stain removing device 300 of the third embodiment, as shown in Fig. 12(a), the shape and the positions in the shell main body 709 are different from those of the stain removing device 300 of the third embodiment.

[0092] Specifically, as shown in Fig. 12(a), a third gear 722C constituting the vibration unit 702 is provided with 2 bulges 722c, which are protruded radially at equal intervals in the circumferential direction, instead of the bulges 22c which extend parallel to the axis 122ee (refer to Fig. 6). The number of vibrations per unit time of the head part 1 can be adjusted according to the number of the bulges 722c; and the beating action of the head part 1 in the present embodiment is set to 15 to 20 times per one second. Furthermore, the number of the bulges 722c is not limited to 2 and may also be 1 or 3 or more.

[0093] Furthermore, the barrel 721, which also constitutes the vibration unit, is configured such that a part of a second component 721y is integrally fitted to the outer circumference of the closed-end cylindrical first component 721x in the vibration direction, a spiral spring containing portion 721a is arranged inside the first component 721x, in the part of the closed-end cylindrical second component 721y overlapped with the first component 721x and facing the head part 1, a liquid storage portion 721b, an inserted portion 721c and an inserted segment

1121g are arranged. The second component 721y covers the first component 721x up to the center of the vibration direction substantially, and a snap-fitting claw 1721b that can be in snap fit with the bulge 722c of the third gear 722C is formed at the end of the second component 721x on the side of the first component 721x.

[0094] This spiral spring containing portion 721a contains the other end of the spiral spring 24 and a fixed portion 793 which is formed by a component different from the shell main body 709 and which has a basic end fixed to the shell main body 709.

[0095] The liquid storage portion 721b comprises a wide portion 1721d which is wider than an opening 1721g of the shell main body 709 and a narrow portion 1721e which is narrower than the opening 1721g of the shell main body 709 and which is protruded from the opening 1721g, and the wide portion 1721d is blocked by a limiting component 709b which is arranged along the edge of the opening of the shell main body 709, thereby limiting the moving range of the barrel 721 towards the protruding direction Y1. Furthermore, the limiting component 709b for the barrel is made of elastic materials such as rubber, polyurethane resin, so that the damage of the barrel 721 and the shell main body 709 can be inhibited; and moreover, the noise produced when the stain removing device 700 is operated can be suppressed. In addition, in order to suppress the noise when the stain removing device 700 is operated, it is also effective that the shell main body 709 is integrally or substantially integrally designed into a double structure and the components such as the vibration unit 702 are embedded into the shell main body 709. Furthermore, since the shell main body is of the double structure, the fixing component such as screws fixed to the inner side of the shell can be shielded by the outer side of the shell, so that the appearance designability of the stain removing device can be improved.

[0096] The inserted portion 721c comprises a conical water supply hole 1721f extending from the narrow portion 1721e and the inserted segment 1121g, which has a width approximately the same as that of the narrow portion 1721e and into which the cylindrical insertion portion 12 of the head part 1 is inserted in a slightly pressing manner.

[0097] The bottom surface 703a of the containing portion main body 703a of the liquid containing part 703 is inclined towards one end 741a of the liquid supply tube 741, and the shape of the containing portion main body 703a is different from that of the containing portion main body of the stain removing device 300 of the third embodiment. Furthermore, the other end 741b of the liquid supply tube 741 with one end 741a connected with the liquid containing part is connected with the wide portion 1721d of the barrel 721. Furthermore, a spiral spring 741c is wound in the vicinity of the other end 741b of the liquid supply tube 741 to prevent the immobility of the liquid caused by the bending of the flexible liquid supply tube 741.

[0098] Furthermore, the switch SS in the present em-

bodiment is a sliding-type switch; and the operation portion SS1 of the switch SS is provided with three sliding positions, i.e. a closed position as shown in Figs. 12(a) and 13(a), a first sliding position as shown in Fig. 13(b) and a second sliding position as shown in Fig. 13(c). Specifically, when the operation portion SS1 is in the closed position, it is a power-off state not supplying power to either of the motor 23 of the vibration unit 702 and the heater 731; and when the operation portion SS1 is in the first sliding position, it is a preheating state only supplying power to the heater 731 via the power supply connector 735. Further, when the operation portion SS1 is in the second sliding position, it is a heating and beating state supplying power to both the heater 731 and the motor 23 of the vibration unit 702.

[0099] Therefore, in the preheated state, the waterproof cover part 706 is pushed against the clothes 10A to heat the clothes 10A; and when the clothes 10A are heated to a certain degree, the switch SS is switched to the heating and beating state to perform the stain removing operation in a state of heating the clothes 10A.

[0100] Thus, in the stain removing device 700 of the present embodiment, the waterproof cover part 706 pushed against the clothes 10A is heated by the heat of the heater 731 when the stain removing operation is performed. Therefore, even if the heating device 601 shown in Fig. 10 is not additionally used, the stained portion and its vicinity of the stain removing object can be always heated by the waterproof cover part 706 in the process of stain removing operation, thereby realizing the miniaturization and further improving the stain removing effect. Furthermore, assuming that the heater is provided in the head part rather than the waterproof cover part, the heat can only be discontinuously transferred to the clothes 10A, and the clothes 10A cannot be efficiently heated.

[0101] Furthermore, in the stain removing device 700 of the present embodiment, an LED, which is turned on when the heater 731 is in a power supply state, can also be provided. In this way, the user can control the situation where the waterproof cover part 706 is being heated.

[0102] Furthermore, the waterproof cover part 706 of the present embodiment can be removed from the shell main body 709; and the waterproof cover part 6 with no heater of the stain removing device 100 of the first embodiment shown in Fig. 1 can also be installed on the shell main body 709 of the stain removing device 700 according to the fouling condition of the clothes 10A and the available electric power.

[0103] Further, although the switch SS is of a sliding type in the present embodiment, the switch SS can also be of other types such as a knob switch or a button switch.

[0104] In addition, the stain removing device 700 of the present embodiment and the heating device 601 shown in Fig. 10 can also be collectively used as described above, so that the clothes 10A can be more efficiently heated, and the stain removing effect can be further improved.

[0105] Although one embodiment of the present dis-

closure is described above, the specific structure of each portion is not limited to the above-mentioned embodiment.

[0106] For example, although the stain removing devices 100-500 and 700 of the above embodiments are used with the beating surface 111 of the head part 1 facing downwards, the beating surface 111 also can be used in the transverse direction. In this case, the liquid is, for example, sent out by a pump.

[0107] Furthermore, although the beating surface 111 of the head part 1 (refer to Fig. 1, etc.) and of the head part 151 (refer to Fig. 4) in the above embodiments is flat (planar), the shape of the beating surface 111 is not limited thereto and can also be a concave-convex shape as shown in Fig. 14. Fig. 14 is a view illustrating a variation example of the head part 1 shown in Fig. 1. Specifically, Fig. 14(a) is a perspective view illustrating a head part 171; Fig. 14(b) is a side view illustrating the head part 171; and Fig. 14(c) is a bottom view illustrating the head part 171. As shown in Figs. 14(a) and (b), the beating surface 172 formed at the beating portion 171a of the head part 171 comprises a basic portion 172a and surfaces 172ba of a plurality of bulges 172b protruding from the basic portion 172a. As shown in Figs. 14(b) and (c), each bulge 172b is of a semispherical shape, and the bulges are regularly arranged in the basic portion 172a. In the stain removing devices 100-500 and 700 of the present disclosure, head parts with different shapes, such as the head parts 171 and 1, can be appropriately replaced according to the type of the dirt constituting the stained portion 10a, so that the stains can be more efficiently removed.

[0108] Furthermore, in the above embodiments, although the head part 1 is a replaceable structure capable of being unplugged from the barrel 21, the head part 1 can also be an unpluggable structure. Further, the head part 1 can also rotate around an axis parallel to the vibration direction by using the stroke action.

[0109] Furthermore, in the above embodiments, a mechanism for heating the liquid in the stain removing devices 100-500 and 700 and a structure for dripping the heated liquid onto the clothes 10A can be used, thereby further improving the stain removing effect.

