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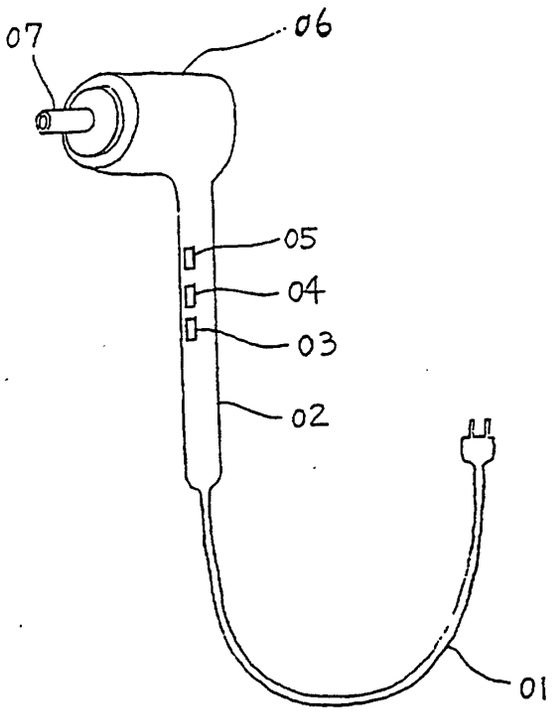
(54) MACHINE FOR RELIEVING ATHLETE'S FOOT

(57) During the seasons from the early summer to the early autumn when the temperature and humidity are high, ringworm fungus (Trichophyton) proliferate in the skin of patient's feet infected with athlete's foot if he or she keeps wearing shoes for a long time. As a result, vesicles are formed on the skin of the patient to induce a subjective symptom of itching, giving discomfort to the patient. The present invention is to provide a machine for inhibiting proliferation of ringworm fungus (Trichophyton) by applying a shear load and a compressive load repeatedly to an affected part on the skin surface of a patient's sole of foot having been infected and exacerbated with ringworm fungus (Trichophyton). This machine applies a load with a beat number of 180 to 900 per minute and a beat intensity of 78 N to 108 N, with a columnar beater (diameter: ca. 11 mm) having a recess at the center being applied to the skin.

Figure 1



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Description

TECHNICAL FIELD

[0001] According to the present invention, a shear load and a compressive load are applied repeatedly at a rate of 20 minutes per day to an affected part on the skin surface of a patient's sole of foot having been infected and exacerbated with athlete's foot, thus healing vesicles and relieving itching of the patient in 2 or 3 days. The present invention relates to a machine for relieving athlete's foot. In addition, even if the patient wears socks and shoes again, the degree of proliferation of athlete's foot is extremely lowered.

BACKGROUND ART

[0002] Athlete's foot include typical athlete's foot with blisters, which takes on the arch of the sole of foot, around the heel, the roots of toes, etc. If a patient infected with it wears shoes for a long time in a high-temperature atmosphere, blisters (vesicles) form on the skin of foot to induce a subjective symptom of itching, and the patient cannot keep wearing the shoes in some cases. The symptom of athlete's foot is induced when ringworm fungus(Trichophyton) takes on the skin and proliferates there.

[0003] Even if the skin is infected with ringworm fungus (Trichophyton), the fungus cannot proliferate during the cold season, so that no vesicles are formed on the skin. Therefore, the affected part appears to be unaffected, and the patient has no subjective symptom of itching.

[0004] Meanwhile, once affected, it is extremely difficult to cure completely. Even the slightest spores which have survived during the winter will start to proliferate at the beginning of the next summer.

[0005] There are two general treatment techniques for athlete's foot, which follows: One is to apply an ointment or solution containing a substance having antitrichophyton action to affected parts, and the other is to irradiate artificial ultraviolet light to affected parts, thus killing ringworm fungus(Trichophyton).

[0006] Even such treatment techniques cannot kill ringworm fungus(Trichophyton) completely, but if the patient puts socks and shoes on, the fungus proliferates in 2 or 3 hours due to the hot and humid condition in the shoes and causes the affected parts to take a turn for the worse. It is out of the question for ordinary people to go along without wearing socks and shoes, so that the condition does not ease off until autumn when the temperature drops.

