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(54) **COOLING SYSTEM FOR PATIENTS WITH FEVER**

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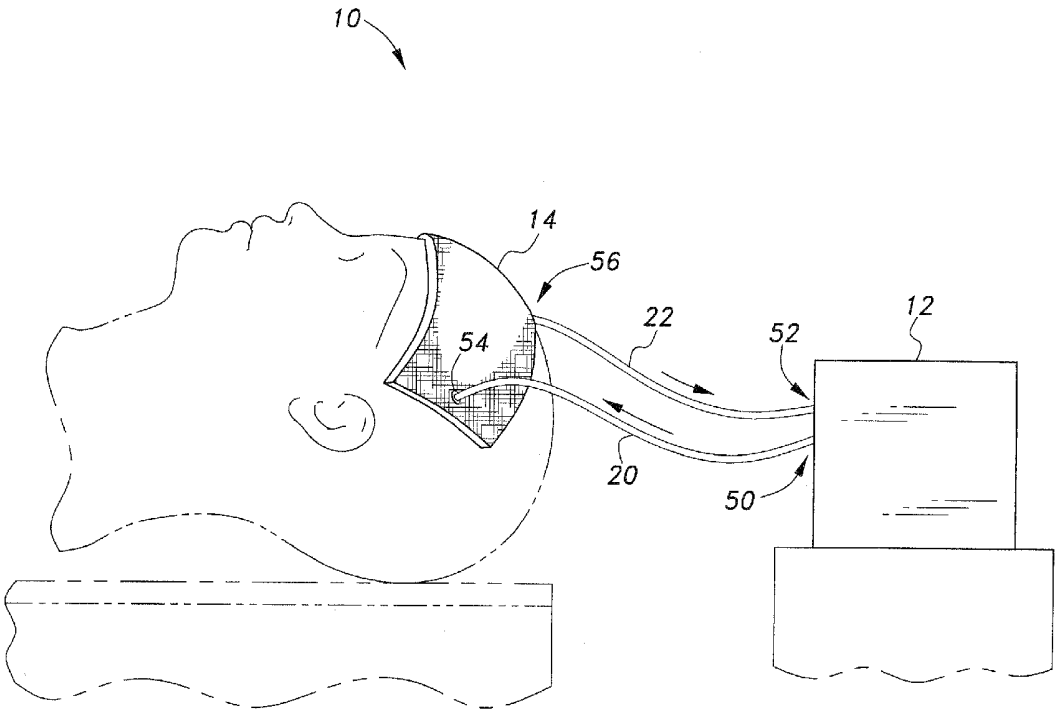
(57) **ABSTRACT**

The cooling system for patients with fever is a mechanical, fluid-based system for cooling patients suffering from fever. The cooling system for patients with fever includes a reservoir for containing a cooling fluid, which is maintained at a desired temperature. A temperature sensor is received in the reservoir. The temperature sensor is immersed in the cooling fluid for measuring the temperature thereof. A chiller is also received in the reservoir for selectively cooling the cooling fluid when the temperature thereof, measured by the temperature sensor, is above a pre-set temperature threshold. The reservoir communicates with a cooling pad, which is formed from a padded layer having at least one channel embedded therein. At least one pump and tubing is provided for circulating the cooling fluid through the reservoir and the cooling pad. In use, the cooling pad is applied to the skin of a patient with a fever.



