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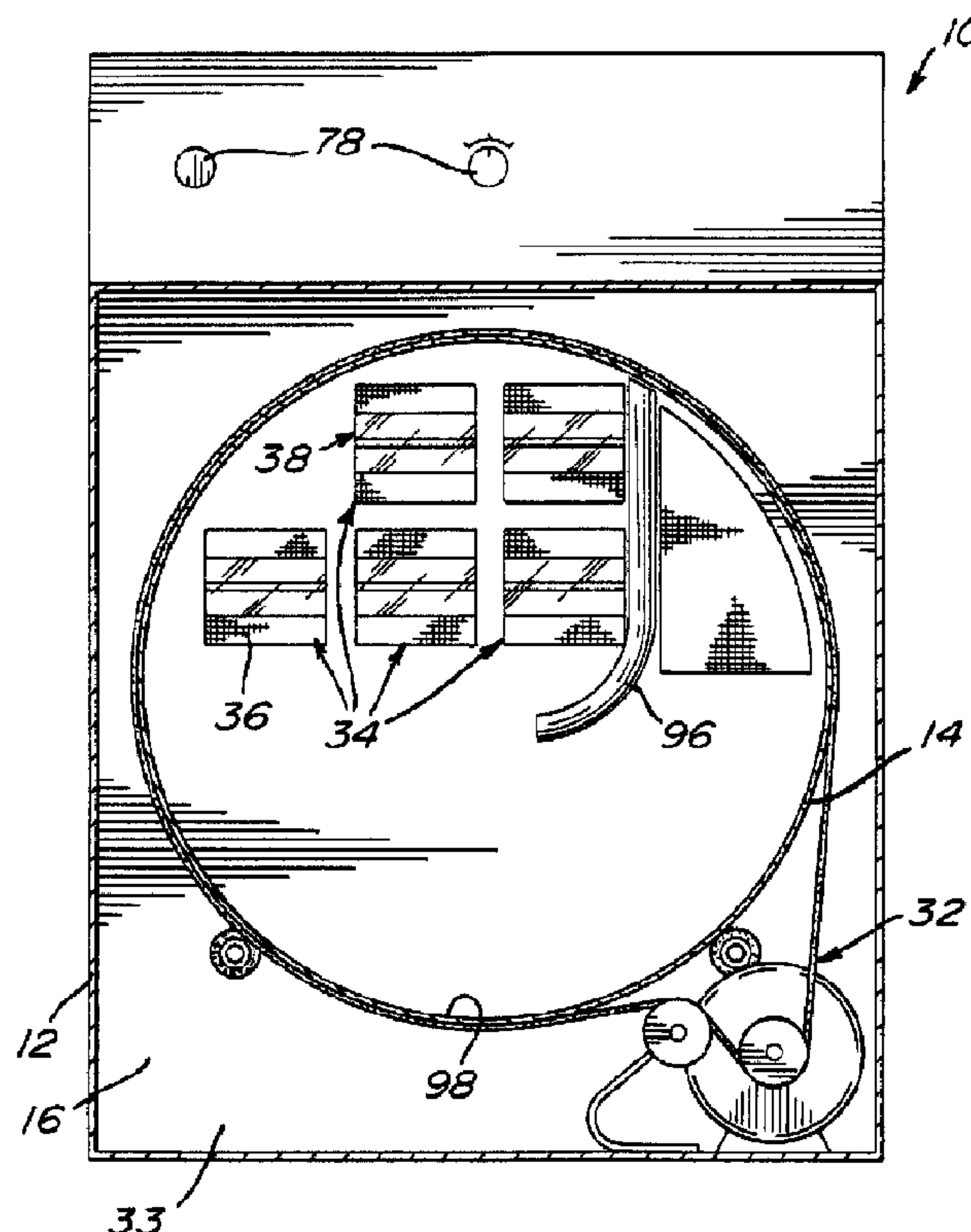
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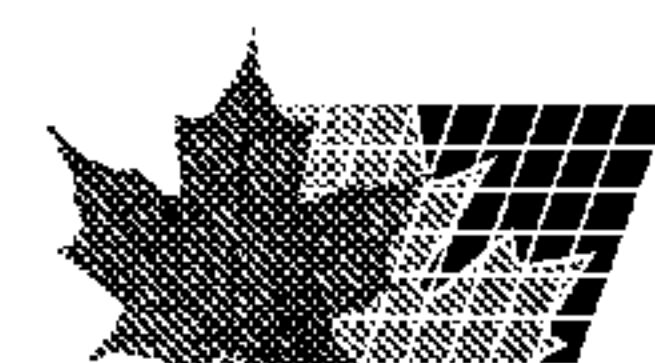
(54) Titre : SECHE-LINGE UTILISANT UNE LAMPE HALOGENE COMME MOYEN DE SECHAGE

(54) Title: CLOTHES DRYER USING HALOGEN-TYPE LIGHT AS A DRYING MEANS



(57) Abrégé/Abstract:

A clothes dryer apparatus using halogen-type light as drying means is described herein. The dryer apparatus includes a rotary dryer drum in which the articles to be dried are placed. The halogen-type light generates a flow of photons which are directed in the dryer drum to thereby photonically bombard the articles placed therein to thereby dry the articles. The moisture-containing air of the dryer drum is exhausted through an exhaust outlet by an exhaust fan. An inlet fan is provided to both cool the halogen-type light and to supply the air warmed by the cooling of the halogen-type light in the dryer drum to thereby prevent condensation of vapor phase water in the dryer drum.



ABSTRACT OF THE DISCLOSURE

5 A clothes dryer apparatus using halogen-type light as
drying means is described herein. The dryer apparatus includes a rotary
dryer drum in which the articles to be dried are placed. The halogen-type
light generates a flow of photons which are directed in the dryer drum to
thereby photonically bombard the articles placed therein to thereby dry
the articles. The moisture-containing air of the dryer drum is exhausted
10 through an exhaust outlet by an exhaust fan. An inlet fan is provided to
both cool the halogen-type light and to supply the air warmed by the
cooling of the halogen-type light in the dryer drum to thereby prevent
condensation of vapor phase water in the dryer drum.