DISCLOSURE OF THE INVENTION

[0007] If a shear load and a compressive load are applied repeatedly at a rate of 20 minutes per day to an affected part on the skin surface of a patient's sole of foot having been infected and exacerbated with ringworm fungus (Trichophyton), vesicles disappear and itching is relieved in 2 or 3 days. In addition, even if the patient wears socks and shoes again, the degree of proliferation of ringworm fungus(Trichophyton) is extremely low.

[0008] The present invention provides a machine for applying a shear load and a compressive load for such purposes.

[0009] Currently there is no such commercially available machine for relieving athlete's foot.

[0010] Meanwhile, the degrees of the shear load and the compressive load to be applied to the skin using this machine exert no ill effect upon the skin of persons with normal bone structure and the like.

[0011] If an affected part is treated with the machine of the present invention, hyphae and spores of ringworm fungus (Trichophyton) are prevented significantly from proliferating by the shear load and the compressive load applied to the skin, and this treatment shows an extremely prolonged antitrichophyton action. Repeated daily applications of this treatment exhibit high recurrence inhibitory effect compared with the treatment with chemical agents. This inhibitory effect lasts even after a patient has walked around in his or her shoes for 7 or 8 hours.

[0012] Although it is not likely that the machine of the present invention has an effect of killing ringworm fungus (Trichophyton) completely all over the foot, it has an effect of significantly inhibiting proliferation of the fungus, causing no occurrence of vesicles, nor the subjective symptom of itching. Thus, even a person affected with athlete's foot can be relieved from sore skin and itch, so that he or she can feel as if the disease had been cured completely. Therefore, the patient is relieved from the itch of athlete's foot during the summer.

[0013] In addition, while the effects of chemical agents applied to the skin cannot be exerted to the depth of the skin, the machine of the present invention exerts the antitrichophyton action to the depth of the skin. Since blisters of the skin (vesicles) form as a physical reaction induced by ringworm fungus (Trichophyton) proliferated at the depth of the skin, the present invention is innovative compared with chemical agents in terms of effect and deserves special mention in that the former exerts its effect to the depth of the skin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is an outline view of the machine for relieving athlete's foot according to the present invention;

Fig. 2 is an illustration showing a situation where an affected part on the skin of the foot is treated using the machine of the present invention;

Fig. 3 is an illustration showing the machine of the present invention acting upon an affected part on the skin;

Fig. 4 shows an example of electric circuit in the machine of the present invention;

Fig. 5 shows another example of electric circuit in the machine of the present invention;

Fig. 6 is a schematic drawing of a beater which is designed to be separated for replacement; and

Fig. 7 shows another example of the configuration of the tip of the beater.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] Fig. 1 shows an outline view of the apparatus for relieving athlete's foot according to the present invention. The machine is composed essentially of a power cord 01, a handle 02, a power switch 03, a beat number controller 04, a beat intensity controller 05, a main body 06 and a beater 07.

[0016] As shown in Fig. 2, the power cord 01 is plugged into a 100 V single-phase AC wall socket, and a patient grips the handle 02, turns on the power switch 03 and applies the beater 07 to an affected part on the skin 08 of the foot to apply a shear load and a compressive load repeatedly. This means that the beater 07 beats the affected part continuously. The beat number controller 04 and the beat intensity controller 05 adjust the number of beats per minute and the beat intensity, respectively.

[0017] A load with a beat number of 180 to 900 per minute and a beat intensity of 78 N to 108 N is effective and gives no pain to the foot.

[0018] Fig. 3 shows a state where the beater 07 is applying a shear load and a compressive load to the skin 08 of the foot. The beater 07 is column-shaped and has a diameter of about 11 mm at the lower end face. The end face has an annular peripheral ridge with a width of about 1 mm and a recess with a depth of about 1 to 3 mm formed at the center. A portion of the skin 09 to which the annular peripheral ridge is applied undergoes the compressive load, while a portion of the skin 10 spaced away about 1 to 2 mm from the portion 09 undergoes the shear load. By applying such loads repeatedly to the skin 08 all over the foot, while shifting the position of applying the loads little by little, the affected part entirely is subjected to the shear load and the compressive load.

