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SPRINKLER HEAD HAVING A CHECKING MEANS FOR CHECKING THAT FLUID HAS
BEEN FILLED INSIDE A SPRINKLER HEAD BODY AND METHOD FOR CHECKING
THAT THE FLUID HAS BEEN FILLED USING SUCH SPRINKLER HEAD

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This invention relates to a sprinkler head having a
checking means for checking that fluid has been filled inside of
the sprinkler head body and a method for checking that the fluid has
10 been filled using such sprinkler head.

There are hitherto sprinkler heads of this type. An
example is described in the specification of Japanese Utility Model
Laid-Open No. 2-109661 filed by the applicant of the present
invention, as illustrated in FIG. 9. The sprinkler head described
15 therein is characterized in that a plug 4 is pushed upwardly and is
maintained at a position so as to close an outlet port 5 of a head
frame 1. The sprinkler head of this arrangement is generally
mounted on a ceiling plane of a room or the like in a state where
fire protection water is filled inside of the head frame 1 such
20 that the sprinkler head can sprinkle the fire protection water once
fire has occurred.

However, since such conventional plug 4 merely serves to

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close the outlet port 5 of the head frame 1, the filled state of the fire protection water inside of the sprinkler head body 27 could not be checked from the outside, which presents an inherent disadvantage. Therefore, when the fire protection water is not

5 filled inside of the sprinkler head body 27 due to an insufficient connecting of distributing water pipes or other accidents in communicating the fluid, such undesirable state cannot be found before the fire occur, which causes serious troubles in extinguishing the fire with the sprinkler head.

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Therefore, it is an object of the present invention to provide a sprinkler head and a method for enabling a user to readily

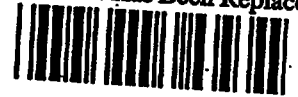
15 check from the outside that fluid has been filled inside of a sprinkler head body, and to find the insufficient connecting of distributing water pipes or the like.

In accordance with the present invention, there is provided a sprinkler head having a checking means for checking from outside

20 that fluid has been filled inside of the sprinkler head body.

There is further provided a method for checking that fluid has been filled comprising providing a movable rod inside of the

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sprinkler head body in such a manner as to be moved backward and forward when the fluid has been filled inside of the sprinkler head body, and checking that the fluid has been filled inside of the sprinkler head body by observing a position of the movable rod from
5 the outside.

Accordingly, in the sprinkler head and the method of the present invention, the filled state of the fluid inside of the sprinkler head body can readily be checked from the outside.

Various other objects, features and attendant advantages of
10 the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings in which like reference characters designate like or corresponding parts throughout the several views and wherein:

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FIG. 1 is a sectional view illustrating one embodiment of the present invention;

20 FIG. 2 is a sectional view illustrating one of operational steps of the sprinkler head of FIG. 1;

FIG. 3 is a sectional view illustrating a further

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embodiment of the present invention;

FIG. 4 is a sectional view illustrating a further
embodiment of the present invention;

FIG. 5 is a sectional view illustrating one of operational
5 steps of the sprinkler head of FIG. 4;

FIG. 6 is a sectional view illustrating a further
embodiment of the present invention;

FIG. 7 is an partially enlarged sectional view illustrating
an actual use of the sprinkler head of FIG. 6;

10 FIG. 8 is a sectional view illustrating a still further
embodiment of the present invention;

FIG. 9 is a sectional view illustrating a conventional
sprinkler head.

15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the first embodiment of the present
invention. A head frame 1 is provided therein with a passageway 2
for fire protection water. A frame 3, having a substantially
20 cylindrical shape, is threaded into an annular concaved portion of
the head frame 1.

A plug 4 is provided on its lower periphery with a collar

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portion 6, and is arranged inside of a sprinkler head body 27 so as to close an outlet port 5 defined in a lower portion of the head frame 1. A through-hole 8 is defined in a substantially center of the plug 4. Internal threads 7 are formed on an internal periphery of a lower portion of the through-hole 8. A diameter of the upper end of the through-hole 8 is smaller than that of the other portion of the through-hole 8.

An externally threaded portion 9 is threaded into the internal threads 7. A through-hole 10 with its lower portion of hexagonal shape is defined in a substantially center of the externally threaded portion 9 and is associated with the through-hole 8 in fluid communication with each other. A sealing means (not shown) is applied between the externally threaded portion 9 and the internal threads 7 of the plug 4.