TITLE OF THE INVENTION

CLOTHES DRYER USING HALOGEN-TYPE LIGHT AS
A DRYING MEANS.

5

FIELD OF THE INVENTION

The present invention relates to dryer apparatuses.
10 More specifically, the present invention is particularly concerned with a
clothes dryer using halogen-type lights as a means for extracting humidity
from the clothes.

15 **BACKGROUND OF THE INVENTION**

The field of clothes dryers is replete with various types
of structures for extracting moisture from the clothes. Most conventional
clothes dryers include a dryer drum rotatably mounted inside an
20 enclosure. A heating element is provided for heating an incoming flow of
air that is circulated inside the dryer drum by a ventilating system so as
to evaporate the moisture from the clothes. The moist air is continuously
allowed to flow out of the dryer drum through an air exhaust duct.

25 Although widely used, the conventional so-called air-
type clothes dryers are relatively inefficient. Indeed, the air-type clothes
dryers require a considerable amount of energy to operate properly.

Firstly, the incoming flow of air must be considerably heated by heating elements which are usually very energy-consuming. Secondly, the moist air exiting through an exhaust duct of the conventional clothes dryers still contains a considerable amount of heat which indicates the relative inefficiency of the air-type clothes dryers since this heat still contained in the exhausted air has not been used to dry the clothes.

OBJECTS OF THE INVENTION

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It is therefore an object of the present invention to provide a dryer apparatus having an improved energy efficiency.

Another object of the present invention is to provide a dryer apparatus capable of removing the moisture from the clothes inserted therein in a relatively short period of time.

15

SUMMARY OF THE INVENTION

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More specifically, in accordance with the present invention, there is provided a dryer apparatus for drying wet articles comprising:

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an article support structure for supporting the articles to be dried; and

at least one photon generating halogen-type light assembly associated with the support structure so as to direct a flow of photons towards the articles to be dried;
whereby the articles to be dried are placed on the support structure to be
5 dried by the flow of photons generated by the photon generating halogen-type lights.

According to another aspect of the present invention, there is provided a clothes dryer apparatus comprising:
10 a frame structure;
a dryer drum having a rotation axis and an inner surface defining an internal volume; the dryer drum being mounted in the frame structure so as to rotate about the rotation axis; and
at least one photon-generating halogen-type light
15 assembly mounted in the frame structure so as to direct a flow of photons towards the internal volume of the dryer drum;
whereby wet clothes placed in the internal volume of the dryer drum are dried by the flow of photons generated by the photon-generating halogen-type lights.

20
It is to be noted that in the present disclosure, as well as in the appended claims, the term "halogen-type light" is to be construed as a light where the gas present in the light bulb increases the fusion temperature of the filament used above the fusion temperature of the
25 filament used in a conventional incandescent light bulb. Examples of this type of lights are: quartz-iodine lamp and quartz-halogen lamp. Also, the term "photon" is to be construed as being an elementary particle of light.

Other objects, advantages and features of the present invention will become more apparent upon reading of the following non restrictive description of preferred embodiment thereof, given by way of example only with reference to the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

In the appended drawings:

10

Figure 1 is a top sectional view of a clothes dryer in accordance with an embodiment of the present invention;

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Figure 2 is a front elevational sectional view taken along line 2-2 of Figure 1;

Figure 3 is a rear elevational view of the clothes dryer of Figure 1;

20

Figure 4 is a rear elevational sectional view taken along line 4-4 of Figure 1;

Figure 5 is a perspective view of a halogen-type light assembly according to an embodiment of the present invention;

25

Figure 6 is a sectional view taken along line 6-6 of Figure 4 illustrating the various components forming each halogen-type light assembly; and

5 Figure 7 is an elevational view of a halogen-type light bulb.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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Referring to Figures 1-4, there is shown schematically a clothes dryer 10 in accordance with an embodiment of the present invention. The clothes dryer 10 includes a substantially parallelepiped-shaped clothes dryer frame structure (body) 12, a cylindrical clothes dryer
15 drum 14, internal walls 16, 18 and 20 (Figures 1 and 4) defining, with a rear wall 22 (Figure 3) and peripheral walls 23, an air inlet chamber 24 and an air exhaust chamber 26.

20 The parallelepiped-shaped frame structure 12 is very similar to the frame structure of conventional air-type clothes dryers.

The clothes dryer drum 14 is mounted in the enclosure formed by the frame structure 12 so as to be rotatable about a rotation
25 axis 30 by a conventional drum rotating mechanism 32 (Figure 2) mounted in a rotating mechanism compartment 33. The rotation of the dryer drum 14 has the conventional displacement offset on the clothes to

be dried (not shown) placed therein. Drum rotating arrangement 32 will not be described in greater details herein as it is believed to be well known in the art.

5 A plurality of air inlet apertures 34 extends through the internal wall 16. The air inlet apertures 34 are provided with a filtering screen 36 extending thereacross.

10 A number of photon generating halogen-type light assemblies 38 corresponding to the number of air inlet apertures 34 are mounted on the internal wall 16 substantially in register with the air inlet apertures 34 so as to extend across the latter. The halogen-type light assemblies 38 are mounted to the internal wall 16 so as to project light inside of the dryer drum 14.

15 To cool the halogen-type light assemblies, the air inlet chamber 24 is provided with a pair of inlet fans 40 and 42 which, when energized, draw air from outside the clothes dryer 10, creating an air flow which cools the halogen-type light assemblies 38 before penetrating the
20 dryer drum 14 through the air inlet apertures 34 (see arrows 44, 46 and 48 in Figures 1 and 3).