[0110] Further, the material of the components constituting the stain removing devices 100-500, 700 and the heating device 601 is not limited to the material shown by hatched lines in the drawings.

[0111] Furthermore, in the above embodiments, in the case where only the water as the liquid drips from the stain removing devices 100, 300, 500, 700, it is effective to apply the detergent directly onto the stained portion 10a of the clothes 10A beforehand when the stain removing operation is performed. In this case, the stain removing devices 100, 300, 500, 700 achieve the stain removing effect by performing the beating action while supplying the water; and the dripped water transfers the dirt and detergent onto the absorption liner 10B by virtue of further continuous action, so the rinsing effect can be

realized.

[0112] Furthermore, in the above embodiments, although the waterproof cover part 6 is of a cylindrical shape, the waterproof cover part can also be in a shape that the sectional diameter is increased towards the protruding end 61 of the waterproof cover part. Accordingly, the stain removing devices 100-500 can be stably pushed against the clothes 10A.

[0113] Various variations can be made to other structures without departing from the spirit and scope of the present disclosure.

Description of reference numerals:

[0114] 1, 151, 171: head part; 2, 302, 702: vibration unit; 3, 703: liquid containing part; 4, 158, 704: water supply path; 41a: one end of the water supply path; 1121h: discharging port (the other end of the water supply path); 6, 706: waterproof cover part; 7: detergent containing part; 8: detergent supply unit; 24: elastic component (spiral spring); 61: protruding end of the waterproof cover part; 100, 300, 400, 500, 700: stain removing device; 111, 172: beating surface; 159: liquid amount adjusting portion; 508: steam injection unit; 601: heating device; 631, 731: heater; 651: heating plate; 651 a: beaten surface; 600: stain removing unit.

Claims

1. A stain removing device, comprising:

a head part formed with a beating surface;
a vibration unit allowing the head part to vibrate in a direction substantially orthogonal to the beating surface by power supply;
a liquid containing part configured to contain liquid; and
a water supply path having one end connected with the liquid containing part and the other end opened in the periphery of the head part, wherein the liquid is supplied from the other end of the water supply path to the periphery of the head part along with vibration of the head part caused by the vibration unit.

2. The stain removing device according to claim 1, wherein

a non-flexible waterproof cover part encircling a side surface of the head part is further comprised, the vibration unit comprises an elastic component capable of extending and contracting in the direction substantially orthogonal to the beating surface, the head part being protruded by an elastic force of the elastic component, and
an action end on one side of the head part is set at a position which is slightly protruded from a protruding end of the waterproof cover part.

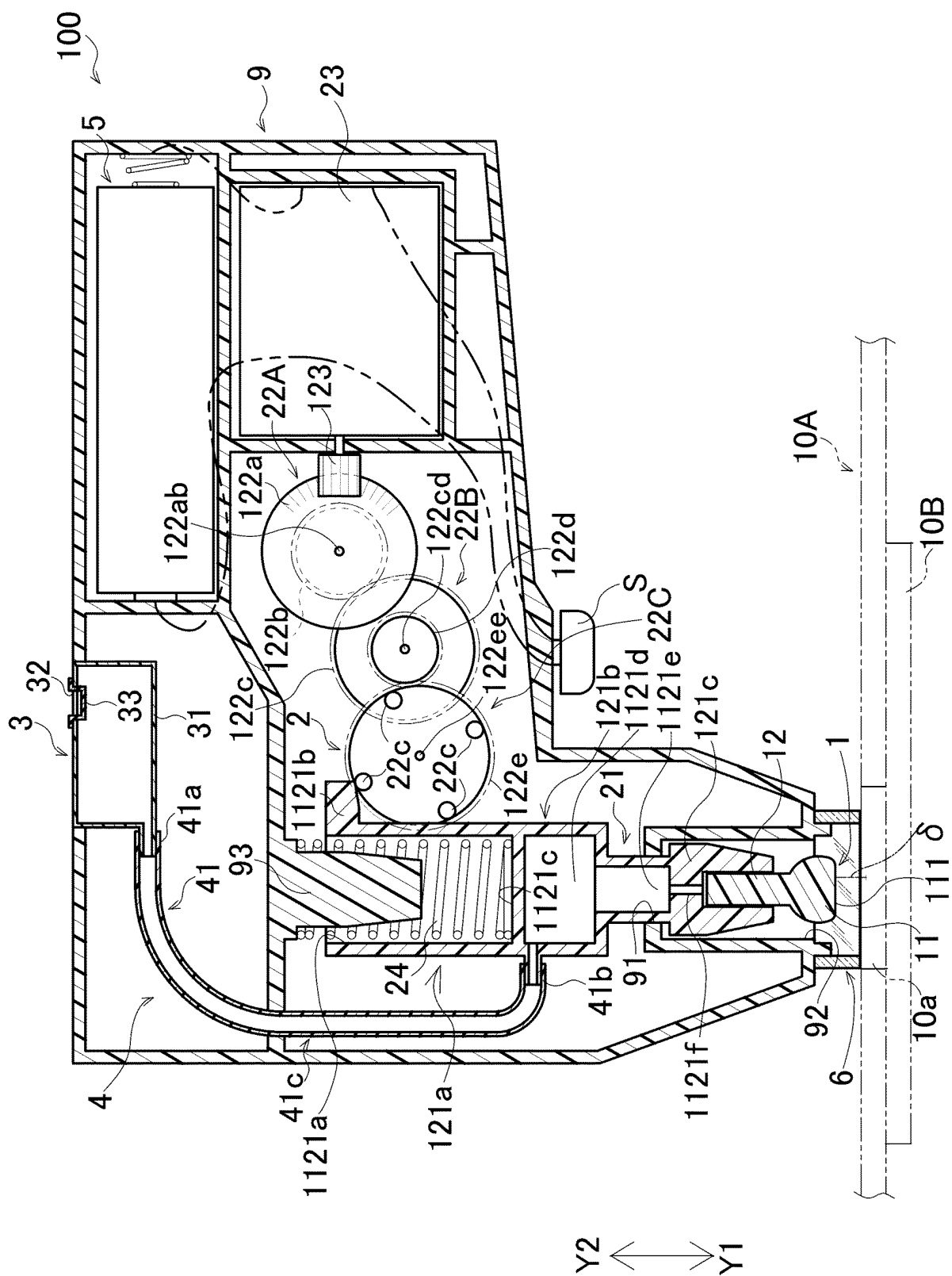
3. The stain removing device according to claim 2,
wherein
the waterproof cover part comprises a heater which
generates heat by power supply. 5
4. The stain removing device according to any one of
claims 1 to 3, further comprising
a liquid amount adjusting portion enabling the liquid
to drip from the other end of the water supply path
by means of the vibration caused by the vibration 10
unit and being capable of adjusting the dripping
amount of the liquid.
5. The stain removing device according to any one of
claims 1 to 3, further comprising: 15
- a detergent containing part holding liquid deter-
gent; and
a detergent supply unit supplying the detergent
in the detergent containing part to the periphery 20
of the head part.
6. The stain removing device according to any one of
claims 1 to 3, further comprising: 25
- a steam injection unit capable of injecting steam
towards the head part.
7. A stain removing unit, comprising: 30
- the stain removing device of any one of claims
1 to 3; and
a heating device, which at least comprises a
heater generating heat by power supply, and a
heating plate having a beaten surface and trans- 35
ferring the heat generated by the heater, the
head part constituting the stain removing device
applying an external force to the beaten surface.

