

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11)

Publication number:

**0 273 580
A2**

(12)

EUROPEAN PATENT APPLICATION

(21)

Application number: **87310346.9**

(51)

Int. Cl.⁴: **D06F 58/04**

(22)

Date of filing: **24.11.87**

(30)

Priority: **28.11.86 JP 284098/86**

(43)

Date of publication of application:
06.07.88 Bulletin 88/27

(84)

Designated Contracting States:
DE FR GB IT NL

(71)

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Tumble drier.

(57)

Drying apparatus including an outer support frame having opposed mountings (11, 12) which are interconnected whereby said outer support frame may be moved between a stowed attitude in which said opposed mountings are closely adjacent one another and an extended attitude in which said opposed mountings are extended away from one another; a collapsible clothes drum (40) supported within said outer support frame (11, 12) and having opposed end walls, one of which is provided with a loading opening (53) and each being supported for rotation about a common axis on a respective one of said opposed mountings; drive means (60) for rotating said clothes drum, and conditioned air circulation means (46) for circulating air through said clothes drum.

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TUMBLE DRIER

This invention relates to drying apparatus. This invention has particular but not exclusive purposes to the drying of clothes, and for illustrative purposes reference will be made to such application. However, it is to be understood that this invention could be used in other applications, such as the dehumidification of selected materials.

Clothes driers which tumble-dry clothes in a heated air stream have become very common in homes. Unfortunately, it is often necessary to install driers in laundry rooms which were designed before driers became common, and considerable difficulty is often experienced in finding room within a laundry to fit a drier of reasonable internal capacity. Driers are often hung from walls because of a lack of floor space, but the bulk of a conventional drier often results in an unacceptable intrusion into the working area of the laundry.

The present invention aims to alleviate the above disadvantages and to provide drying apparatus which will be reliable and efficient in use. Other objects and advantages of this invention will hereinafter become apparent.

With the foregoing and other objects in view, this invention in one aspect resides broadly in drying apparatus including: an outer support frame having opposed mountings which are interconnected whereby said outer support frame may be moved between a stowed attitude in which said opposed mountings are closely adjacent one another and an extended attitude in which said opposed mountings are extended away from one another; a collapsible clothes drum supported within said outer support frame and having opposed end walls, one of which is provided with a loading opening and each being supported for rotation about a common axis on a respective one of said opposed mountings; drive means for rotating said clothes drum, and conditioned air circulation means for circulating air through said clothes drum.

Preferably, the clothes drum is formed from a plurality of annular members which may be telescoped together to place the clothes drum in a stowed position and which may be extended axially to form a drying drum in an operating position. Sealing means may be provided between the annular members, whereby leakage of fluid from the drying drum in the operating position may be minimised, and inward projections may be formed on an annular member whereby a tumbling action may be imparted to clothes within the drying drum when the drying drum is rotated. Alternatively, the drum may be formed as a series of flat segments, and a tumbling action may be imparted by the action of the flat segments on the clothes.

Of course, if desired, other means of expanding and contracting the drum may be used, such as the use of bellows sections or mesh-like sections within the drum. The mesh-like section may incorporate inward projections which deploy internally during extension of the drum whereby a tumbling action may be imparted to clothes within the drum when the drum is rotated. Alternatively, the drum may be formed as a series of flat segments, and a tumbling action may be imparted by the action of the flat segments on the clothes.

Preferably, the outer housing is formed from a plurality of housing segments which may be telescoped together to form an enclosure for the clothes drum in a stowed position and which may be extended along the axis of the clothes drum to form an enclosure for the clothes drum in its operating position. Sealing means may be provided between the housing segments whereby leakage of fluid from the housing in the operating position may be minimised. Of course, if desired, other means of expanding and contracting the housing may be used, for instance by the use of a bellows section in the housing.

Movement of the housing segments from the stowed position to the operating position may be controlled by displacement control means whereby relative movement of the housing segments is limited to movement along the axis of the rotary drum.

In a preferred embodiment, the displacement control means is a plurality of scissor linkages, each link being pivoted to one of the housing segments at one end and having at the other end sliding means adapted for sliding within a slot formed in a further one of the housing segments and there being provided locking means for retaining the sliding means at selected positions within the slot.