25 To avoid the generation of a positive pressure in the dryer drum 14 as well as to provide an exhaust path for moisture-containing air present in the dryer drum 14, the air exhaust chamber 26 is provided with a dryer drum exhaust aperture 50 having a filtering screen 51, an exhaust fan 52 and a rotating mechanism compartment

aperture 54. When the exhaust fan 52 is energized, a negative pressure is created in the exhaust chamber 26. This negative pressure creates a drawing effect which tends to draw the moisture-containing air from the dryer drum 14 through the exhaust aperture 50. Of course, air from the rotating mechanism compartment 33 is also drawn through the aperture 54 therefore preventing excessive heating of the compartment 33. The drawn air is exhausted through an outlet 56 (see arrow 58 in Figures 1 and 3). A rotatable baffle plate 60 is provided near the outlet 56 to regulate the exhaust air flow as will be described hereinafter. The baffle plate 60 includes a baffle plate actuator 61.

The general characteristic of the present invention is to dry wet clothes by a bombardment of photons which are generated by the halogen-type light assemblies 38. This flow of photons is directed inside the dryer drum 14 and is preferably focused as will be discussed later. The photons are adapted to fraction the water molecules embedded in the clothes and to facilitate the extraction of these water molecules. Of course, when the water molecules are extracted from the clothes, they generate moisture in the air contained in the dryer drum 14.

The warm air entering the dryer drum 14 through the apertures 34 will prevent the condensation of the water vapour generated by the drying of the clothes placed in the dryer drum 14, and the exhaust fan 52 will evacuate the moisture-containing air out of the dryer drum 14.

It has been found that it is advantageous to prevent the halogen-type light assemblies 38 from being energized when the exhaust

fan 52 is not operating properly to prevent possible overheating of the dryer drum 14.

Therefore, a controller 28 is provided to control the
5 operation of the clothes dryer 10. The controller 28 is provided with an
air flow sensor 62, electrically connected to the controller 28 through a
wire 64, acting as a fan-operation sensor to determine if the exhaust fan
52 is operating properly. The inlet fans 40 and 42 are electrically
connected to the controller 28 through a wire 66 and the exhaust fan is
10 electrically connected to the controller 28 through a wire 68. The
halogen-type light assemblies 38 are electrically connected to the
controller 28 through wires 70 and the baffle plate actuator 61 electrically
connected to the controller 28 through a wire 72. Finally, a heat sensor
74, mounted to the internal wall 16, is electrically connected to the
15 controller 28 through a wire 76. The purpose of the heat sensor 74 will
be described later. Of course, switches or other controls 78 are
electrically connected to the controller 28 to enable the controller 28 to
accept instructions from the user.

20 The controller 28 may therefore be configured so as to
de-energize the halogen-type light assemblies 38 should the sensor 60
detect that the exhaust fan 52 does not operate properly.

It has been found that the walls of the dryer drum 14 and
25 the moisture-containing exhausted air remain at a normal temperature
while the clothes to be dried placed in the dryer drum 14 are still wet.
However, the temperature increases significantly when the clothes are

dry. The heat sensor 74 is therefore provided to detect this significant temperature increase so that the controller 28 may de-energized all the electrical components of the clothes dryer 10 when the clothes placed in the dryer drum are dry. The clothes dryer 10 is therefore automatically
5 stopped when the clothes are dry, which increases its overall efficiency since no unnecessarily operation is permitted.

As will be easily understood by one of ordinary skill in the art, the controller 28, which has been generally described as an
10 electrical controller, could be replaced by a mechanical controller performing essentially the same functions.

The baffle plate 60 is provided to limit the exhaust of moisture-containing air to thereby adjust the temperature in the dryer
15 drum 14 depending on various factors such as the temperature of the air surrounding the clothes dryer 10.

It is to be noted that the baffle plate actuator 61 could easily be replaced by a mechanical actuator (not shown).

20

Turning now to Figures 5 to 7, the halogen-type light assemblies 38 will be described in greater details.

Each halogen-type light assembly 38 is provided with a
25 plurality of oversized heat transfer fins 80 adapted to dissipate the heat generated by the halogen-type light assemblies 38. The heat is therefore

more efficiently transferred to the flow of air generated by fans 40 and 42 and entering the dryer drum 14.

5 A photon generating halogen-type light bulb 81 is used to generate the light to be transmitted in the dryer drum 14.

10 The halogen-type light assemblies 38 are also provided with a pair of light reflectors 82 and 84 interconnected by a bimetallic element 86. The light reflectors 82 and 86 are shown in full lines in Figure 6 as being in a position where the light generated by the halogen-type light bulb 81 is focused at a predetermined focused location 88 in the dryer drum 14 (see dashed lines 90).

15 A characteristic of the bimetallic element 86 interconnecting the light reflectors 82 and 84 is its known deformation when a predetermined temperature is reached. Therefore, the bimetallic element 86 is adapted to move the reflectors 82 and 84 to a position shown in dotted lines so that the light generated by the bulb 81 becomes unfocused (see dotted lines 92) when a temperature indicating the dry
20 state of the clothes placed in the dryer drum 14 is reached.

A thermal-type glass plate 93 separates the clothes from the halogen-type light assemblies 38 to protect both the light bulb 81 and the clothes.

25

Figure 7 illustrates light bulb 81 which advantageously includes slotted tabs 94 to be electrically connected to electrical supports

(not shown) via fasteners such as screws. Indeed, it is advantageous to use fasteners to connect the light bulb 81 because of the continuous vibrations of the clothes dryer 10 upon operation thereof.

5 Compared to conventional halogen-type light assemblies, the halogen-type light assemblies 38 typically have undersized reflectors 82 and 84, and oversized heat sinks elements 80.