A spring member 14, consisting of a belleville spring coated with fluoroplastic, is provided between a lower end of the outlet port 5 of the head frame 1 and an upper surface of the collar portion 6 of the plug 4, and is urged by a predetermined pressure. An inner periphery of the spring member 14 is fit in an internally extending annular groove 6a which is defined in the collar portion 6 of the plug 4.

A plurality of deflectors 15, each of which having a bent

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portion, are connected to an outer periphery of the plug 4. A
guide ring 16, having a guide member 16a which is vertically
oriented and slidably abuts against an outer surface of the head
frame 1, is connected to an upper end of the deflectors 15 so as to
5 serve as a guide when the plug 4 falls down. A detent member 17 is
formed in a partially cutaway ring-shape, and is elastically
deformable so as to diametrically expand and contract.

A pair of restraining members 18, 19 are arranged so as to
restrain the detent member 17. A hole 18a is defined in an upper
10 surface of the upper restraining member 18 such that a lower portion
of the externally threaded portion 9 can be inserted into that hole
18a. A cylindrical portion 18b of the upper restraining member 18
is provided on its inner periphery with internal threads 18c, and is
slidably inserted into a cylindrical portion 19a of the lower
15 restraining member 19. An upwardly sloped surface 20 and a
downwardly sloped surface 21 are respectively defined on the
restraining members 18, 19. The sloped surfaces 20, 21 come closer
to each other as they advance inwardly so as to hold the detent
member 17 in tensioned state. The detent member 17 is held between
20 the sloped surfaces 20, 21, and an inner periphery of an inwardly
projecting portion 22 defined on an inner periphery of the lower
portion of the head frame 1.

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A lock screw 23 is threaded into the internal threads 18c of the upper restraining member 18. A through-hole 23a is defined coaxially in a center portion of the lock screw 23. On a lower surface of the lower restraining member 19 is provided a thermal insulating packing 24, on which a thermal sensitive member 25 is provided. A heat meltable member 26 is provided between the thermal sensitive member 25 and an outwardly extending flange 23b formed on a lower end of the lock screw 23 in heat conductive relationship with the thermal sensitive member 25.

10 A movable rod 11 has a rod-shaped projection 11a on its upper end, a pin 11b on its lower end, and is inserted into a bore of the outernally threaded portion 9 via an elastic member 12 consisting of a coil spring so as to be moved backward and forward.

The movable rod 11 is usually urged in an upward direction by the elastic member 12 such that a lower end of the pin 11b becomes flush with a lower surface of the lock screw 23 which defines some region of a lower surface of the sprinkler head 27, as illustrated in FIG. 1. On a side periphery of the pin 11b closer to the lower end thereof is applied fluorescent paint.

20 An O-ring 13 seal is mounted to an outer periphery of the movable rod 11 for sealing between an inner periphery of the outernally threaded portion 9 and an outer periphery of the movable

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rod 11.

The application of the sprinkler head in accordance with this embodiment, which includes the sprinkler head body 27 and the movable rod 11, will be described hereinbelow.

5 First, the sprinkler head is fixed at a predetermined position on a ceiling plane. The sprinkler head is connected with a distributing water pipe (not shown) through a connecting pipe (not shown). Then, the fire protection water is communicated with the distributing water pipe. In this regard, when the fire protection
10 water has been filled inside of the sprinkler head body 27, the movable rod 11 is moved downwardly by the pressure of the fire protection water applied thereover, while resisting the spring force of the elastic member 12, and consequently the pin 11b
15 protrudes outwardly away from the lower surface of the lock screw 23.

On the other hand, when the fire protection water has not been sufficiently filled or it has not been filled at all inside of the sprinkler head body 27, the pin 11b of the movable rod 11 does not protrude sufficiently or it does not protrude at all to the
20 outside. The filled state of the fire protection water inside of the sprinkler head body can be checked by observing a position of the pin 11b in this manner. In addition, since the fluorescent

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paint is applied over the side periphery of the lower end of the pin 11b, the position of the pin 11b can be observed at night or the like.

Accordingly, insufficiently connected portions of the pipes can be found previously. And when the fire protection water has not been sufficiently filled inside of the sprinkler head body 27, the filled state of the water is checked again after checking the piping or the like.

As a further advantage of the present invention, the sprinkler head with such a simple construction can be manufactured readily in a cheap manner.

Once the fire has occurred and caused the thermal sensitive member 25 to increase its temperature, the heat meltable member 26 is melted or softened, and the lower restraining member 19 moves downwardly. Then, the detent member 17 is contracted inwardly, and is released from the locking relationship with the inwardly projecting portion 22 of the frame 3. The upper restraining member 18, the externally threaded portion 9 and the plug 4 fall down to the lower direction of the head frame 1 by the spring force of the spring member 14. Consequently, the fire protection water is flashed from the outlet port which has been opened, collides against an upper surface of the plug 4, and is sprinkled radially.