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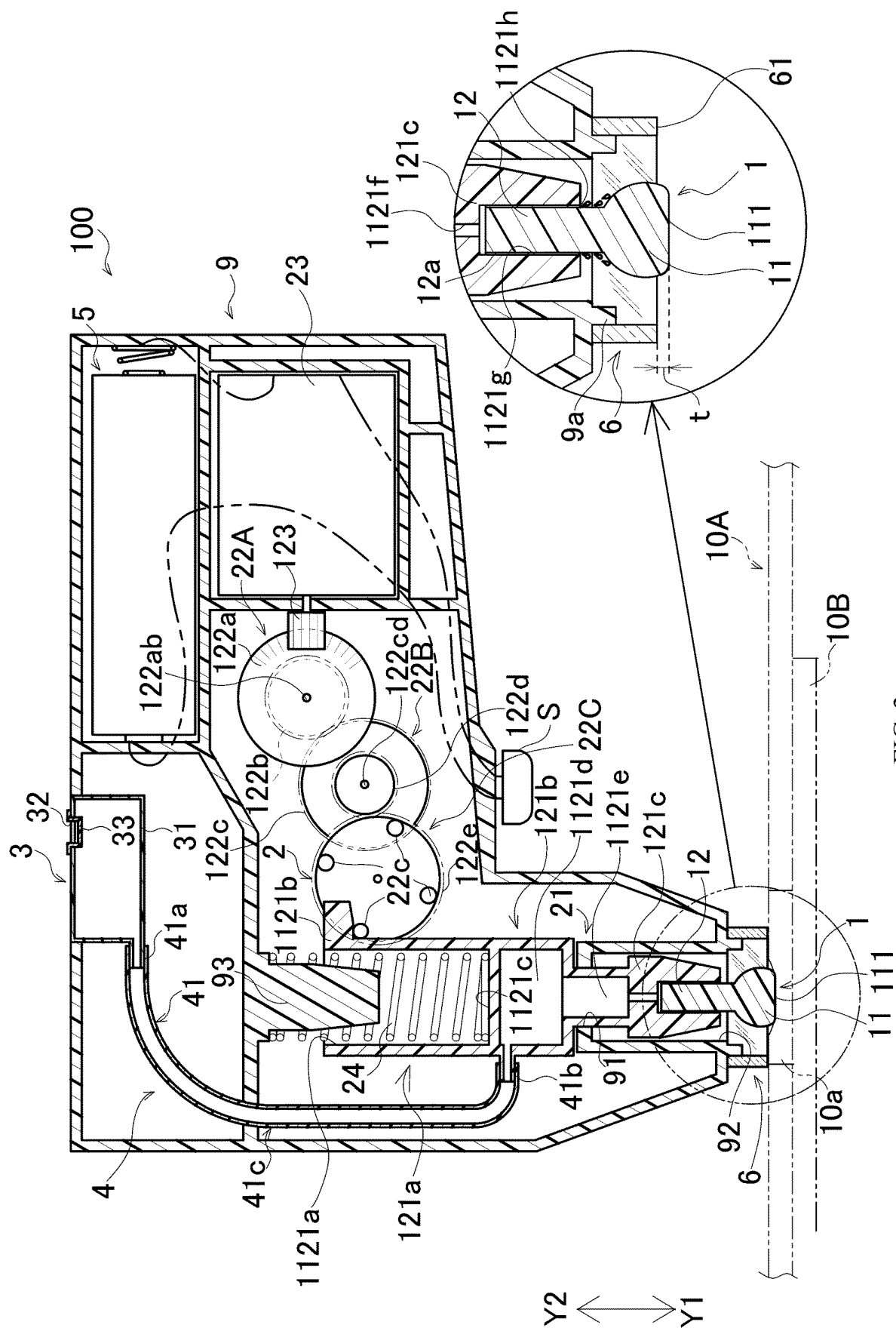