10 Returning to Figures 1 and 2, a clothes spacing structure 96 is operatively positioned inside the dryer drum 14 and is adapted to act as a spacing means for ensuring that the clothes inside the dryer drum 14 are spaced apart from the halogen-type light assemblies 38. Furthermore, the ramp-like profile of the clothes spacing structure 96 guides the clothes near the focused location of the halogen-type light
15 assemblies 38 which increases the efficiency of the clothes dryer 10 since the intensity of photons is greater at this focused location.

 To further increase the efficiency of the clothes dryer 10, an internal surface 98 (Figure 2) of the dryer drum 14 is preferably white
20 so as to potentially minimize losses due to the absorption of photons by the dryer drum 14.

 It is to be noted that the fans 40, 42 and 52 could be operationally linked to the drum rotating mechanism 32 by suitable
25 mechanical links (not shown) should one want to use only one motor in the clothes dryer 10. However, this would lead to a more complex mechanical structure of the clothes dryer.

It is also to be noted that the clothes dryer 10 could be easily modified to dry non-clothing wet articles. In this case, the rotating dryer drum would be replaced by a support structure adapted to support the wet articles to be dried.

5

Although the present invention has been described hereinabove by way of preferred embodiments thereof, it can be modified, without departing from the spirit and nature of the subject invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

5 1. A dryer apparatus for drying wet articles comprising:
an article support structure for supporting the articles to
be dried; and

 at least one photon generating halogen-type light
assembly associated with the support structure so as to direct a flow of
photons towards the articles to be dried;
10 whereby the articles to be dried are placed on the support structure to be
dried by the flow of photons generated by said at least one photon
generating halogen-type light.

 2. A dryer apparatus as defined in claim 1, wherein said
15 articles support structure comprises a container defining an internal
volume and having a peripheral wall.

 3. A dryer apparatus as defined in claim 2, further
comprising a frame and wherein the container is cylindrical and has a
20 substantially horizontal rotation axis; and wherein the dryer apparatus
further includes a container rotating mechanism mounted to said frame
for rotating the cylindrical container about said rotation axis to therefore
displace the articles to be dried in a tumbling fashion.

25 4. A dryer apparatus as defined in claim 3, wherein
each said photon-generating halogen-type light assembly includes a
halogen-type light bulb, at least one light reflector and heat sink means.

 5. A dryer apparatus as defined in claim 4, wherein the
30 flow of photons generated by said at least one photon-generating

halogen-type light assembly is focused at a predetermined location of said internal volume of said container by said at least one light reflector.

5 6. A dryer apparatus as defined in claim 5, wherein said container comprises a clothes spacing structure for guiding the articles to be dried towards said predetermined location.

10 7. A dryer apparatus as defined in claim 5, comprising two light reflectors which are interconnected through a bimetallic element; the bimetallic element causing a movement of the reflectors when the temperature has reached a predetermined threshold, to prevent overheating at said predetermined location.

15 8. A dryer apparatus as defined in claim 3, wherein said peripheral wall of said container is essentially white.

20 9. A dryer apparatus as defined in claim 2, wherein said container includes an air inlet aperture and wherein said dryer apparatus further comprises an inlet fan mounted in the proximity of the air inlet aperture of the container; said inlet fan producing an air flow cooling said at least one halogen-type light assembly before penetrating said container through said air inlet aperture to thereby provide warm air in the container and therefore prevent water condensation in the container.

25 10. A dryer apparatus as defined in claim 2, wherein said container includes an air outlet aperture and wherein said dryer apparatus includes an exhaust fan mounted in the proximity of the air outlet aperture; the exhaust fan drawing moisture-containing air from said container.

11. A dryer apparatus as defined in claim 10, further comprising:

5 a controller means operatively connected to said inlet and exhaust fans and to said at least one photon-generating halogen-type light assembly;

a heat sensor operatively connected to said controller means to detect a temperature threshold in the container indicating the dried state of the articles placed in the container;

10 a fan-operation sensor operatively connected to said controller for detecting the operation of said exhaust fan;

whereby (a) the controller means de-energize said at least one photon-generating halogen-type light assembly and the inlet and exhaust fans when the heat sensor detects a temperature above a predetermined temperature threshold indicating that the articles placed in said container are dry, and (b) the controller means de-energize said at least one photon-generating halogen-type light assembly when the fan-operation sensor detects that the exhaust fan is not operating properly, thereby preventing overheating of the container.

20 12. A clothes dryer apparatus comprising:

a frame structure;

a dryer drum having a rotation axis and an inner surface defining an internal volume; the dryer drum being mounted in the frame structure so as to rotate about said rotation axis; and

25 at least one photon-generating halogen-type light assembly mounted in the frame structure so as to direct a flow of photons towards the internal volume of the dryer drum;

whereby wet clothes placed in the internal volume of the dryer drum are dried by the flow of photons generated by said at least one photon-generating halogen-type light.

30

13. A clothes drying apparatus as defined in claim 12,
further comprising a rotating means mounted in said frame structure and
associated to said dryer drum to rotate said dryer drum about said
rotation axis to therefore displace the clothes to be dried in a tumbling
5 fashion.

14. A clothes dryer apparatus as defined in claim 13,
wherein each said photon-generating halogen-type light assembly
includes a halogen-type light bulb, at least one light reflector and heat
10 sink means.

15. A clothes dryer apparatus as defined in claim 14,
wherein the flow of photons generated by said at least one photon-
generating halogen-type light assembly is focused at a predetermined
15 location of said internal volume of said dryer drum.

16. A clothes dryer apparatus as defined in claim 15,
wherein said dryer drum further comprises a clothes spacing structure for
guiding the clothes to be dried towards said predetermined location.
20

17. A clothes dryer apparatus as defined in claim 16,
comprising two light reflectors which are interconnected through a
bimetallic element; the bimetallic element causing a movement of the
reflectors when the temperature has reached a predetermined threshold,
25 to prevent overheating at said predetermined location.

18. A clothes dryer apparatus as defined in claim 12,
wherein said internal wall of said dryer drum is essentially white.