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In this embodiment, the pin 11b generally becomes flush with the lower surface of the lock screw 23 by urging the movable rod 11 with the elastic member 12. However, the whole length of the pin 11b can be positioned inside of the lock screw. Or a relatively short length thereof can be positioned outside of the lock screw 23. It is essential that the filled state of the fluid such as the fire protection water inside of the sprinkler head body 27 can be checked by arranging the movable rod 11 so as to protrude to the outside after the fluid has been filled inside of the sprinkler head body 27.

In addition, the present invention is not limited to the sprinkler head of the above embodiment. It can be applied to a sprinkler head as illustrated in FIG. 3, in which a flexible bellows 28 with a bottom wall disposed on a lower end thereof is mounted in the through-hole 8 of the plug 4, with abutting against the upper end of the movable rod 11, and a covering member having a through-hole 29, is threaded into the internal threads 7 of the through-hole 8. Further, it can be applied to a dry sprinkler head where gas such as air is filled inside of the sprinkler head body 27.

Contrary to the first embodiment where the movable rod 11 protrudes outwardly when the fire protection water has been filled inside of the sprinkler head body 27, in a second embodiment which

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will be described hereinbelow, the movable rod 11 is introduced into the sprinkler head body 27.

Since, the main features of the sprinkler head of the second embodiment is same as that of the first embodiment, only 5 different features between the embodiments will be described hereinbelow.

Referring to FIG. 4, the movable rod 11 is provided on its upper end with a movable member 31 which is slidably inserted into the through-hole 10 of the externally threaded portion 9. The 10 movable rod 11 is usually tensioned downwardly as a usual state with the elastic member 12 of the coil spring, and the lower end of the movable rod 11 protrudes outwardly away from the lower surface of the lock screw 23. The lower end surface of the movable rod 11 is painted with the fluorescent paint (not shown).

15 A passageway 32 is coaxially defined in a center of the movable member 31. A lower end of the passageway 32 is divided into several passageways, each of which extends in a radial direction. The divided passageways are associated with a space 34 defined by an inner periphery of the through-hole 10 of the 20 externally threaded portion 9 and a stepped portion 33 of the movable member 31 in fluid communication with each other. A ring seal 35 of X-shape in cross section is mounted between the externally



threaded portion 9 and the movable member 31. An upper surface 33a of the stepped portion 33 of the movable member 31 is larger than an upper surface 11c of the movable rod 11.

In the sprinkler head according to the above-defined arrangement, when the fire protection water has been filled inside of the sprinkler head body 27, it is introduced into the space 34 via the passageway 32 of the movable rod 11, and its pressure is applied over the upper surface 33a of the stepped portion 33. Then, the movable rod 11 is forced to move upwardly by the pressure of the fire protection water, while resisting the spring force of the elastic member 12, since the upper surface 33a is larger than the upper surface 11c of the movable rod 11. Thereby the movable rod 11 is drawn into the sprinkler head body 27 such that the lower surface of the movable rod 11 becomes flush with the lower surface of the lock screw 23.

On the other hand, when the fire protection water has not been filled inside of the sprinkler head body 27, the movable rod 11 does not move inwardly, and a partially protruded portion of which is maintained in an initial position. Thereby the unfilled state of the fire protection water can be readily checked by observing such position of the movable rod 11 from the outside, and subsequently the insufficient connecting of the pipes or other



accidents in communicating the fluid can be found before the fire occurs.

As the first embodiment, the arrangement of this embodiment can be applied to the dry sprinkler head, in which gas such as air is filled inside of the head frame 1.

In the first and second embodiments, the filled state of the fire protection water inside of the sprinkler head body 27 can be checked by observing the motion of the movable rod 11 from the outside. However, the filled state can be checked by a different means described in the third embodiment.

In the third embodiment, the main features of the sprinkler head is also same as that of the first embodiment. Therefore, only different features between the embodiments will be described hereinafter.

In FIG. 6, a plurality of holes 4a are defined above the collar portion 6 of the plug 4, each of which extends in a radial direction. A valve 36 includes a diametrically small portion defined on its lower end which is inserted into the through-hole 10 of the externally threaded portion 9, a valve body 36c having a diametrically large valve seat 36a defined on an upper end of the valve 36, the elastic member 12 of the conical coil spring which is mounted above the valve seat 36a. As a usual position of this

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arrangement, the valve body 36c is pressed downwardly by the elastic member 12, causing the pressure applied over the valve seat 36a and the stepped portion defined in the through-hole 10 of the outwardly threaded portion 9 via the O-ring 37, then closing the

5 through-hole 10.