In order that this invention may be more easily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate typical embodiments of the invention, wherein:-

FIG. 1 is a pictorial front view of a collapsible drier in the expanded position;

FIG. 2 is a pictorial rear view of the collapsible drier in the collapsed position;

FIG. 3 is a cross-sectional side view of the collapsible drier in the expanded position;

FIG. 4 is a cross-sectional side view of the collapsible drier in the collapsed position;

FIG. 5 is a sectional top view of the expanding linkage in the expanded position;

FIG. 6 is a sectional top view of the expanding linkage in the collapsed position;

FIG. 7 is a sectional side view of an alternative form of collapsible drier;

FIG. 8 is a top view of the alternative collapsible drier;

FIG. 9 is a sectional side view of a further alternative form of collapsible drier, and

FIG. 10 is a sectional side view of the housing of the drier shown in FIG. 9.

As shown in FIGS. 1 to 6, the collapsible drier assembly 10 has a rear housing 11 and a front housing 12, the front housing 12 being sized to slide into the rear housing, and the housings 11 and 12 are joined at top and bottom by scissor link assemblies 13. The scissor link assemblies 13 comprise pairs of scissor links 14 joined by central pivots 15. The links 14 are each joined at one end to one side of the housings 11 and 12 by pivots 16, and have pins 17 at their other ends which slide in slots 18 on the other side of the housings 11 and 12.

Lock bars 19 pivot about lock bar pivots 20 on the front housing 12 and are linked by a vertical bar 21 to which is attached an operating handle 22. The ends of the lock bars 19 remote from the vertical bar 21 partly cover the slots 18 in the front housing 12, and are shaped to form locking lugs 23, with abutting faces 24 on the sides of the lugs 23 facing the ends of the slots 18 and sloping faces 25 on the sides of the lugs 23 facing the centre of the slots 18.

Rectangular louvre assemblies 26 fill the gap between the rear housing 11 and the front housing 12, and are held in place by louvre pins 27 attached to the scissor links 14 and sliding within louvre slots 28.

The rotary drum assembly 40 has a cylindrical rear drum section 41, a cylindrical central drum section 42 which slides within the rear drum section 41, and a cylindrical front drum section 43 which slides over the central drum section 42 and within the rear drum section 41 to collapse the assembly.

The drum assembly 40 rotates within bearings 44 which are attached to the housings 11 and 12, and the drum sections 41, 42 and 43 are sealed by sealing rings 48 when the drum assembly 40 is in the extended position. The rear drum section 41 has a fan intake aperture 45 in its rear face through which exhaust air is drawn by a fan 46. A perforated fan cover and lint filter 47 covers the fan intake hole 45. The central drum section 42 has inwardly-projecting paddles 50 formed on its surface to engage with clothes placed within the drum to impart a tumbling action to the clothes as the drum assembly 40 rotates. The front face of the front drum section 43 has a series of air intake

holes 51 through which air heated by the ring heating element 52 enters the drum assembly 40.

A central filling opening 53 in the front drum section 43 and a matching opening 54 in the front housing 12 are closed during operation by a door 55. The door 55 pivots on a door hinge 56 and carries a central view panel 57. The front face of the front housing 12 is provided with front handles 58 at the sides, one of the front handles 58 containing the operating handle 22.

The fan 46 and the drum assembly 40 are rotated by an electric motor 60. The front end of the motor shaft carries a drum drive pulley 61 which drives the drum assembly 40 through a drum drive belt 62 which wraps around the outside of the rear section 41. The rear end of the motor shaft carries a fan drive pulley 63. The fan 46 is mounted on a fan shaft 64 which passes through a fan bearing 65 carried in the fan housing 66. A fan pulley 67 mounted on the fan shaft 64 is connected to the fan drive pulley 63 by a fan drive belt 68. The exhaust air is discharged from the drier assembly 10 through the air discharge duct 69.

The drier assembly 10 is stored in the collapsed position with the front housing 12 and the louvre assemblies 26 nested within the rear housing 11, and the three drum sections 41, 42 and 43 telescoped together. In this position, the pins 17 in the ends of the scissor links 14 are locked in the outer ends of the slots 18 in the front housing 12 by the lugs 23 on the lock bars 19. This holds the front housing 12 locked within the rear housing 11.

To prepare the drier assembly 10 for use, the handle 22 is pulled forward, operating the lock bars 19 to pull the lugs 23 backwards and away from the pins 17 to allow them to slide within the slots 18. The operator may then pull on the front handles 58 to pull the front housing 12 and the louvre assemblies 26 out of the rear housing until the pins 17 slide up the sloping face 25 of the inner locking lugs 23. The locking lugs 23 then close behind the pins 17, locking the drier assembly 10 in the extended position.

During the extension process, the drum assembly 40 also extends, with the front section 43 and the central section 42 sliding axially out of the rear section 41.

Damp clothes or the like may then be inserted into the drum 40 through the door 55.