19. A clothes dryer apparatus as defined in claim 12,
wherein said dryer drum includes an air inlet aperture and wherein said
frame structure includes an inlet fan mounted in the proximity of said air
inlet aperture; said inlet fan producing an air flow cooling said at least one
5 halogen-type light assembly before penetrating said dryer drum through
said air inlet aperture to thereby provide warm air in the dryer drum and
therefore prevent water condensation in the dryer drum.

20. A clothes dryer apparatus as defined in claim 12,
10 wherein said dryer drum includes an air outlet aperture and wherein said
frame structure includes an exhaust fan mounted in the proximity of the
air outlet aperture; the exhaust fan drawing moisture-containing air from
the dryer drum.

21. A clothes dryer apparatus as defined in claim 20,
15 further comprising:

a controller means operatively connected to said inlet
and exhaust fans and to said at least one photon-generating halogen-
type light assembly;

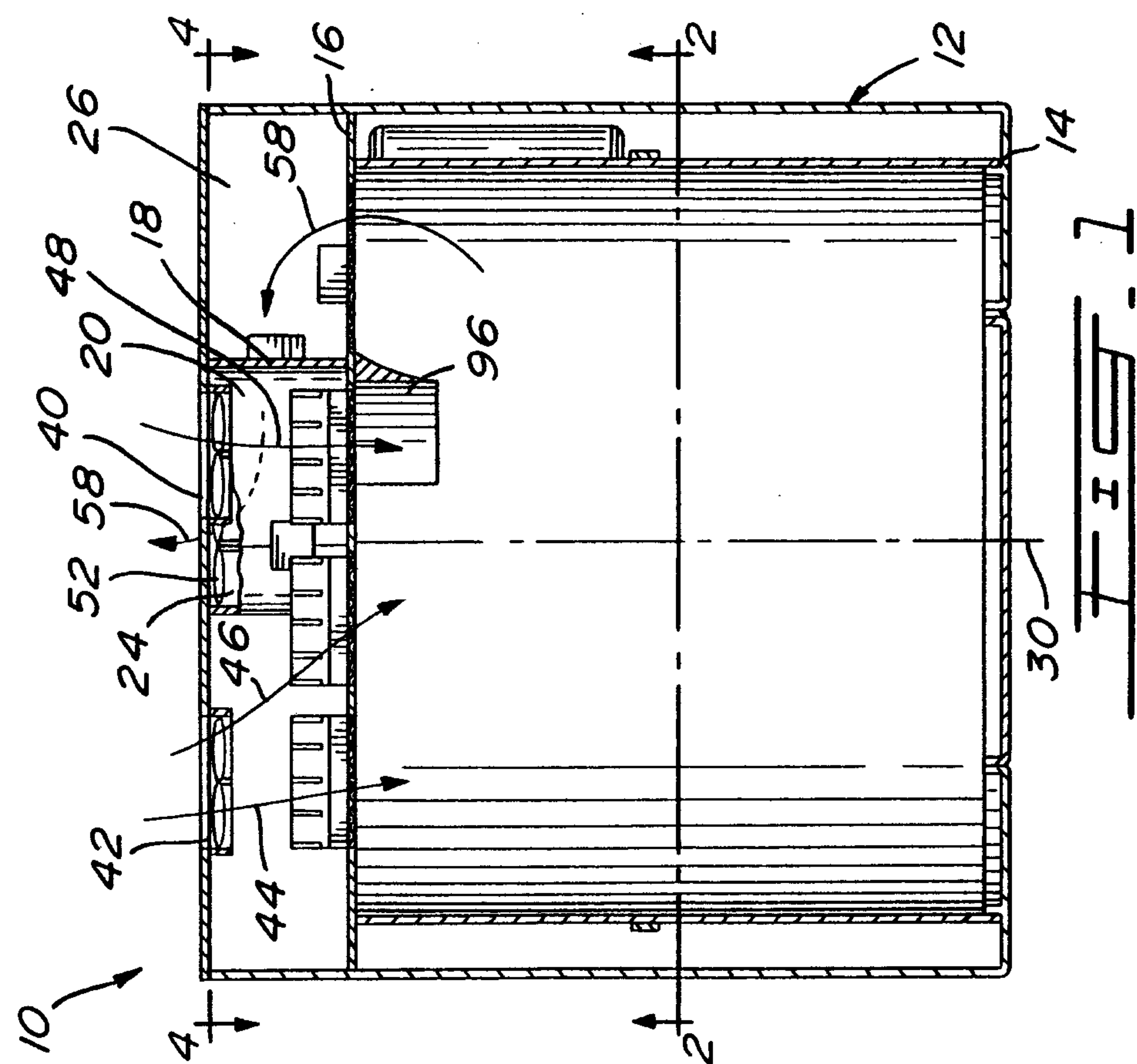
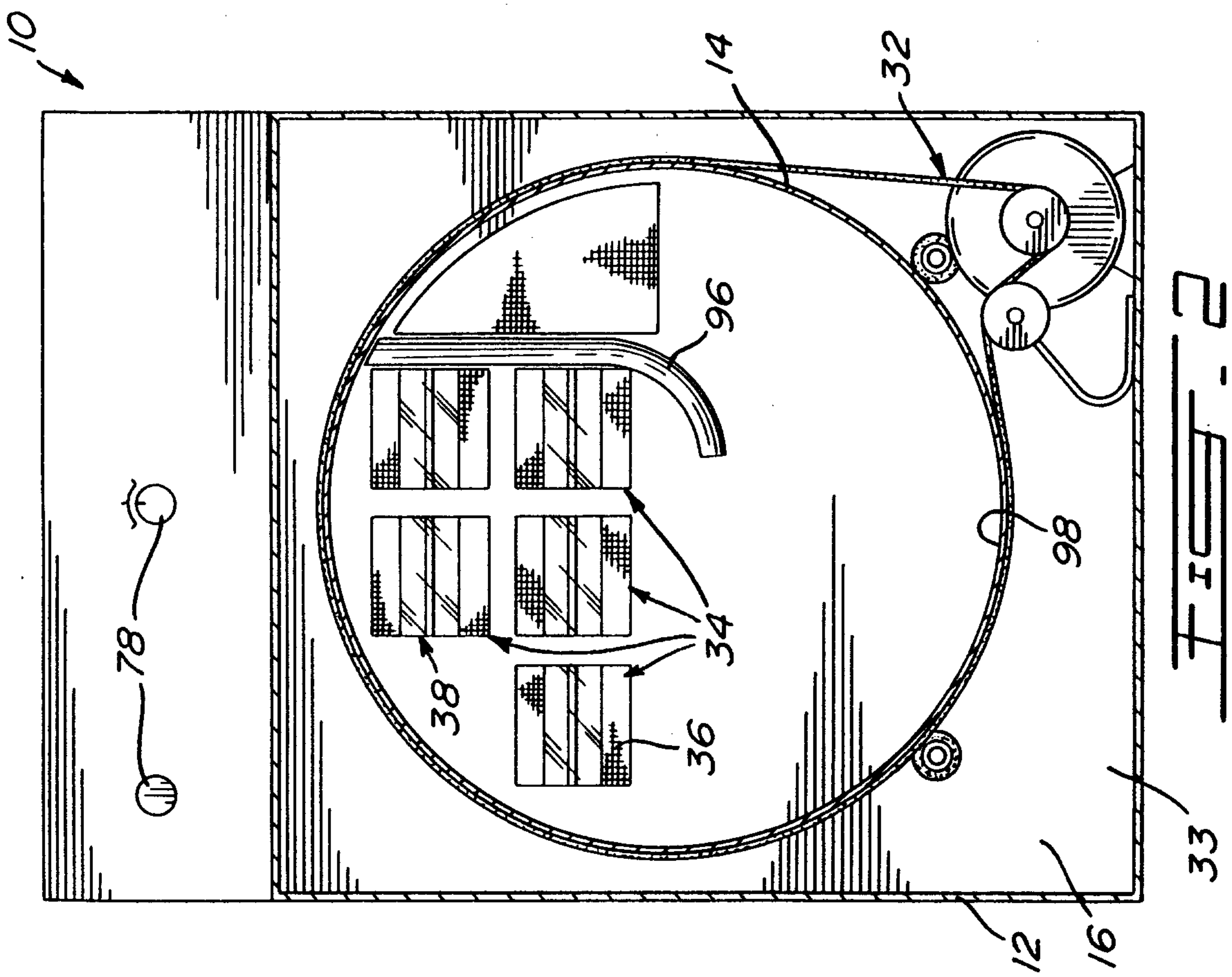
20 a heat sensor operatively connected to said controller
means to detect a temperature threshold in the container indicating the
dried state of the articles placed in the dryer drum;