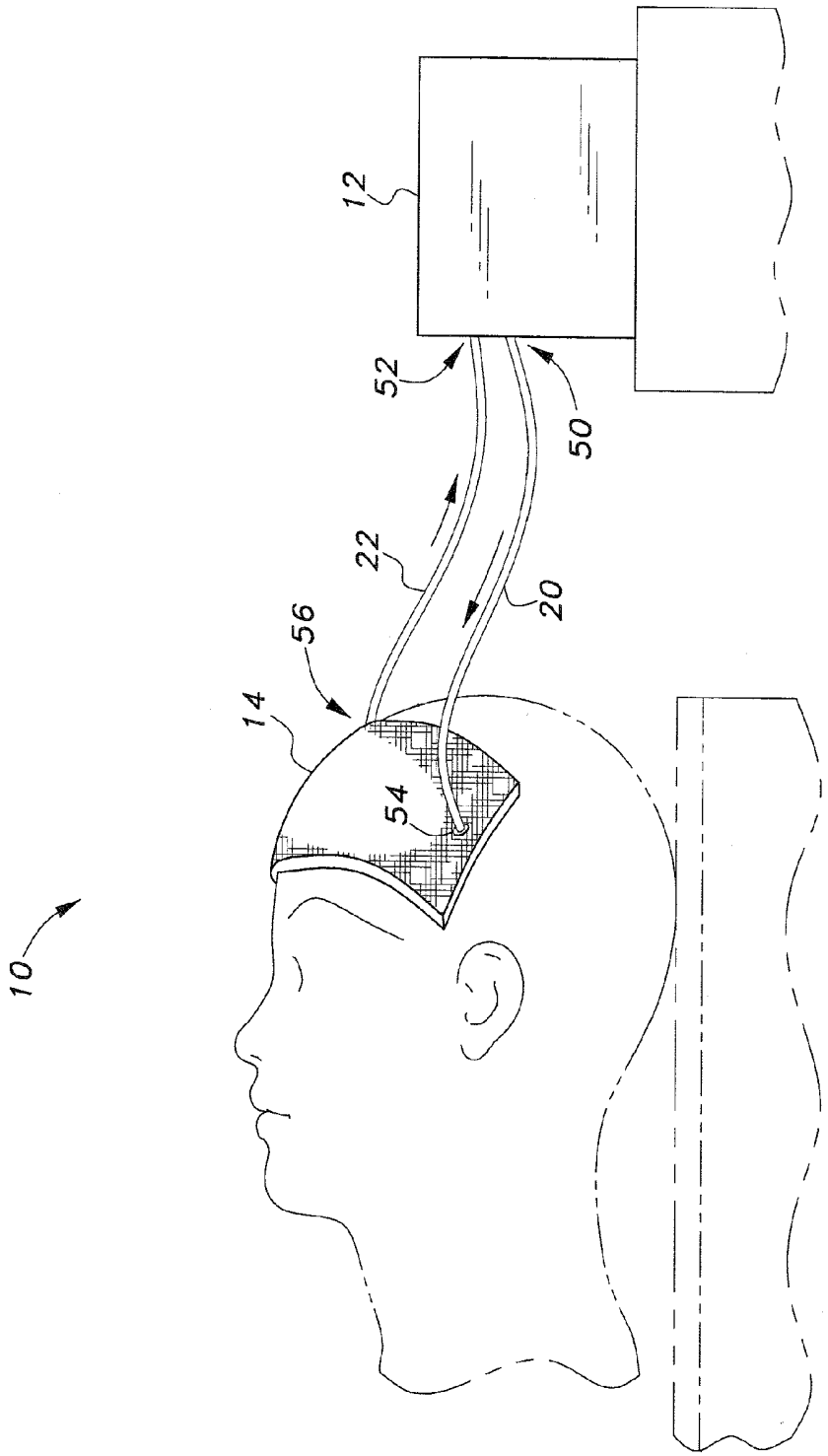


Fig. 1

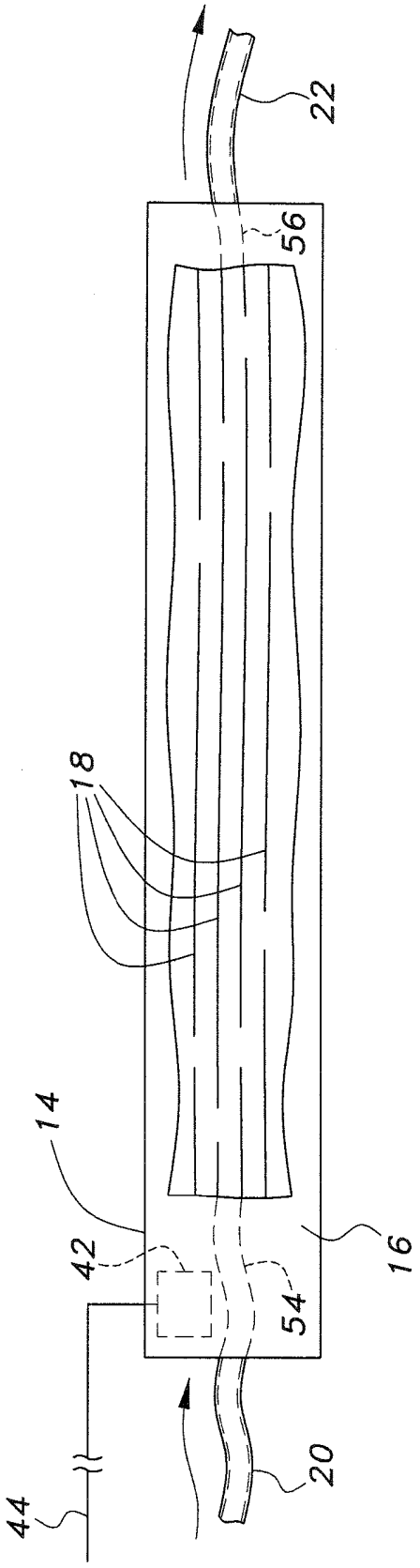


Fig. 2

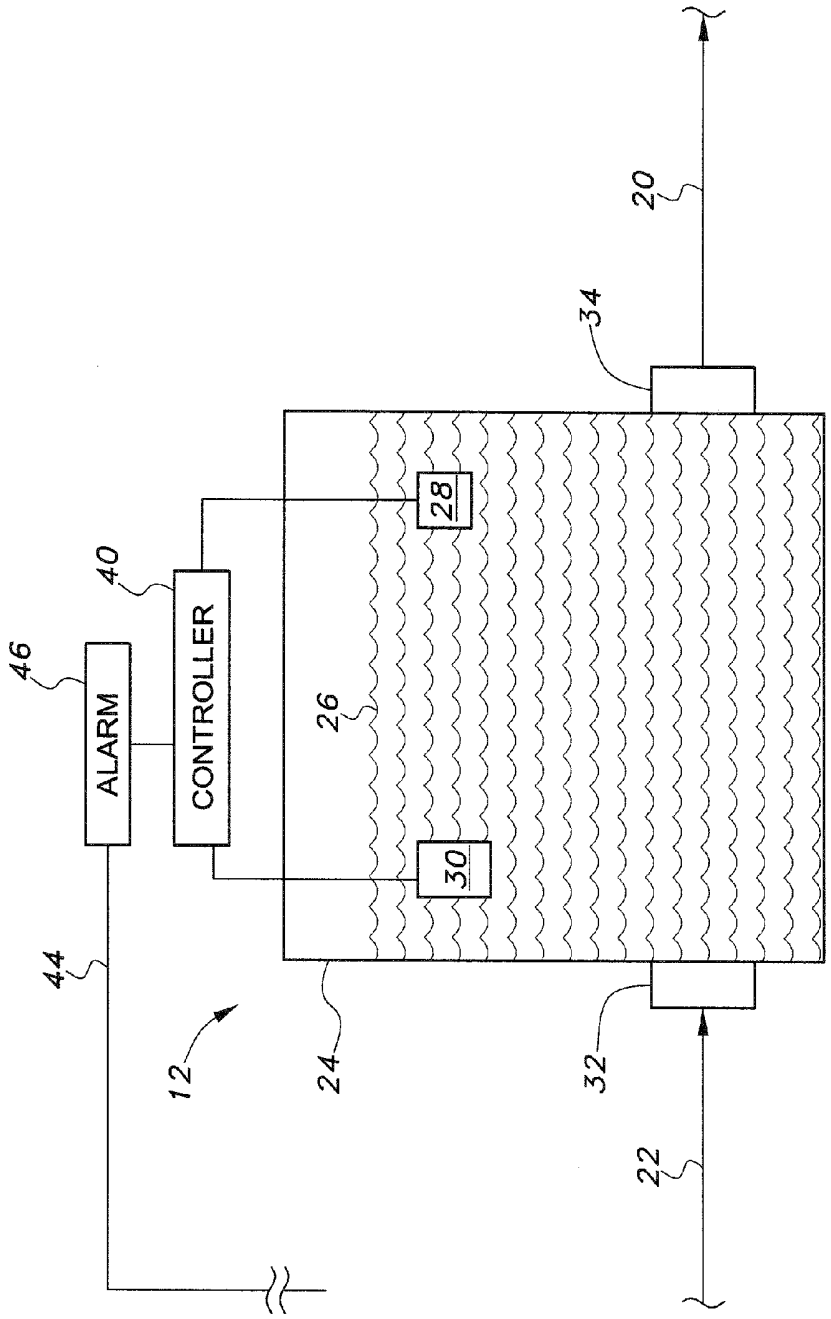


Fig. 3

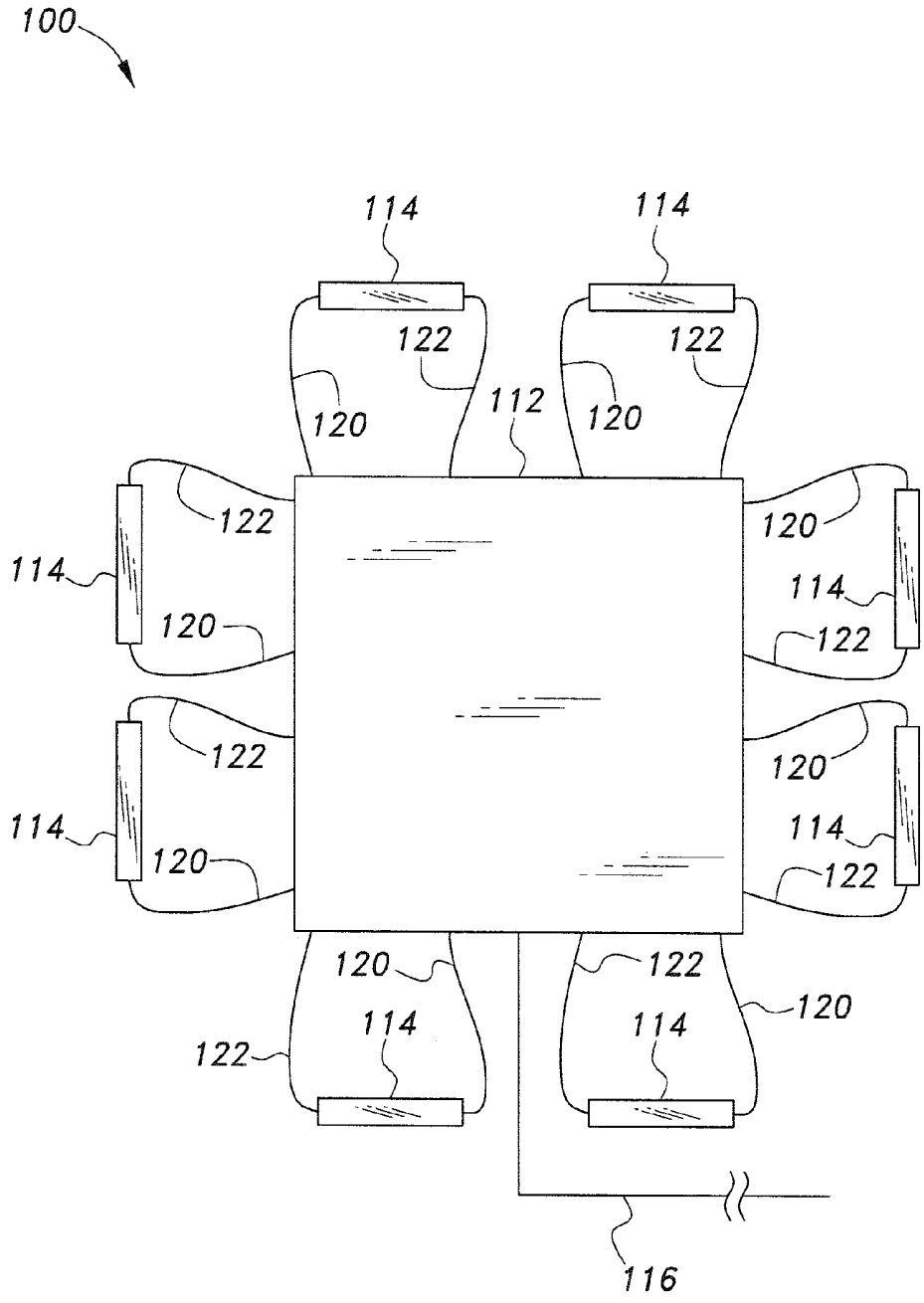

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Fig. 4

COOLING SYSTEM FOR PATIENTS WITH FEVER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to fever reduction, and particularly to a cooling system for patients with fever which operates via fluid-based thermal transfer.

[0003] 2. Description of the Related Art

[0004] Fever, also known as pyrexia and febrile response, is most accurately characterized as a temporary elevation in the body's thermoregulatory set-point, causing typical body temperature to rise. A body temperature at or above 37.5° C. is typically indicative of a fever. The increase in thermoregulatory set-point triggers increased muscle contraction and causes a feeling of cold in the patient despite an increased body temperature. This results in greater heat