[0019] The configuration of the lower end of the beater 07 is not limited to that shown in Fig. 3, and may be any so long as it can apply a shear load and a compressive load.

[0020] The expression "compressive load" referred to herein means the load which compresses the skin perpendicularly inward. Meanwhile, the expression "shear load" means such a load as is exerted to the skin at the boundary between the portion where the compressive load is acted and the portion where no compressive load is acted in such a way that the skin is bent to form a step along the boundary.

[0021] While athlete's foot takes mainly on the skin of foot, athlete's foot diseases developed in other parts of the body, for example, the skin of hand can be treated likewise.

[0022] Fig. 4 shows an example of electric circuit diagram of the machine for relieving athlete's foot of the present invention. The circuit contains a power cord 01, a power switch 03, a beat number controller 04, a beat intensity controller, a beater 07, a coil 11, an iron core 12, a helical compression spring 13, a reciprocating section 14 and a conductor 15.

[0023] These components are integrated into the inside of the handle 02 and the main body 06.

[0024] When the power cord 01 is plugged into a 100 V single-phase AC wall socket and the power switch 03 is turned on, an electric current flows through the conductor 15 to energize the coil 11.

[0025] The energization of the coil 11 magnetizes electrically the iron core 12. Since the reciprocating section 14 is made of an electromagnet, it is attracted by the magnetic force toward the iron core 12. The reciprocating section 14 compresses the compression spring 13 when it moves toward the iron core 12. If the electric circuit is turned off temporarily by the beat number controller 04 immediately after the compression of the spring 13, the iron core 12 is demagnetized, so that the reciprocating section 14 is caused to return to the original position by the resilience of the spring 13. That is, if the beat number controller 04 turns off temporarily the electric circuit at intervals of 180 to 900 times per minute, the beater 07 attached to the tip of the reciprocating section 14 beats continuously the skin of foot. If a beat intensity controller 05 is incorporated into this circuit, the beat intensity can be controlled. The beat intensity controller 05 is a variable resistor.

[0026] This circuit diagram shows a simplest example for realizing the present invention, and the present invention can be realized by using other electric circuits.

[0027] The reason why the beat intensity is 78 N to 108 N is that the higher the beat intensity, the more effective for inhibiting proliferation of ringworm fungus (Trichophyton), but a maximum permissive intensity leaving no pain to the skin is about 108 N. The reason why the beat number is 180 to 900 per minute is that the more, the preferred for reducing the treating time, but if the beat number exceeds 900 per minute, the beat intensity is lowered, in turn, the inhibitory effect due to the structure utilizing the electromagnet. The stroke of the beater 07 is suitably 4 to 7 mm. The reason why a stroke of about 4 to 7 mm is suitable is to secure the beat intensity and to increase the beat number.

[0028] The machine for applying repeatedly a shear

load and a compressive load to the skin is not necessarily limited to that shown in Fig. 4, and the machine may contain the electric circuit as shown in Fig. 5.

[0029] The electric circuit contains a power cord 1, a power switch 03, a beater 07, a coil 11, a conductor 15, a pulse selector 16, a selected pulse time length controller 17, a magnetic pipe 18, an attractable section 19, a coil spring 20 and a shaft 21.

[0030] In this circuit, the pulse selector 16 serves as the beat number controller 04 in Fig. 4, while the selected pulse time length controller 17 serves as the beat intensity controller 05.