a fan-operation sensor operatively connected to said
controller for detecting the operation of said exhaust fan;

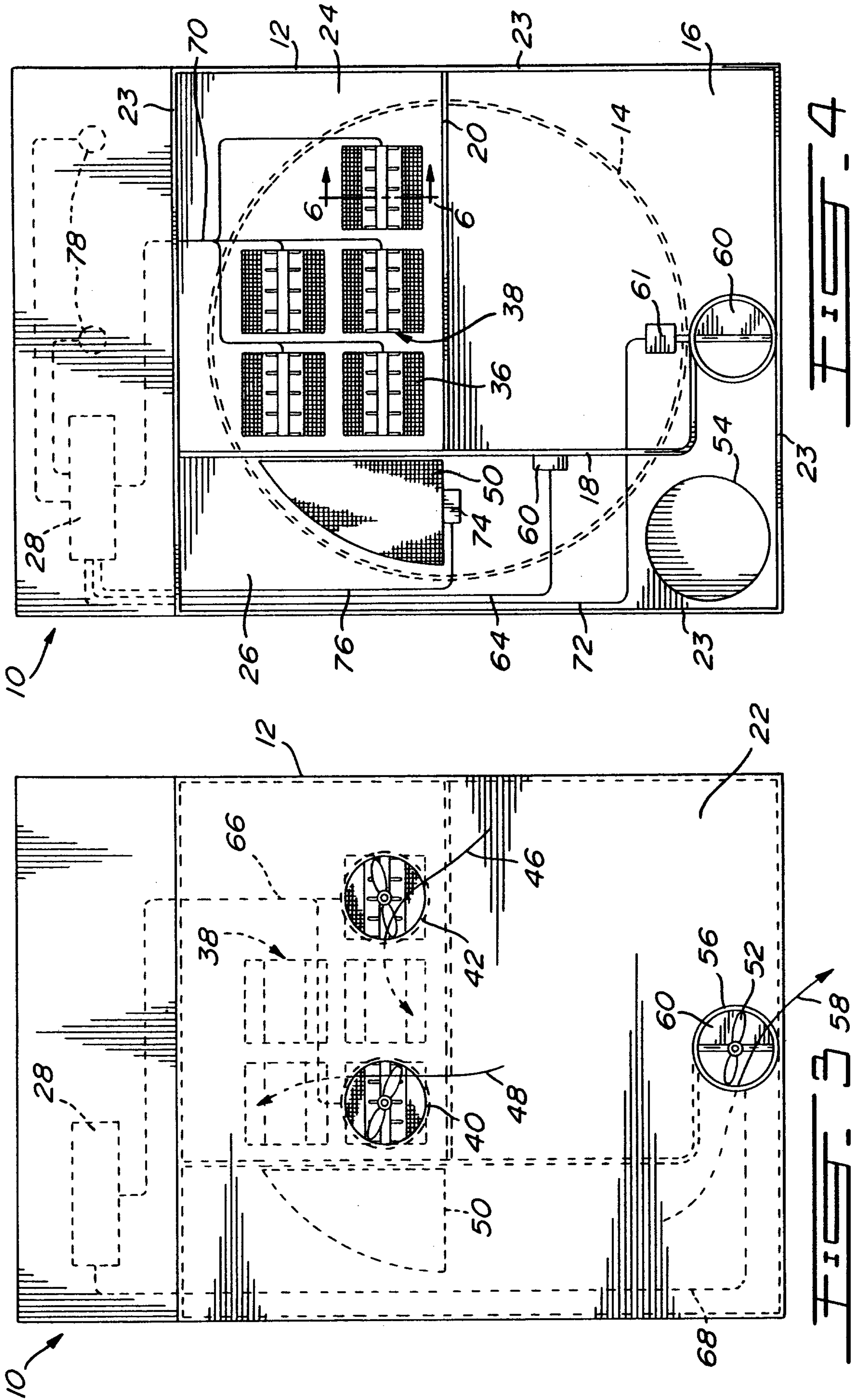
25 whereby (a) the controller means de-energize said at least one photon-
generating halogen-type light assembly and the inlet and exhaust fans
when the heat sensor detects a temperature above a predetermined
temperature threshold indicating that the articles placed in said dryer
drum are dry, and (b) the controller means de-energize said at least one
30 photon-generating halogen-type light assembly when the fan-operation