In use, the extended drier is energised electrically to heat the heating element 52 and to rotate the motor 60, driving the fan 46 and rotating the drum assembly 40. The fan draws in past the louvre assemblies 26, over the heating element 52, into the drum assembly 40 through the air intake holes 51. The air then exits the drum 40 through the cover 47, then through the fan 46 and out of the drier 10 through the air discharge duct 69.

As the drum 40 rotates, the paddles 50 on the drum central section 42 carry the clothes around with the drum 40, tumbling them within the heated airstream and thus drying them.

The drier assembly 80 shown in FIGS. 7 and 8 has a housing 81 formed with bellows 82 around its central section such that the front section 83 may be moved towards or away from the rear section 84 by flexure of the bellows 82.

Movement of the front section 83 relative to the rear section 84 is controlled by scissor linkages 85 which consist of pairs of scissor links 86 pivoted to one end to the housing 81 and having at their other ends pins 87 which slide within slots 90 in the housing 81. The inner ends of the slots 90 are formed with re-entrant recesses 91 into which the pins 87 may be clipped to lock the scissor linkages 85 in a position in which the housing 81 is extended.

The drum assembly 92 is formed with a rear face plate 93 and a front face plate 94, between which a bellows 95 extends. The bellows 95 is penetrated with a pattern of holes 96 through which air flows into the drum 92. The front face plate 94 has a central flanged opening 97 through which clothes may be passed into the drum 92 and around which a bearing 100 is disposed. A door 101 covers the opening 97 when the drier 80 is operated.

The drum 80 is rotated by a motor 102 which drives the drum 80 through a drive belt 103.

The drier assembly 110 shown in FIGS. 9 and 10 has a housing assembly 111 formed from a rear segment 112, a central segment 113 and a front segment 114. The drum assembly 115 has a rear flange 116 attached to the rear segment 112 by a bearing 117, while a front flange 118 is attached to the front segment 114 by a bearing 120. The central section 121 of the drum assembly 115 is formed from a mesh-like material which forms a hyperbolic surface of revolution when tension is applied to the front and rear flanges 116 and 118 by extension of the housing assembly 111. A central flanged opening 122 in the front flange 118 permits clothes to be passed into the drum 115, and is covered by a door 123 when the drier 110 is operating.

Seals 124 operate between the rear segment 112 and the central segment 113, and between the central segment 113 and the front segment 114.

It will of course be realised that while the above has been given by way of illustrative example of this invention, all such and other modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of this invention as is defined in the appended claims.

Claims

1. Drying apparatus including:-an outer support frame having opposed mountings which are interconnected whereby said outer support frame may be moved between a stowed attitude in which said opposed mountings are closely adjacent one another and an extended attitude in which said opposed mountings are extended away from one another; a collapsible clothes drum supported within said outer support frame and having opposed end walls, one of which is provided with a loading opening and each being supported for rotation about a common axis on a respective one of said opposed mountings; drive means for rotating said clothes drum, and conditioned air circulation means for circulating air through said clothes drum.

2. Drying apparatus as defined in Claim 1, wherein said clothes drum is formed from a plurality of annular members which may be telescoped together to place said clothes drum in said stowed attitude and which may be extended axially to form a drying drum.

3. Drying apparatus as defined in Claim 2, wherein said outer support frame is formed from a plurality of housing segments which may be telescoped together to form an enclosure for said clothes drum in said stowed attitude and which may be extended along the axis of said clothes drum to form an enclosure for said drying drum in said extended attitude.

4. Drying apparatus as defined in Claim 3, wherein movement of said housing segments from said stowed attitude to said extended attitude is controlled by displacement control means whereby relative movement of said housing segments is limited to movement along the axis of said clothes drum.

5. Drying apparatus as defined in Claim 4, wherein said displacement control means is a plurality of scissor linkages, each link being pivoted to one of said housing segments at one end having at the other end sliding means adapted for sliding within a slot formed in a further one of said housing segments and there being provided locking means for retaining said sliding means at selected positions with said slot.

6. Drying apparatus as defined in Claim 2, wherein the innermost of said annular members is provided with an inward projection.

7. Drying apparatus as defined in Claim 2, wherein sealing means are provided between said annular members whereby the peripheral surface of said drying drum is substantially sealed.

8. Drying apparatus as defined in Claim 3, wherein sealing means are provided between said housing segments.

9. Drying apparatus as defined in Claim 1, wherein said clothes drum is formed with a bellows section in its body portion, said bellows section being expandible and contractible along the axis of said clothes drum.

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10. Drying apparatus as defined in Claim 1, wherein said housing is formed with a bellows section in its body, said bellows section being expandible and contractible along the axis of said clothes drum.