[0031] The power cord 01 is plugged into a 100 V single-phase AC wall socket, and a patient grips the handle 02 as shown in Fig. 2, and the beater 07 is pressed against the skin 08 of the foot. Thus, the coil spring 20 is compressed to push the shaft 21 downward in Fig. 5 and cause the attractable section 19 connected to the shaft 21 to be spaced away from the magnetic pipe 18. Next, when the power switch 03 is turned on, a one-way AC pulse current selected by the pulse selector 16 flows through the conductor 15, and the pulse current flows through the coil 11. This electrically magnetizes the magnetic pipe 18, and the attractable section 19 made of a magnetic material is attracted toward the magnetic pipe 18 by the magnetic force. When the attractable section 19 moves toward the magnetic pipe 18, the coil spring 20 is relieved and also beats the skin 08 of the foot with the beater 07. When the beater 07 is pressed continuously against the skin 08 of the foot, the electric circuit temporarily turned off to be demagnetized upon completion of the pulse current selected by the pulse selector 16. Thus, the beater 07 is pressed back from the skin 08 of the foot by counter-reaction of the force of pressing the handle 02, and the shaft 21 moves downward in Fig. 5 to carry the attractable section 19 to the original position, compressing again the coil spring 20. That is, when the pulse selector 16 selects 180 to 900 per minute as the number of turning on the electric circuit temporarily, the beater 07 connected to the attractable section 19 through the shaft 21 beats continuously the skin of the foot. A stroke of about 4 to 7 mm is effectively secured for the beater 07. If a selected pulse time length controller 17 is attached to the pulse selector 16 to be able to control a pulse time length and to reduce the ON period per pulse, the pulse current is reduced, and thus the beat intensity can be lowered accordingly.

[0032] That is, the selected pulse time length controller 17 can adjust the beat intensity from strong to weak. The beat intensity is preferably about 78 N to 108 N.

[0033] The electric circuit diagram is briefly shown here as an example for realizing the present invention, and other necessary equipment including a protecting circuit for protecting the circuit elements from surge voltage are of course incorporated into this circuit.

[0034] It is also possible to employ a constitution as shown in Fig. 6, in which the beater 07 is divided into a base 22 and a tip 23 so that the tip 23 can be replaced. Thus, the tip 23 can be replaced with a thinner tip 23 having a diameter of about 6 mm so that it can be inserted between the toes to apply there the compressive load and the shear load.

[0035] The power cords 01 shown in Figs. 4 and 5 are not necessarily plugged into 100 V single-phase AC wall sockets, but the object of the present invention can be fully attained if plugged into a 200 V single-phase AC wall sockets according to the locality and country.

[0036] The configuration of the skin beating portion at the tip of the beater 07 in Fig. 3 may be modified to have a ridge 24 and recesses 25 as shown in Fig. 7. According to this modification, a shear load and a compressive load can also be applied to the skin. The object of the present invention can be attained likewise by employing a skin beating portion of various other configurations.

INDUSTRIAL APPLICABILITY

[0037] Although it is not likely that the machine of the present invention has an effect of killing ringworm fungus (Trichophyton) completely all over the foot, it has an effect of significantly inhibiting proliferation of the fungus, causing no occurrence of vesicles, nor the subjective symptom of itching. Thus, even a person affected with athlete's foot can be relieved from sore skin and itch, so that he or she can feel as if the condition is cured completely. Therefore, the patient is relieved from the itch of athlete's foot during the summer. It is estimated that there are more than 10,000,000 patients suffering from athlete's foot, so that the machine for relieving athlete's foot according to the present invention is industrially applicability as a unit for treating athlete's foot.

Claims

1. A machine for inhibiting proliferation of ringworm fungus (Trichophyton) causative of ringwormed skin by applying a shear load and a compressive load repeatedly to an affected part on a skin of a patient infected with athlete's foot.

2. A motor-driven grip machine for inhibiting proliferation of ringworm fungus (Trichophyton) causative of ringwormed skin by applying a shear load and a compressive load repeatedly to a skin of a patient infected with athlete's foot.

3. A motor-driven grip machine for inhibiting proliferation of ringworm fungus (Trichophyton) causative of ringwormed skin by applying a shear load and a compressive load repeatedly to a skin of-a patient's foot infected with athlete's foot.