A pin 36b is provided on an upper surface of the valve seat 36a, and is inserted into a diametrically small portion defined in an upper end of the through-hole 8 of the plug 4. A length of the pin 36b is determined such that an upper end thereof protrudes slightly

10 and upwardly away from the upper surface of the plug 4 by a relatively short length, when the valve body 36c is pressed upwardly, while resisting the spring force of the elastic member 12.

A sealing means is applied to a lower surface of the valve

15 seat 36a. An outer diameter of each of the lower ends of the valve body 36c and the pin 36b is slightly smaller than an inner diameter of the through-hole 10.

In accordance with the above-defined arrangement, when the filled state of the fire protection water has to be checked, a

20 pushing rod 38 of a suitable length is inserted into the through-hole 23a of the lock screw 23 to push a lower surface of the valve body 36c, while resisting the spring force of the elastic member

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12. Thereby the valve body 36c is moved upwardly such that a sealing condition between the valve seal 36a and the outwardly threaded portion 9 is released. Subsequently, a relatively small amount of the fire protection water drops out of the through-hole 23a of the lock screw 23 via the outlet port 5 of the sprinkler head body 27, the through-hole 8 of the plug 4 and the through-hole 10 of the outwardly threaded portion 9.

Further, the pin 36b of the valve body 36c protrudes away from the through-hole 8 of the plug 4 by pressing the valve body 36c. Thereby, even if undesirable foreign materials such as a rubbish of a particular size are accumulated on the through-hole 8, they can be removed from the through-hole 8 by the motion of the pin 36b.

After confirming that the fire protection water has been dropped, the pushing rod 38 is pulled out of the through-hole 23a of the lock screw 23 to release the pressure applied over the valve body 36c, and subsequently return the valve body 36c to an initial position by a restoring force of the elastic member 12. Thus, the through-hole 10 of the outwardly threaded portion 9 is closed to stop the dropping of the fire protection water. A seal for indicating that the filled state of the water has been tested, is bonded onto the through-hole 23a, which simultaneously serves to



close the through-hole 23a.

The fact that the fire protection water does not drop out of the through-hole 23a, indicates an unfilled state of the fire protection water, and insufficient connecting of the pipes or other accidents in communicating the water. In this case, the piping or the like is checked again and the filled state of the water is subsequently tested in the same manner as described above.

Thus, the filled state of the fire protection water inside of the sprinkler head body 27 can be readily checked by such an extremely simple operation. A series of checking operations are generally made just after the piping has been completed. However, it is a matter of fact that they can be periodically made.

The valve 36 of the present invention is not limited to this arrangement by all means, and it is essential to open and close the through-hole 8 defined in the plug 4 with the valve 36. However, when the valve 36 comprises the valve body 36a and the elastic member 12, a pushing member 40 can be formed integrally with the valve body 36c by fixing an end of the pushing member 40 to the lower surface of the valve body 36c, in which the other end of the pushing member 40 can protrude outwardly away from the through-hole 23a of the lock screw 23, as illustrated in FIG. 8.

In addition, the outwardly threaded portion 9 can be

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omitted such that the valve body 36c can open and close the through-hole 8 of the plug 4. In this case, the plug 4, the valve body 36c, the elastic member 12 or other elements are formed such that the valve body 36c and the elastic member 12 can be mounted inside of

5 the through-hole 10 from above of the plug 4.

Further, the elastic member 12 is not limited to the conical coiled spring, and any means can be employed for the elastic member 12 of the conical coil spring. It is essential to press the valve body 36c by the elastic member 12.

10 Further, the present invention is not limited to the above described embodiments. It can be applied to the dry sprinkler head.

In this case, the fire protection water, which has been undesirably accumulated inside of the head frame 1, can be drained out of the head frame 1 by opening and closing the valve 36, which

15 leads to another advantage of the present invention.

In addition, a specific arrangement such as a shape of the plug 4 can be fully designed within the scope of the present invention.

This specification is by no means intended to restrict the

20 present invention to the preferred embodiments set forth therein. Various modifications to the inventive sprinkler head having the checking means for checking that the fluid has been filled inside

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of the sprinkler head body and the method for checking that the fluid has been filled, as described herein, may be made by those skilled in the art without deviating from the spirit and scope of the present invention.