FIG. 2

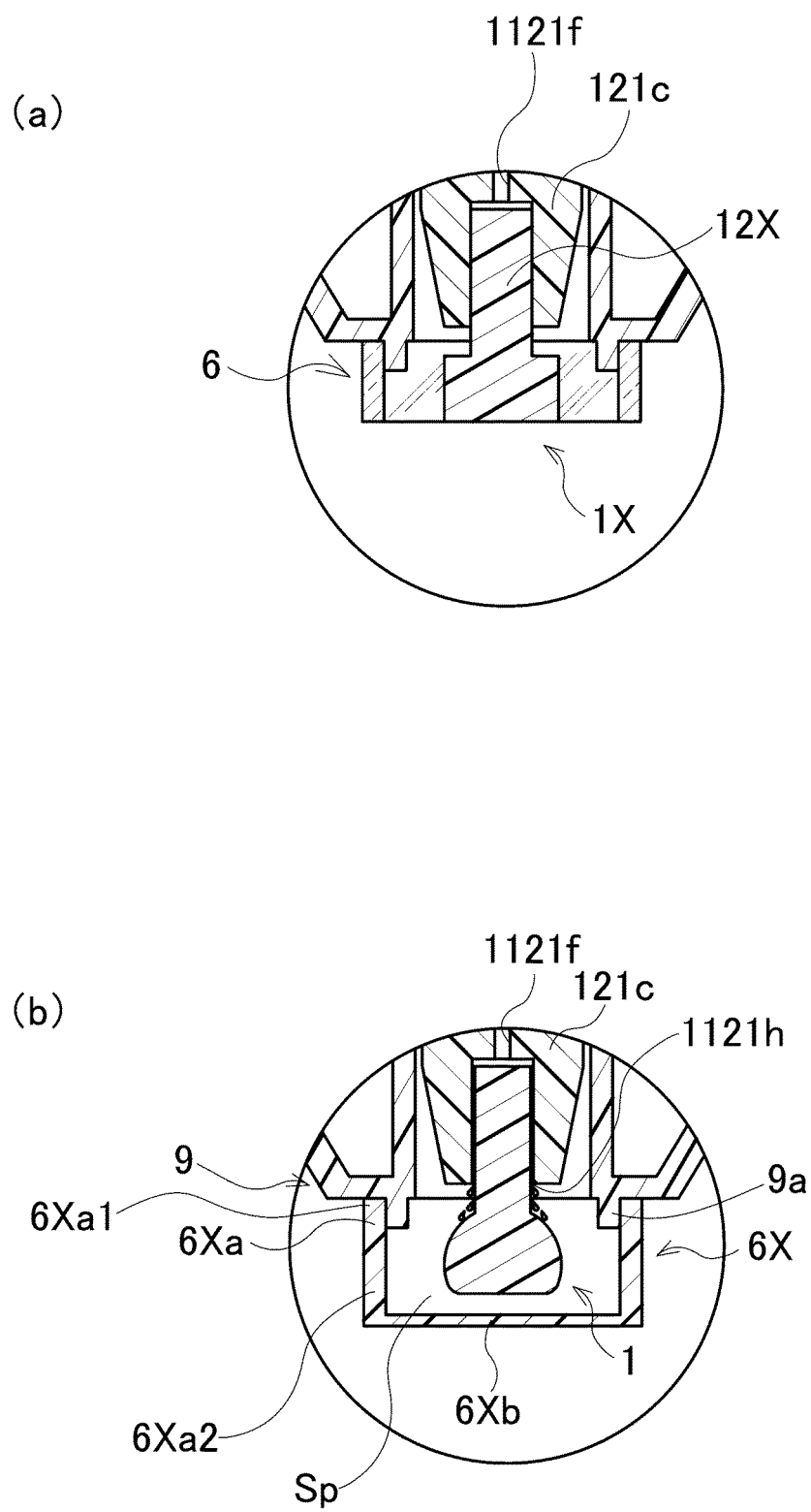


FIG. 3

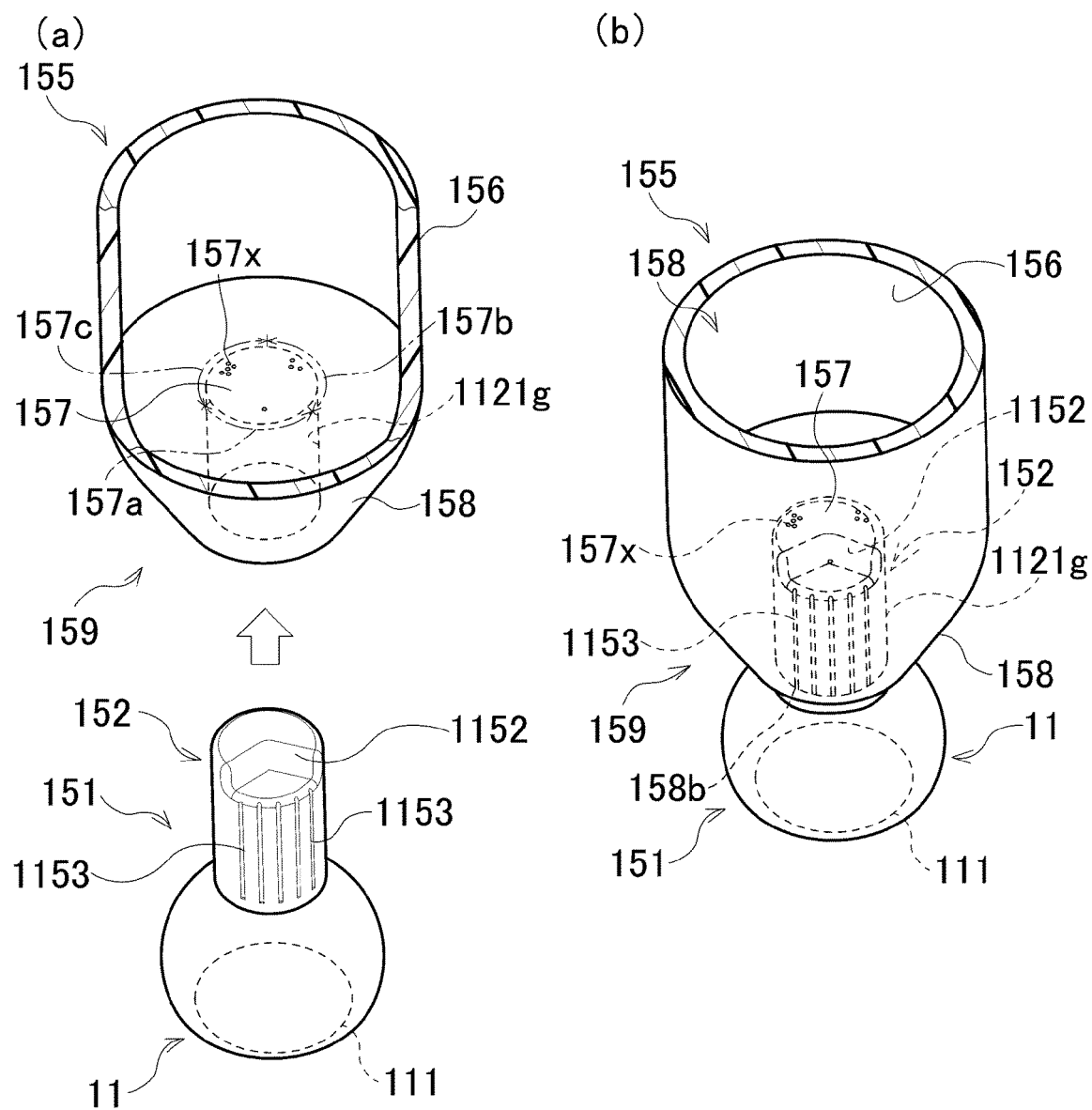
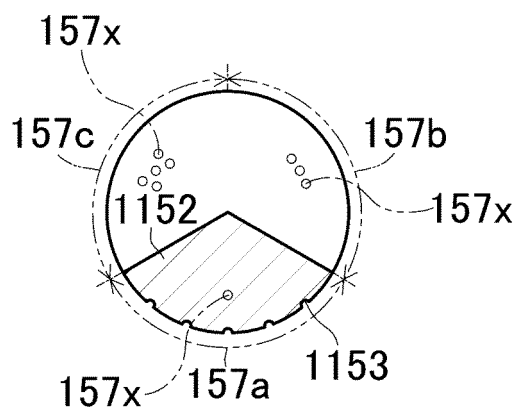
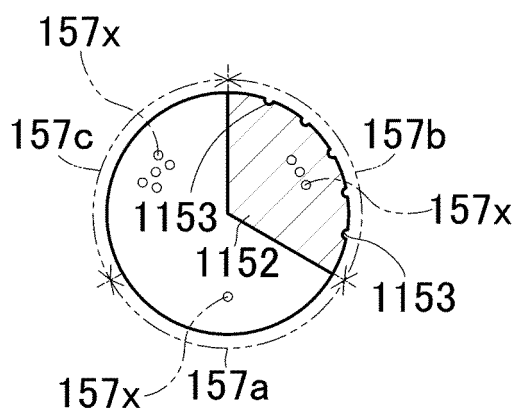


FIG. 4

(a)



(b)



(c)