Figure 1

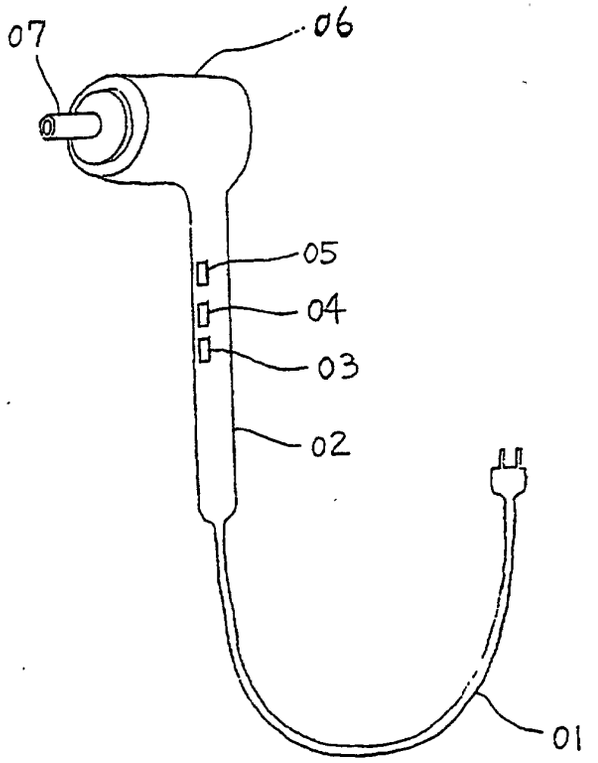


Figure 2

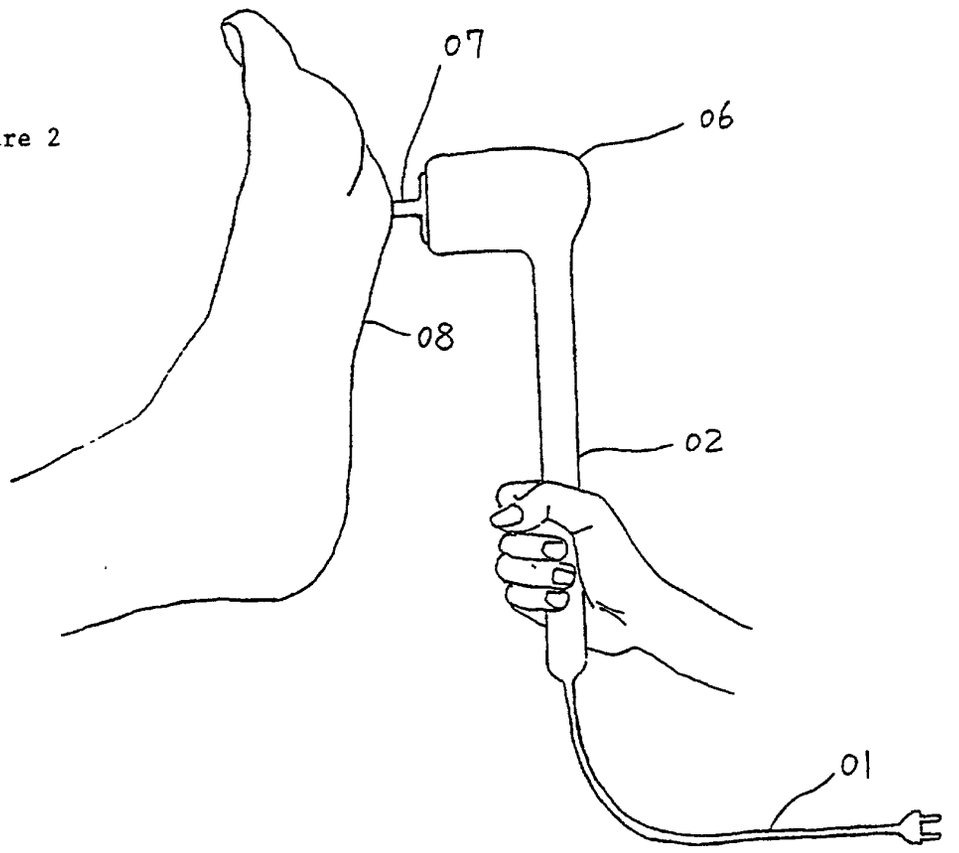


Figure 3

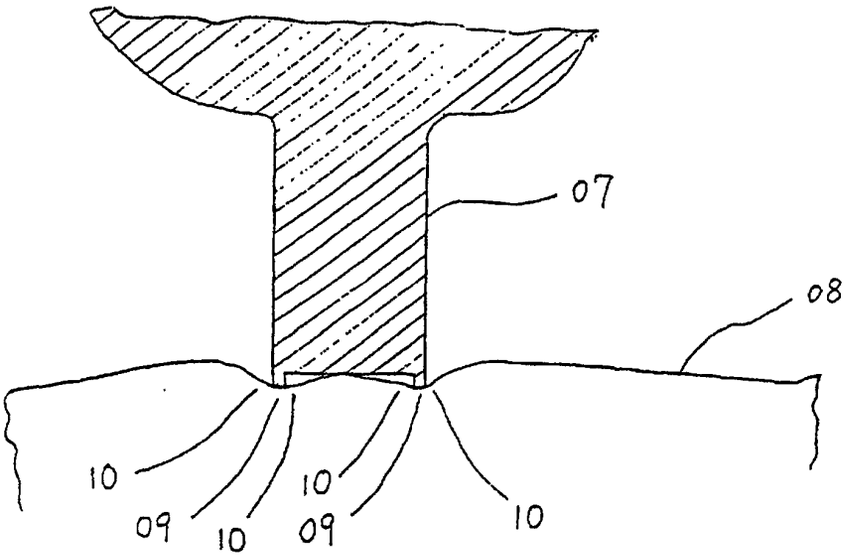


Figure 4

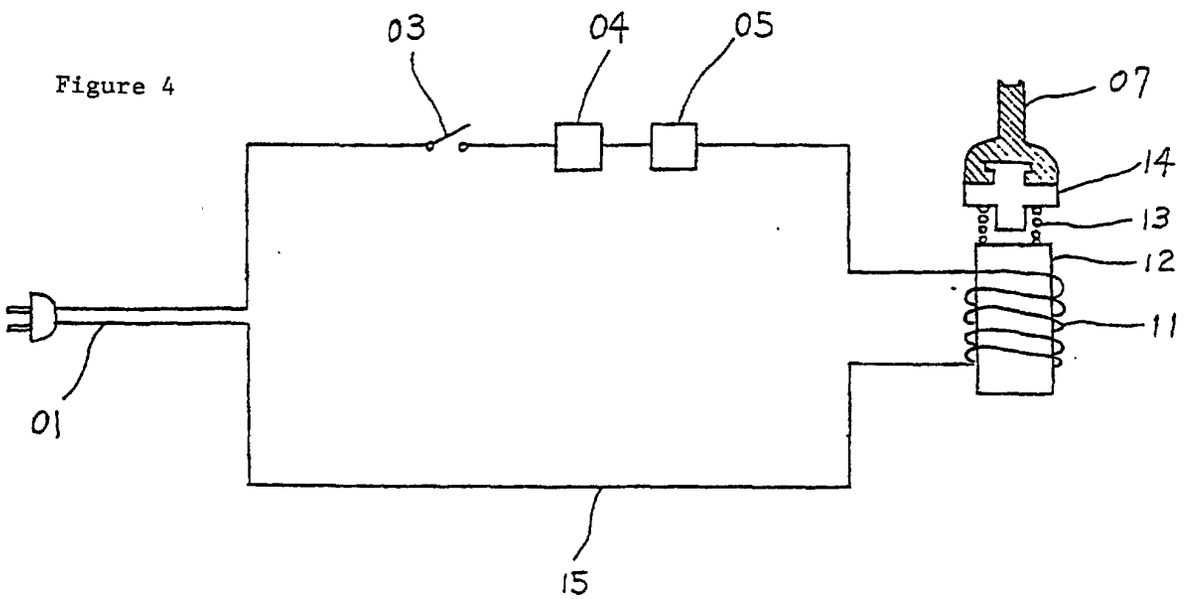


Figure 5

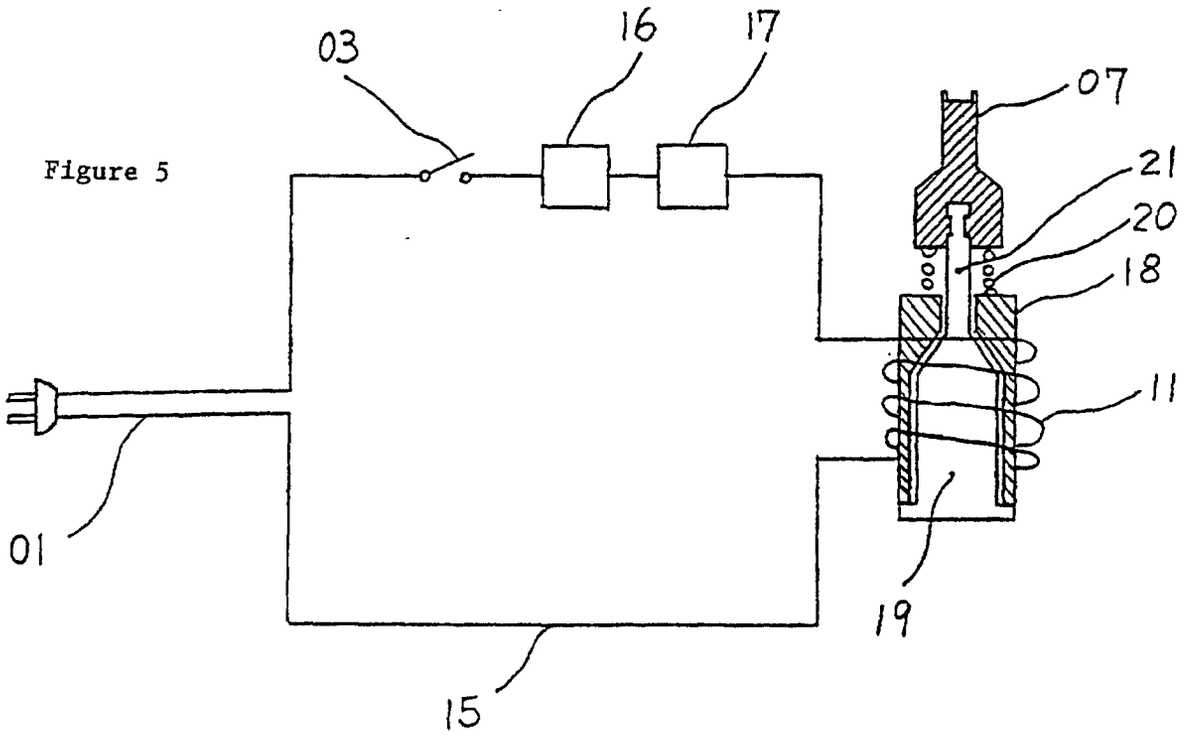