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CLAIMS

1. A sprinkler head comprising a checking means for
checking from the outside that fluid has been filled inside of said
5 sprinkler head body.
2. The sprinkler head as set forth in claim 1, wherein
said checking means is a movable rod which is usually positioned
inside of said sprinkler head body, and is arranged such that it
10 protrudes outwardly away from said sprinkler head body after said
fluid has been filled inside of said sprinkler head body.
3. The sprinkler head as set forth in claim 1, wherein
said checking means is a movable rod which is usually positioned
15 inside of said sprinkler head body and is urged upwardly with an
elastic member inside of a through-hole defined in a plug adapted
for closing an outlet port of a head frame, and an end of said
movable rod protrudes outwardly away from said sprinkler head body
while resisting a spring force of said elastic member, after said
20 fluid has been filled inside of said sprinkler head body.
4. The sprinkler head as set forth in claim 2, wherein

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said movable rod is positioned in an axial center of said sprinkler head body.

5. The sprinkler head as set forth in claim 1, wherein
5 said checking means is a movable rod which is usually positioned outside of said sprinkler head body, and is drawn inside of said sprinkler head body after said fluid has been filled inside of said sprinkler head body.

10 6. The sprinkler head as set forth in claim 1, wherein said checking means comprises a plug adapted for closing an outlet port of a head frame, a through-hole defined in said plug and associated with said outlet port in fluid communication with each other, an outwardly threaded portion threaded into said through-
15 hole of said plug, a movable rod which is inserted into a through-hole defined in said outwardly threaded portion so as to be moved backward and forward, and is urged downwardly with an elastic member as a usual state so as to protrude outwardly away from said sprinkler head body, a passageway defined axially in said movable
20 rod, a space defined by a side periphery of said movable rod and an inner periphery of said outwardly threaded portion, wherein said space is associated with said passageway in fluid communication





with each other so as to introduce said movable rod into said sprinkler head body, while resisting a spring force of said elastic member.

5 7. The sprinkler head as set forth in claim 5, said movable rod is positioned in an axial center of said sprinkler head body.

 8. The sprinkler head as set forth in claim 1, wherein
10 said checking means comprises a plug adapted for closing an outlet port of a head frame, a valve adapted for opening and closing a through-hole defined in said plug and associated with said outlet port of said frame in fluid communication with each other.

15 9. The sprinkler head as set forth in claim 8, wherein said valve comprises a valve body mounted in a through-hole of said plug, and an elastic member adapted for closing said through-hole of said plug by pressing said valve body downwardly.

20 10. The sprinkler head as set forth in claim 1, wherein said checking means comprises a plug adapted for closing an outlet port of a head frame, an outwardly threaded portion threaded into a





lower portion of a through-hole defined in said plug and associated with said outlet port in fluid communication with each other, a valve adapted for opening and closing a through-hole defined in said outwardly threaded portion and associated with said through-hole of said plug in fluid communication with each other.

11. The sprinkler head as set forth in claim 10, wherein said valve comprises a valve body mounted in said through-hole of said outwardly threaded portion and an elastic member adapted for closing said through-hole of said outwardly threaded portion by pressing said valve body downwardly.

12. The sprinkler head as set forth in claim 11, wherein a pin is provided on an upper surface of said valve body, and is inserted into an upper portion of said through-hole of said plug, wherein a diameter of said upper portion of said through-hole is smaller than a diameter of its lower portion.

13. The sprinkler head as set forth in claim 12, wherein an upper end of said pin protrudes outwardly away from said through-hole of said plug, while resisting a spring force of said elastic member when said valve body has been pressed.





14. The sprinkler head as set forth in claim 9, wherein
a pushing member is mounted on a lower end of said valve body so as
to push said valve body, while resisting a spring force of said
5 elastic member.

15. A method for checking that fluid has been filled
comprising providing a movable rod inside of a sprinkler head body
in such a manner as to be moved backward and forward when said
10 fluid has been filled inside of said sprinkler head body, and
checking that said fluid has been filled inside of said sprinkler
head body by observing a position of said movable rod from the
outside.

15 16. A method for checking that fluid has been filled
comprising connecting a sprinkler head to a distributing water
pipe, wherein an outlet port of a sprinkler head body is closed with
a plug, communicating fluid to said distributing water pipe, opening
a valve adapted for opening and closing a through-hole defined in
20 said plug and associated with said outlet port of said sprinkler
head body in fluid communication with each other, and checking that
said fluid has been filled inside of said sprinkler head body by
observing said fluid dropped from said through-hole of said plug.