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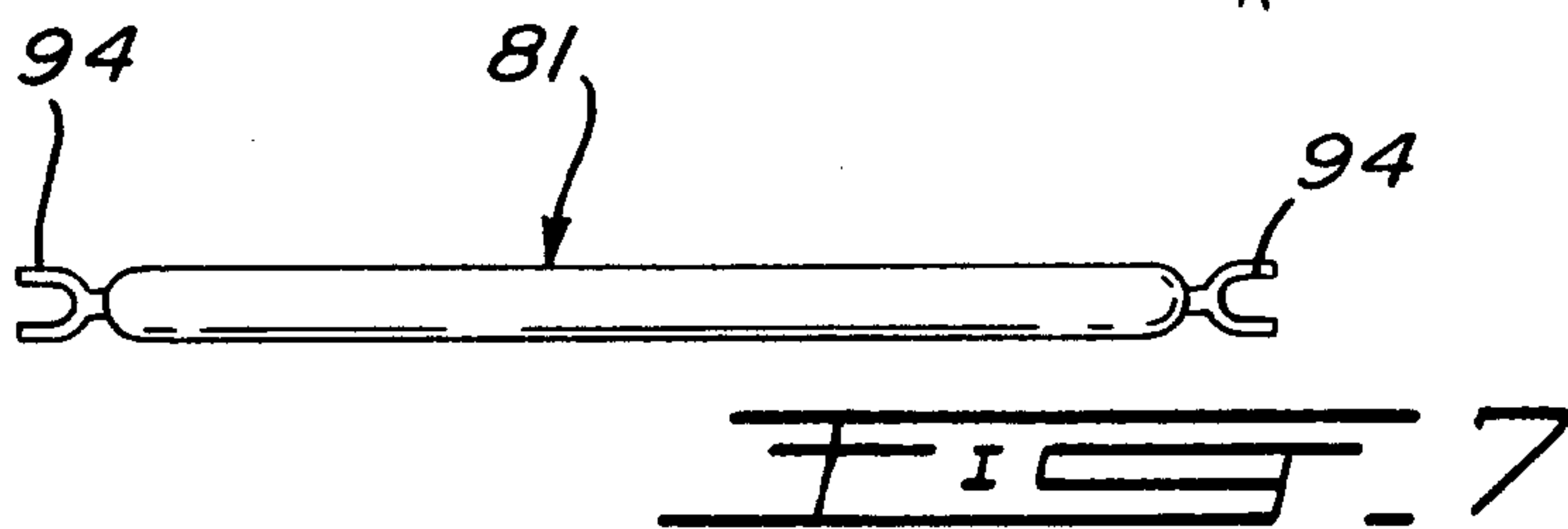
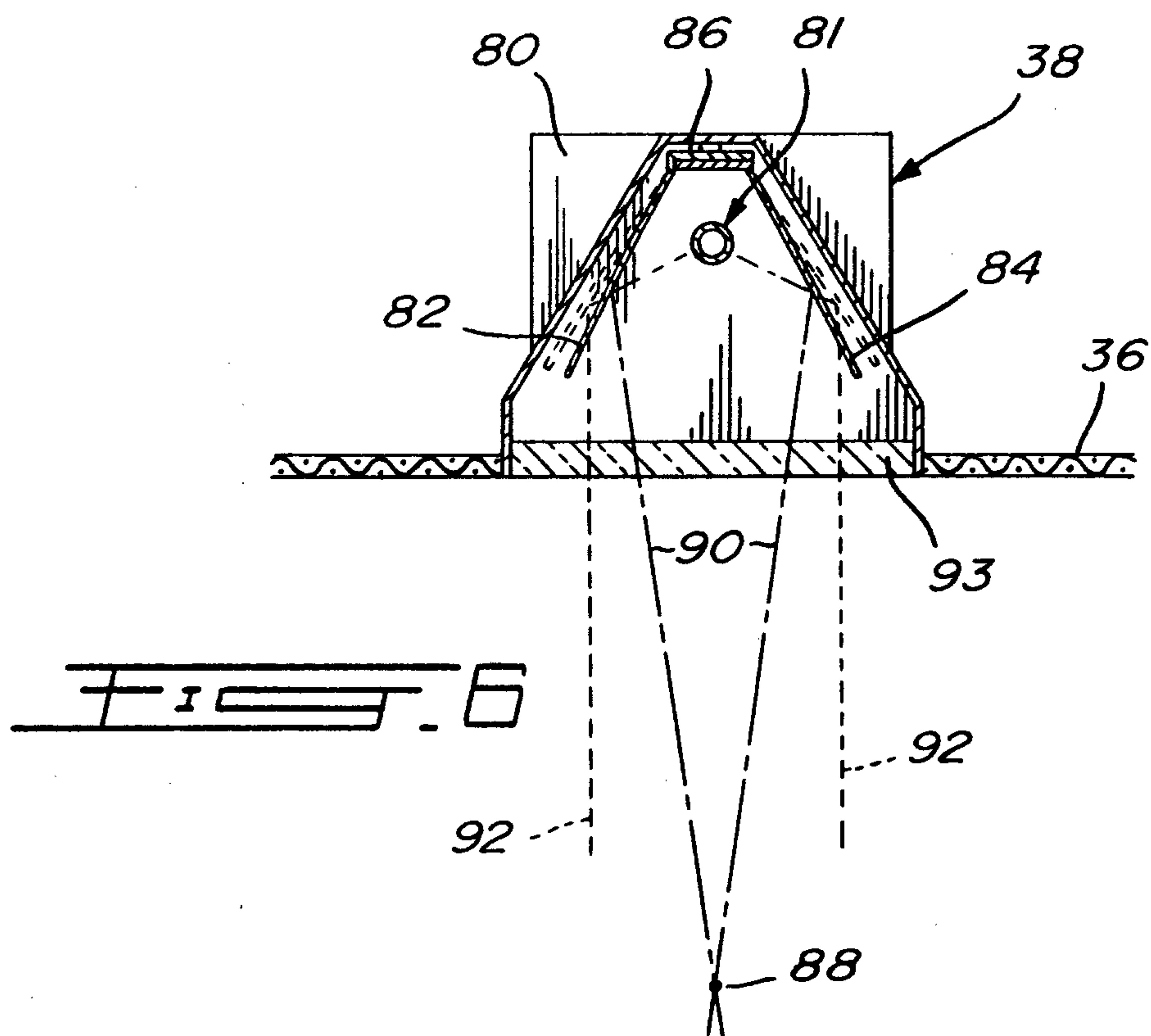
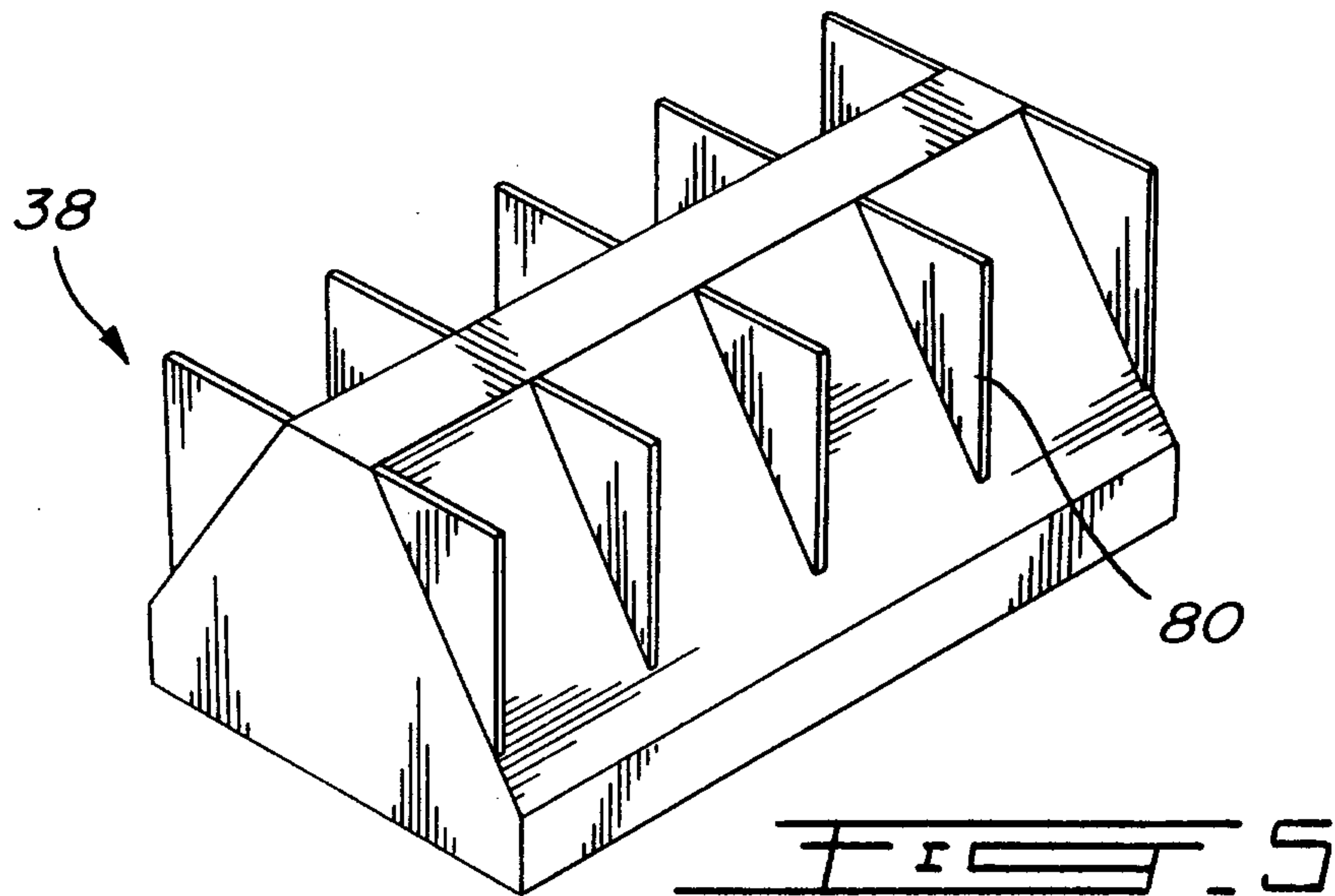
sensor detects that the exhaust fan is not operating properly, thereby preventing overheating of the dryer drum.



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