Figure 6

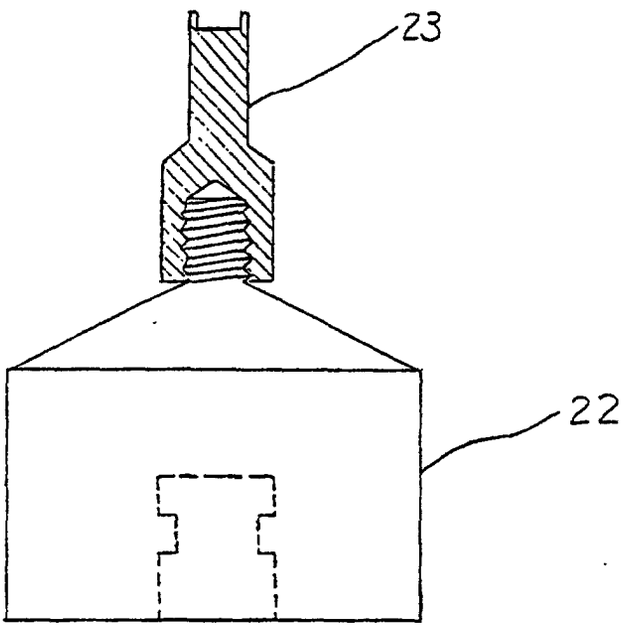
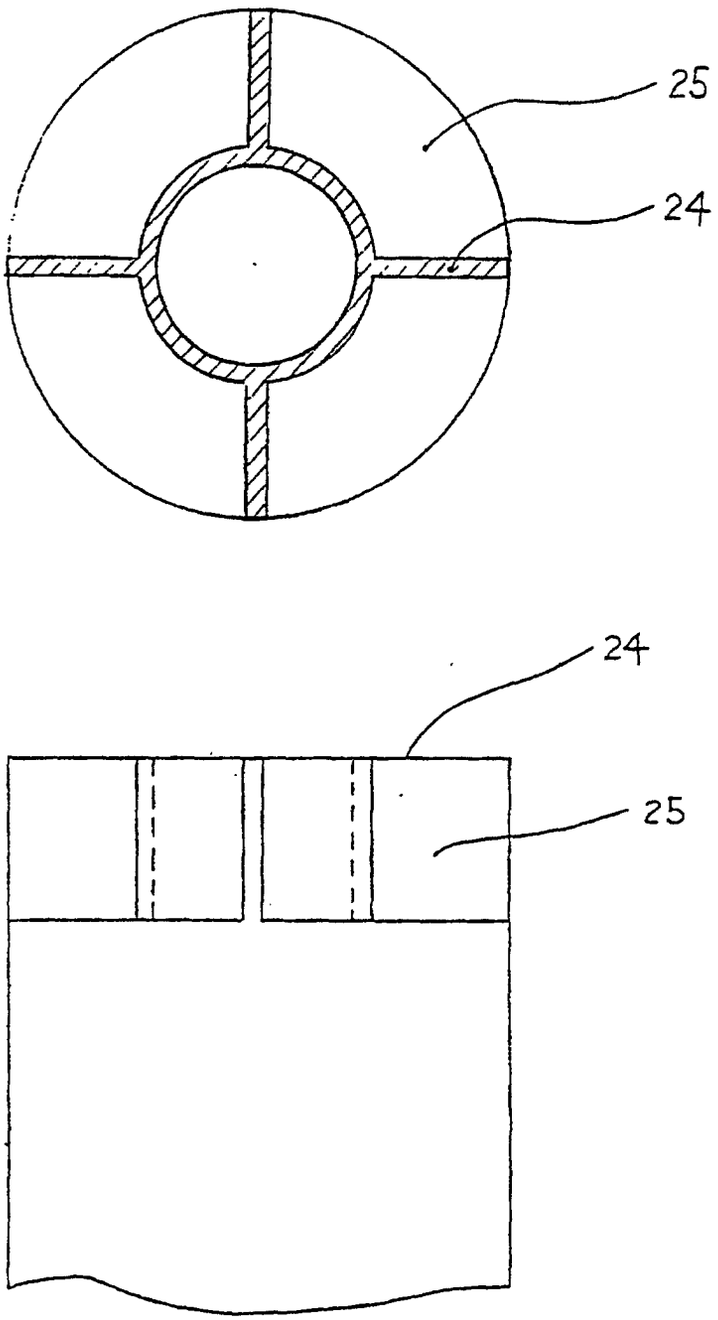


Figure 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/04154

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] A61H23/02

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)
Int.Cl[6] A61H23/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 57-173059, A (Tec Co., Ltd.), 25 October, 1982 (25. 10. 82), Full text ; Figs. 1 to 5 (Family: none)	1-3
A	JP, 60-99940, U (Shunzou Abe), 8 July, 1985 (08. 07. 85), Full text ; Figs. 1 to 3 (Family: none)	1-3

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
23 July, 1999 (23. 07. 99)	2 November, 1999 (02. 11. 99)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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