production and efforts to conserve heat. When the set-point temperature returns to normal, a person feels hot, becomes flushed, and may begin to sweat.

[0005] Non-medicinal treatments for fever include placing a cool, damp cloth on the forehead and taking a lukewarm bath. Additionally, medications, such as ibuprofen or paracetamol, may be effective at lowering the temperature.

[0006] With regard to the non-medicinal treatments, the temperature of a cooling cloth is difficult to regulate and requires the water to be constantly changed. The same issues relate to the bath. With regard to medicinal treatments, overuse of analgesics such as ibuprofen have been shown to potentially lead to nausea, dyspepsia, gastrointestinal ulceration/bleeding, raised liver enzymes, diarrhea, constipation, nosebleed, headache, dizziness, rash, salt and fluid retention, and hypertension. Thus, a cooling system for patients with fever solving the aforementioned problems is desired.

SUMMARY OF THE INVENTION

[0007] The cooling system for patients with fever is a mechanical, fluid-based system for cooling patients suffering from fever. The cooling system for patients with fever includes a reservoir for containing a cooling fluid, which is maintained at a desired temperature. A temperature sensor is disposed in the reservoir, such that the temperature sensor is immersed in the cooling fluid for measuring the temperature thereof. A chiller is also received in the reservoir for selectively cooling the cooling fluid when the temperature thereof, measured by the temperature sensor, is above a pre-set temperature threshold.

[0008] The reservoir communicates with a cooling pad, which is formed from a padded layer having at least one channel embedded therein. A first end of an inflow tube is in fluid communication with the reservoir, and a second end thereof is in fluid communication with a first end of the at least one channel, such that the cooling fluid selectively passes from the reservoir, through the inflow tube, and into the at least one channel. A first end of an outflow tube is in fluid communication with the reservoir, and a second end thereof is in fluid communication with a second end of the at least one channel, such that the cooling fluid passes through the at least one channel, into the outflow tube, and back into the reservoir. At least one pump is provided for selectively circulating the cooling fluid through the reservoir, the inflow tube, the cooling pad and the outflow tube. In use, the cooling pad is applied to the skin of a patient with a fever, such as by making contact with the patient's forehead, for example.

[0009] These and other features of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** diagrammatically illustrates a cooling system for patients with fever according to the present invention.

[0011] FIG. **2** is a partially cut-away plan view of a cooling pad of the cooling system for patients with fever.