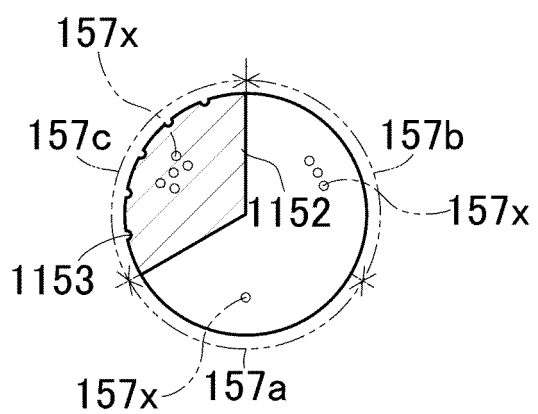


FIG. 5

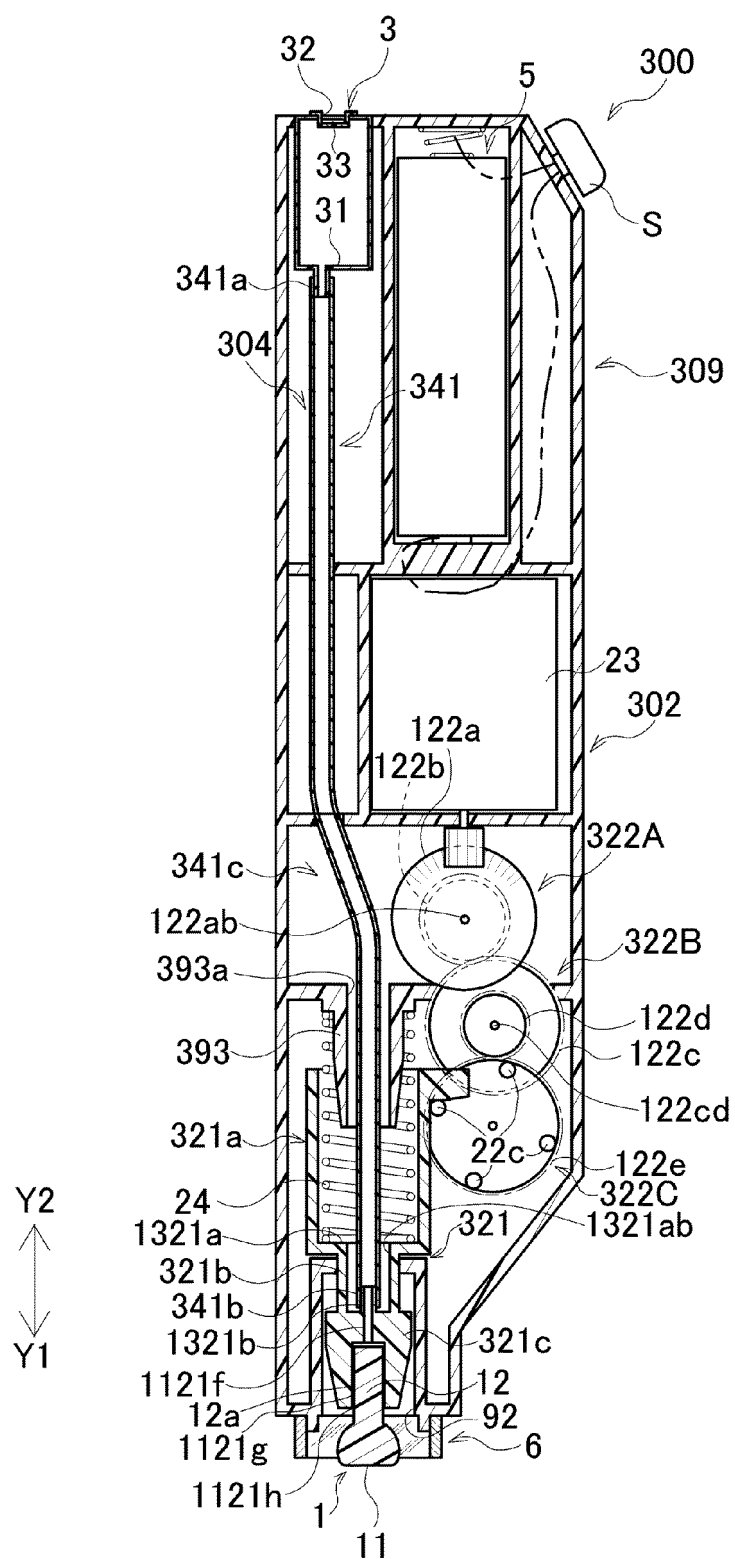


FIG. 6

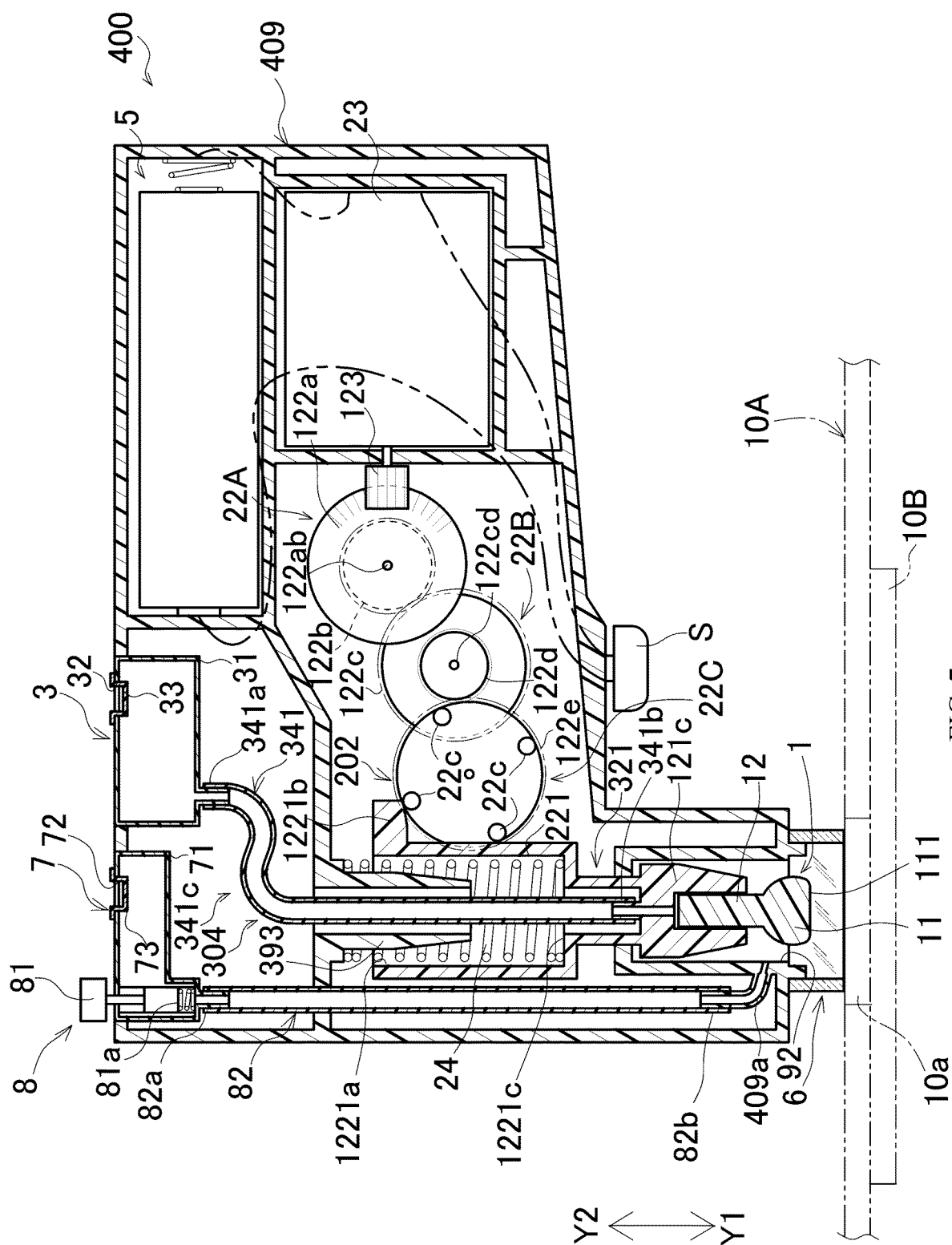


FIG. 7

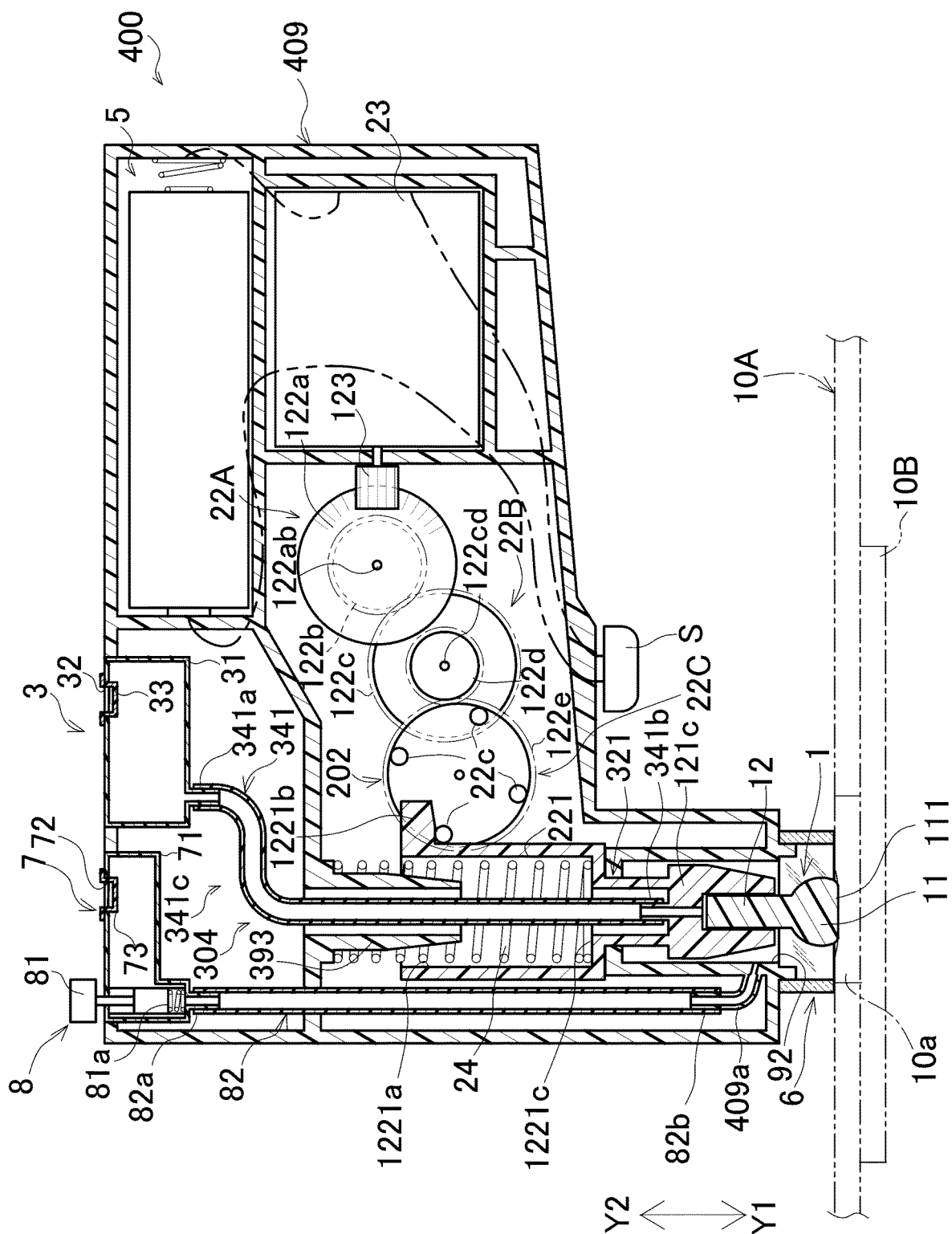


FIG. 8

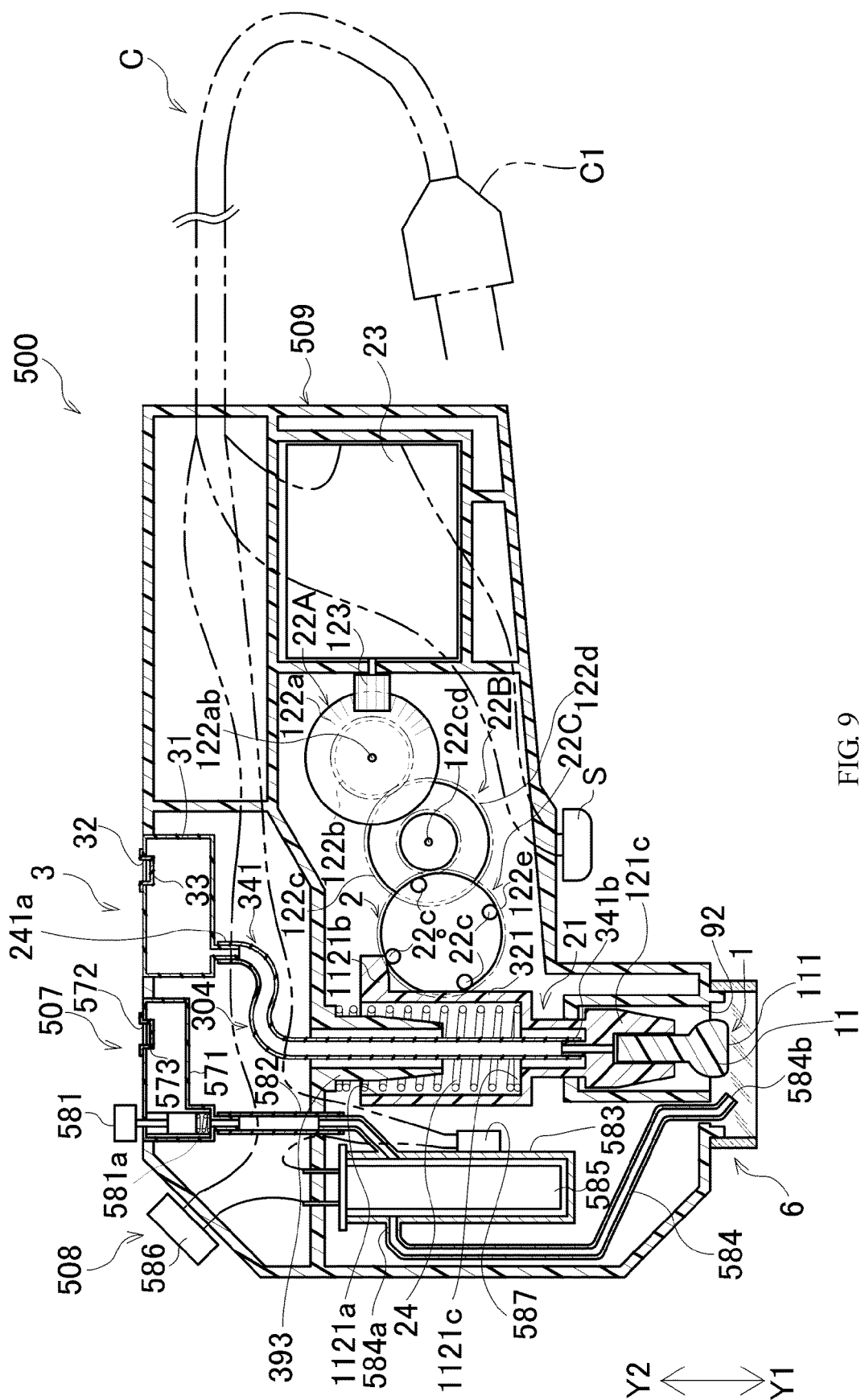


FIG. 9

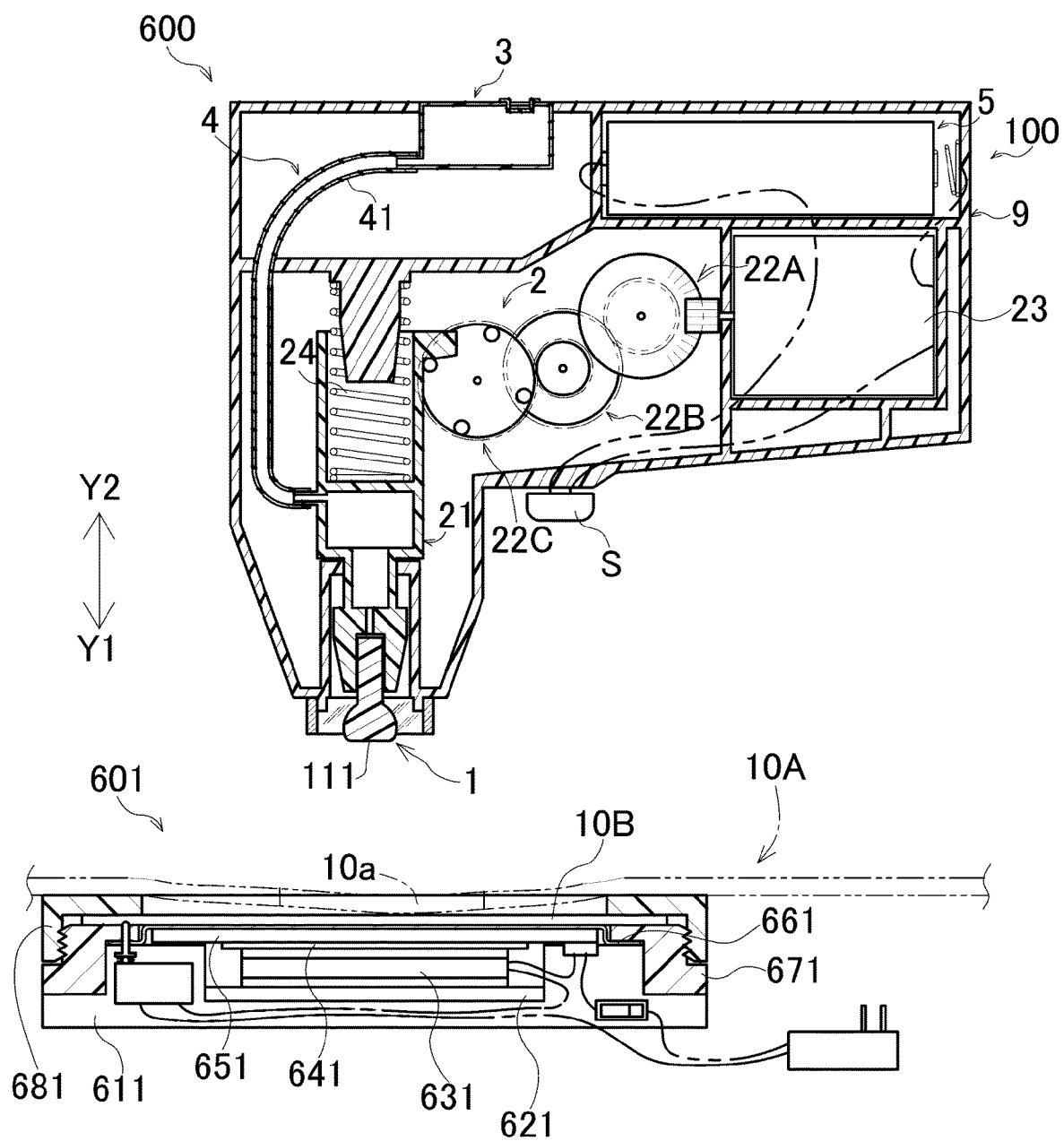


FIG. 10

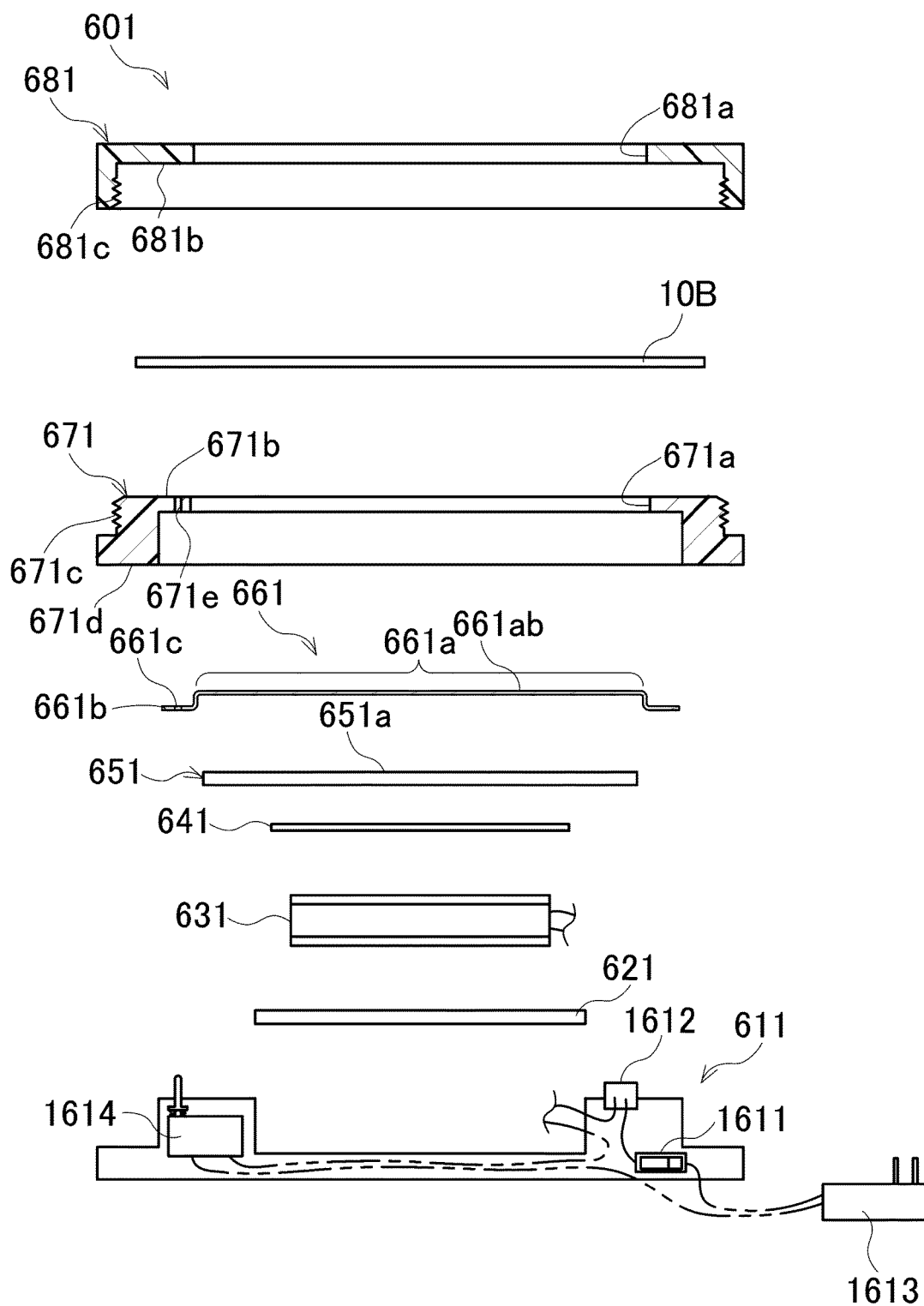


FIG. 11

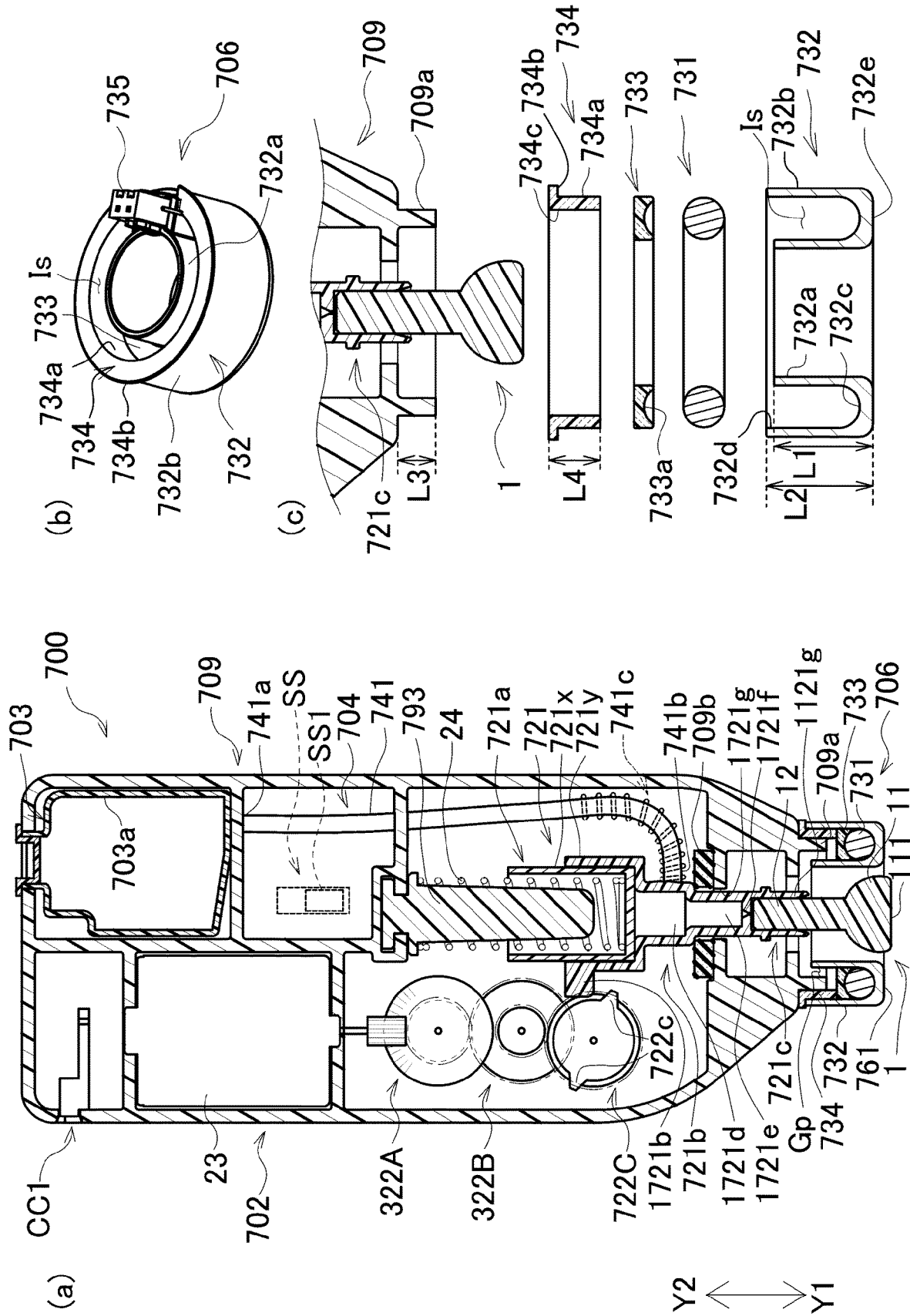


FIG.12

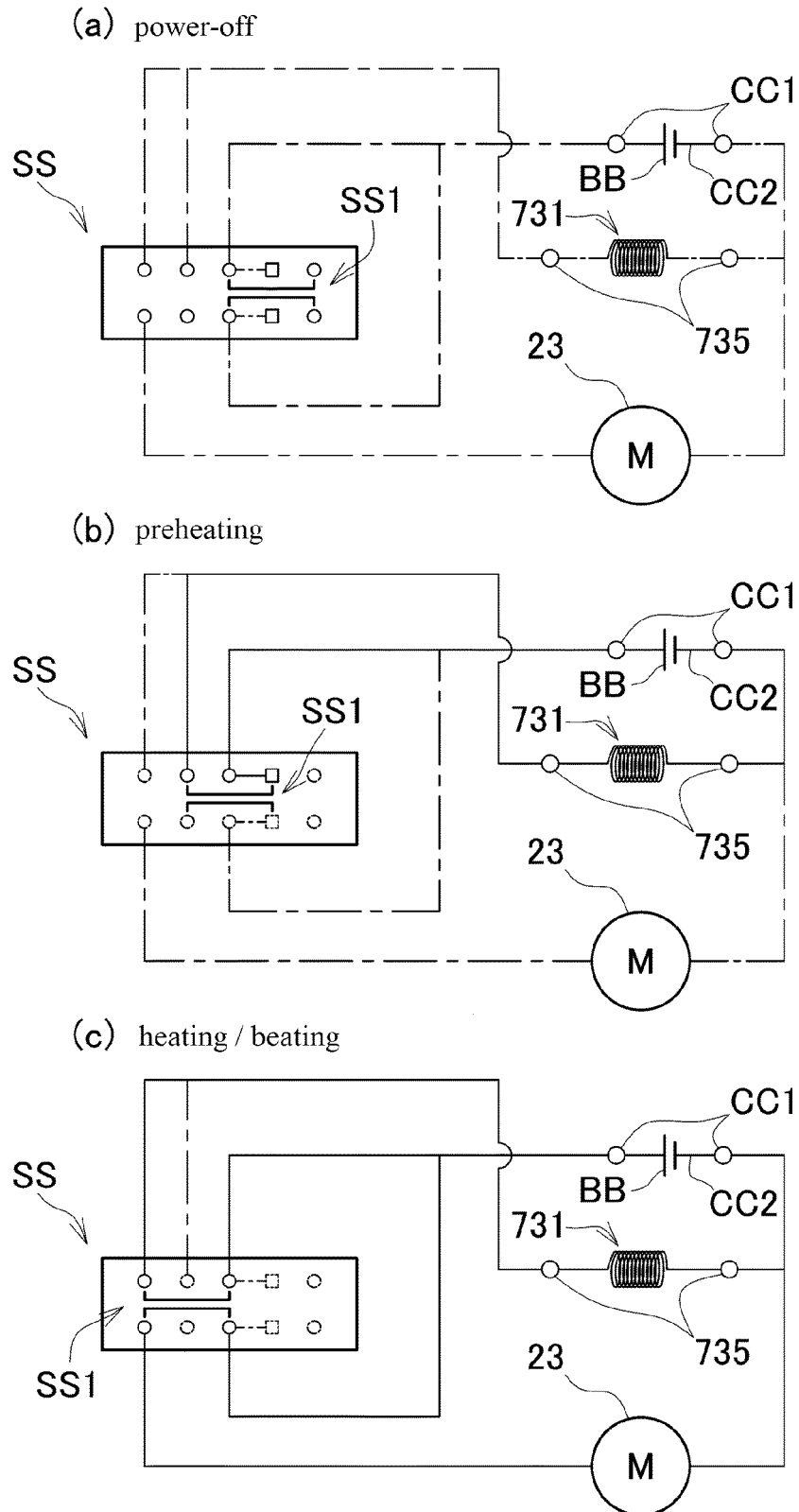


FIG. 13

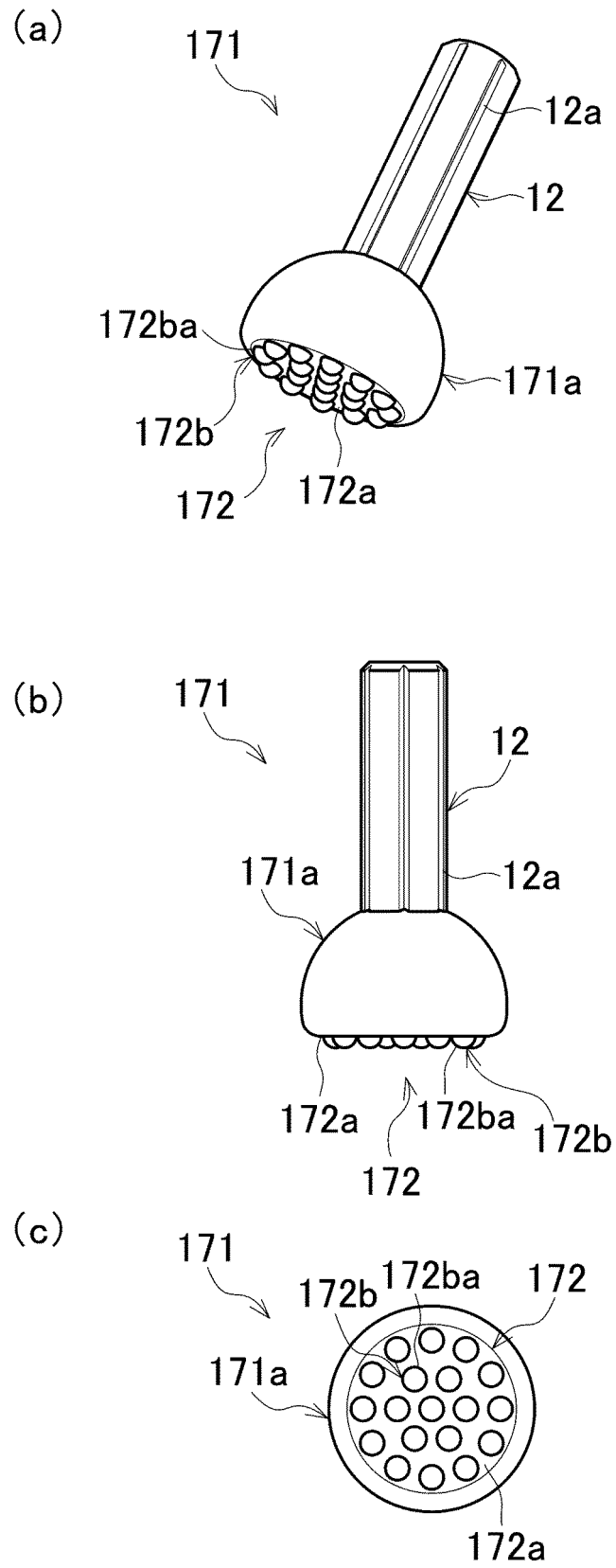


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/077300

A. CLASSIFICATION OF SUBJECT MATTER

D06F 7/04 (2006.01) i

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)

D06F

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)

CNABS; VEN; CNKI: stain, remov+, clean, part, knock, vibration, fabric, cloth+, laundry

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001310165 A (KAO CORP.), 06 November 2001 (06.11.2001), description, paragraph 51, and figures 1 and 12	1-7
A	CN 103485116 A (WUXI LITTLE SWAN CO., LTD.), 01 January 2014 (01.01.2014), the whole document	1-7
A	CN 201040803 Y (LU, Xinjin), 26 March 2008 (26.03.2008), the whole document	1-7
A	US 5402657 A (TECHNICAL ADVANTAGE), 04 April 1995 (04.04.1995), the whole document	1-7

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

* Special categories of cited documents:

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

16 July 2015 (16.07.2015)

Date of mailing of the international search report

28 July 2015 (28.07.2015)

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Authorized officer

FU, Guixin

Telephone No.: (86-10) 62084564

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/077300

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2001310165 A	06 November 2001	None	
CN 103485116 A	01 January 2014	WO 2014205868 A1	31 December 2014
CN 201040803 Y	26 March 2008	None	
US 5402657 A	04 April 1995	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003000996 A [0005]