[0012] FIG. **3** schematically illustrates a cooling unit of the cooling system for patients with fever.

[0013] FIG. **4** diagrammatically illustrates an alternative embodiment of the cooling system for patients with fever.

[0014] Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The cooling system for patients with fever **10** is a mechanical, fluid-based system for cooling patients suffering from fever. As shown in FIG. **1**, the cooling system for patients with fever **10** includes a cooling unit **12** and a cooling pad **14**. The cooling pad **14** is applied to the skin of a patient suffering from fever, such as by application to the forehead of the patient, for example, for cooling the patient via thermal transfer between the cooling unit **12** and the cooling pad **14**. As shown in FIG. **3**, the cooling unit **12** includes a reservoir **24** for containing a cooling fluid **26**, which is maintained at a desired temperature. It should be understood that any suitable type of cooling fluid **26** may be used, such as liquid coolants, liquid water or the like.

[0016] A temperature sensor **28** is received in the reservoir **24**, such that the temperature sensor **28** is immersed in the cooling fluid **26** for measuring the temperature thereof. It should be understood that the temperature sensor **28** may be a thermometer, a thermocouple, or any other suitable type of temperature sensor, as is well known in the art. A chiller **30** is also received in the reservoir **24** for selectively cooling the cooling fluid **26** when the temperature thereof, measured by the temperature sensor **28**, is above a pre-set temperature threshold. It should be understood that chiller **30** may be any suitable type of chiller, cooler, refrigerator, cooling coil or the like which is suitable for cooling the cooling fluid **26** to the desired pre-set temperature. Preferably, as shown, chiller **30** is in communication with temperature sensor **28** through a controller **40**, which may be any suitable type of control circuitry, computer processor or the like, which actuates the chiller **30** when the temperature measured by temperature sensor **28** is above the pre-set temperature threshold.

[0017] The reservoir **24** communicates with the cooling pad **14**, which, as best shown in FIG. **2**, is formed from a padded layer **14** having at least one channel **18** embedded therein. In FIG. **2**, four such channels **18** are illustrated, however it should be understood that this is shown for exemplary purposes only. Any desired number of channels **18** may be embedded within padded layer **16**. It should be further understood that padded layer **16** may be formed from any suitable material which is comfortable for application to the patient's skin and also allows for effective thermal

transfer therethrough. Further, it should be understood that channels **18** may be any suitable type of passages, channels, tubes, pipes or the like, allowing the cooling fluid **26** to pass therethrough, without leakage or corrosion, and providing for effective thermal transfer from the patient's skin to the cooling fluid **26**.

[0018] A first end **50** of an inflow tube **20** is in fluid communication with the reservoir **24**, and a second end **54** of the inflow tube **20** is in fluid communication with a first end of the at least one channel **18**. In operation, the cooling fluid **26** selectively passes from the reservoir **24**, through the inflow tube **20**, and into the at least one channel **18**. A first end **52** of an outflow tube **22** is in fluid communication with the reservoir **24**, and a second end **56** of the outflow tube **22** is in fluid communication with a second end of the at least one channel **18**, such that the cooling fluid **26** passes through the at least one channel **18**, into the outflow tube **22**, and back into the reservoir **24**.

[0019] At least one pump is provided for selectively circulating the cooling fluid **26** through the reservoir **24**, the inflow tube **20**, the cooling pad **14** and the outflow tube **22**. In FIG. **3**, pump **32** is shown being in fluid communication with outflow tube **22**, and pump **34** is shown being in fluid communication with inflow tube **20**. It should be understood that a single pump may alternatively be utilized for effecting circulation of the cooling fluid **26**. In use, the cooling pad **14** is applied to the skin of a patient with a fever, such as by making contact with the patient's forehead, for example.

[0020] Additionally, as shown in FIG. **2**, a pad temperature sensor **42** may be embedded in cooling pad **14** for directly measuring the patient's skin temperature. It should be understood that pad temperature sensor **42** may be a thermometer, a thermocouple, or any other suitable type of temperature sensor, as is well known in the art. As shown in FIGS. **2** and **3**, temperature sensor **42** may be in communication with controller **40** via line **44**, which may be wired or wireless, for display of the patient's temperature or for actuation of an optional alarm **46** if the patient's temperature exceeds a pre-set threshold. It should be understood that alarm **46** may be any suitable type of alarm, such as a conventional display, an auditory alarm, any suitable type of visual alarm or the like.

[0021] In the alternative embodiment of FIG. **4**, a cooling system for patients with fever **100** is adapted for use by multiple patients. The system **100** includes a plurality of cooling pads **114**, which are similar to cooling pad **14** described above, along with corresponding inflow tubes and outflow tubes **120**, **122** for each cooling pad **114**. Each of the cooling pads **114** is in fluid communication with a central reservoir **112**, similar to reservoir **12** described above, such that the cooling system for patients with fever **100** may be used by multiple patients simultaneously, with a central reservoir **112** of cooling fluid and under centralized control. Temperature and operation control may take place at the system **100**, as with system **10**, or may alternatively take place in an external control room, with remote communication provided by line **116**, as shown. The circulation of the cooling fluid from reservoir **112** through each cooling pad **114** takes place as described above with respect to system **10**, only with each cooling pad **114** selectively circulating the cooling fluid with the single, central reservoir **112**.

[0022] It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

I claim:

1. A cooling system for patients with fever, comprising:
- a reservoir for containing a cooling fluid;
- a temperature sensor received in said reservoir, such that said temperature sensor is immersed in the cooling fluid for measuring a temperature thereof;
- a chiller received in said reservoir for selectively cooling the cooling fluid when the temperature thereof, measured by said temperature sensor, is above a pre-set temperature threshold;
- a cooling pad comprising a padded layer having at least one channel embedded therein;
- an inflow tube having opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a first end of the at least one channel, such that the cooling fluid selectively passes from said reservoir, through said inflow tube, and into the at least one channel;
- an outflow tube having opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a second end of the at least one channel, such that the cooling fluid passes through the at least one channel, into said outflow tube, and back into said reservoir; and
- at least one pump for selectively circulating the cooling fluid through the reservoir, the inflow tube, the cooling pad and the outflow tube, whereby the cooling pad may be applied to the skin of a patient with a fever.

2. The cooling system for patients with fever as recited in claim **1**, wherein the cooling fluid comprises a cooling liquid.

3. The cooling system for patients with fever as recited in claim **1**, wherein the cooling fluid comprises liquid water.

4. The cooling system for patients with fever as recited in claim **1**, wherein the at least one channel comprises a plurality of channels.

5. The cooling system for patients with fever as recited in claim **1**, wherein the at least one pump comprises an inlet pump in fluid communication with the inlet tube and an outlet pump in fluid communication with the outlet tube.

6. The cooling system for patients with fever as recited in claim **1**, further comprising a pad temperature sensor embedded in said cooling pad for measuring a skin temperature of the patient.

7. The cooling system for patients with fever as recited in claim **6**, further comprising an alarm in communication with the pad temperature sensor such that the alarm is actuated when the skin temperature of the patient exceeds a pre-set temperature threshold.

8. A cooling system for patients with fever, comprising:
- a reservoir for containing a cooling fluid;
- a temperature sensor received in said reservoir, such that said temperature sensor is immersed in the cooling fluid for measuring a temperature thereof;
- a chiller received in said reservoir for selectively cooling the cooling fluid when the temperature thereof, measured by said temperature sensor, is above a pre-set temperature threshold;

a plurality of cooling pads, wherein each said cooling pad comprises a padded layer having at least one channel embedded therein;

a plurality of inflow tubes, wherein each said inflow tube has opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a first end of the at least one channel of a corresponding one of the cooling pads, such that the cooling fluid selectively passes from said reservoir, through said inflow tube, and into the at least one channel of the corresponding one of the cooling pads;

a plurality of outflow tubes, wherein each said outflow tube has opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a second end of the at least one channel of a corresponding one of the cooling pads, such that the cooling fluid passes through the at least one channel of the corresponding one of the cooling pads, into said outflow tube, and back into said reservoir; and

a plurality of pumps for selectively circulating the cooling fluid through the reservoir and corresponding ones of the plurality of inflow tubes, the plurality of cooling pads and the plurality of outflow tubes, whereby the plurality of cooling pads may be applied to multiple patients with fevers.

9. The cooling system for patients with fever as recited in claim **8**, wherein the cooling fluid comprises a cooling liquid.

10. The cooling system for patients with fever as recited in claim **8**, wherein the cooling fluid comprises liquid water.

11. The cooling system for patients with fever as recited in claim **10**, wherein the at least one channel comprises a plurality of channels.

12. A cooling system for patients with fever, comprising:

a reservoir for containing a cooling fluid;

a temperature sensor received in said reservoir, such that said temperature sensor is immersed in the cooling fluid for measuring a temperature thereof;

a chiller received in said reservoir for selectively cooling the cooling fluid when the temperature thereof, measured by said temperature sensor, is above a pre-set temperature threshold;

a cooling pad comprising a padded layer having at least one channel embedded therein;

an inflow tube having opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a first end of the at least one channel, such that the cooling fluid selectively passes from said reservoir, through said inflow tube, and into the at least one channel;

an outflow tube having opposed first and second ends, the first end thereof being in fluid communication with said reservoir and the second end thereof being in fluid communication with a second end of the at least one channel, such that the cooling fluid passes through the at least one channel, into said outflow tube, and back into said reservoir;

at least one pump for selectively circulating the cooling fluid through the reservoir, the inflow tube, the cooling pad and the outflow tube, whereby the cooling pad may be applied to the skin of a patient with a fever;

a pad temperature sensor embedded in said cooling pad for measuring a skin temperature of the patient; and

an alarm in communication with the pad temperature sensor such that the alarm is actuated when the skin temperature of the patient exceeds a pre-set temperature threshold.

13. The cooling system for patients with fever as recited in claim **12**, wherein the cooling fluid comprises a cooling liquid.

14. The cooling system for patients with fever as recited in claim **12**, wherein the cooling fluid comprises liquid water.

15. The cooling system for patients with fever as recited in claim **12**, wherein the at least one channel comprises a plurality of channels.

16. The cooling system for patients with fever as recited in claim **12**, wherein the at least one pump comprises an inlet pump in fluid communication with the inlet tube and an outlet pump in fluid communication with the outlet tube.

* * * * *

专利名称(译)	发热患者的冷却系统		
公开(公告)号	US20170209303A1	公开(公告)日	2017-07-27
申请号	US15/003739	申请日	2016-01-21
[标]申请(专利权)人(译)	科威特大学		
申请(专利权)人(译)	科威特大学		
当前申请(专利权)人(译)	科威特大学		
[标]发明人	AL ANZI BADER SHAFAQA		
发明人	AL-ANZI, BADER SHAFAQA		
IPC分类号	A61F7/02 A61B5/01 A61B5/00 A61F7/00		
CPC分类号	A61F7/02 A61F7/0085 A61B5/01 A61F2007/0095 A61F2007/0007 A61F2007/0056 A61B5/746		
其他公开文献	US10045880		
外部链接	Espacenet USPTO		

摘要(译)

用于发烧患者的冷却系统是用于冷却患有发烧的患者的机械的，基于流体的系统。用于患有发烧的患者的冷却系统包括用于容纳冷却流体的储存器，该储存器保持在期望的温度。温度传感器容纳在储液器中。将温度传感器浸入冷却流体中以测量其温度。当由温度传感器测量的温度高于预设温度阈值时，冷却器也被接收在储存器中以选择性地冷却冷却流体。贮存器与冷却垫连通，冷却垫由填充层形成，该填充层具有嵌入其中的至少一个通道。提供至少一个泵和管道，用于使冷却流体循环通过贮存器和冷却垫。在使用中，冷却垫通过发烧施加到患者的皮肤上。