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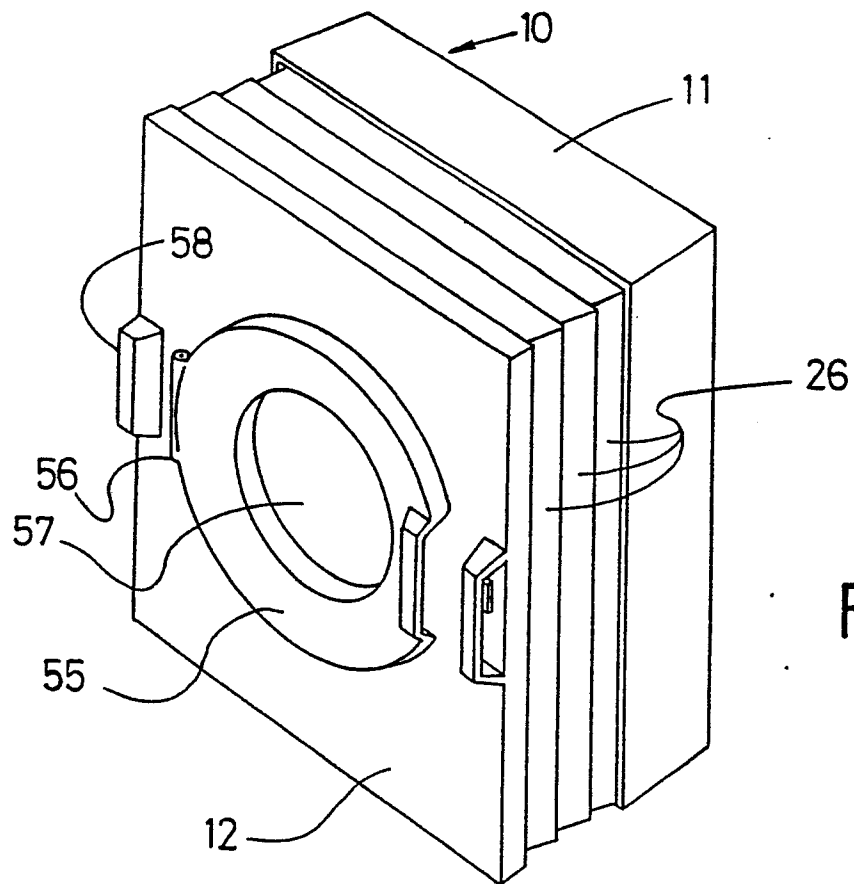


FIG. 1

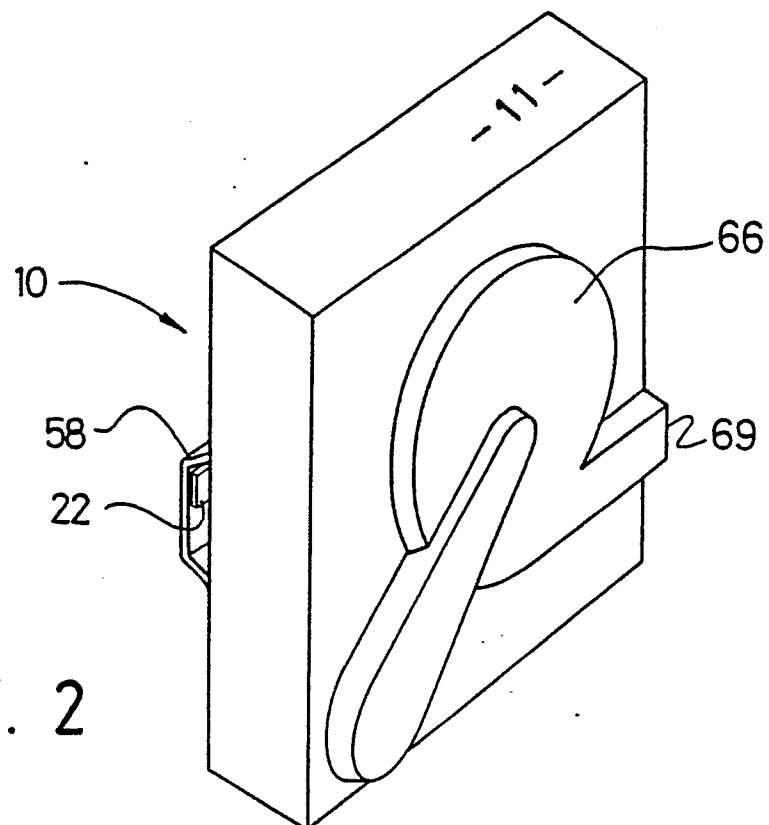


FIG. 2

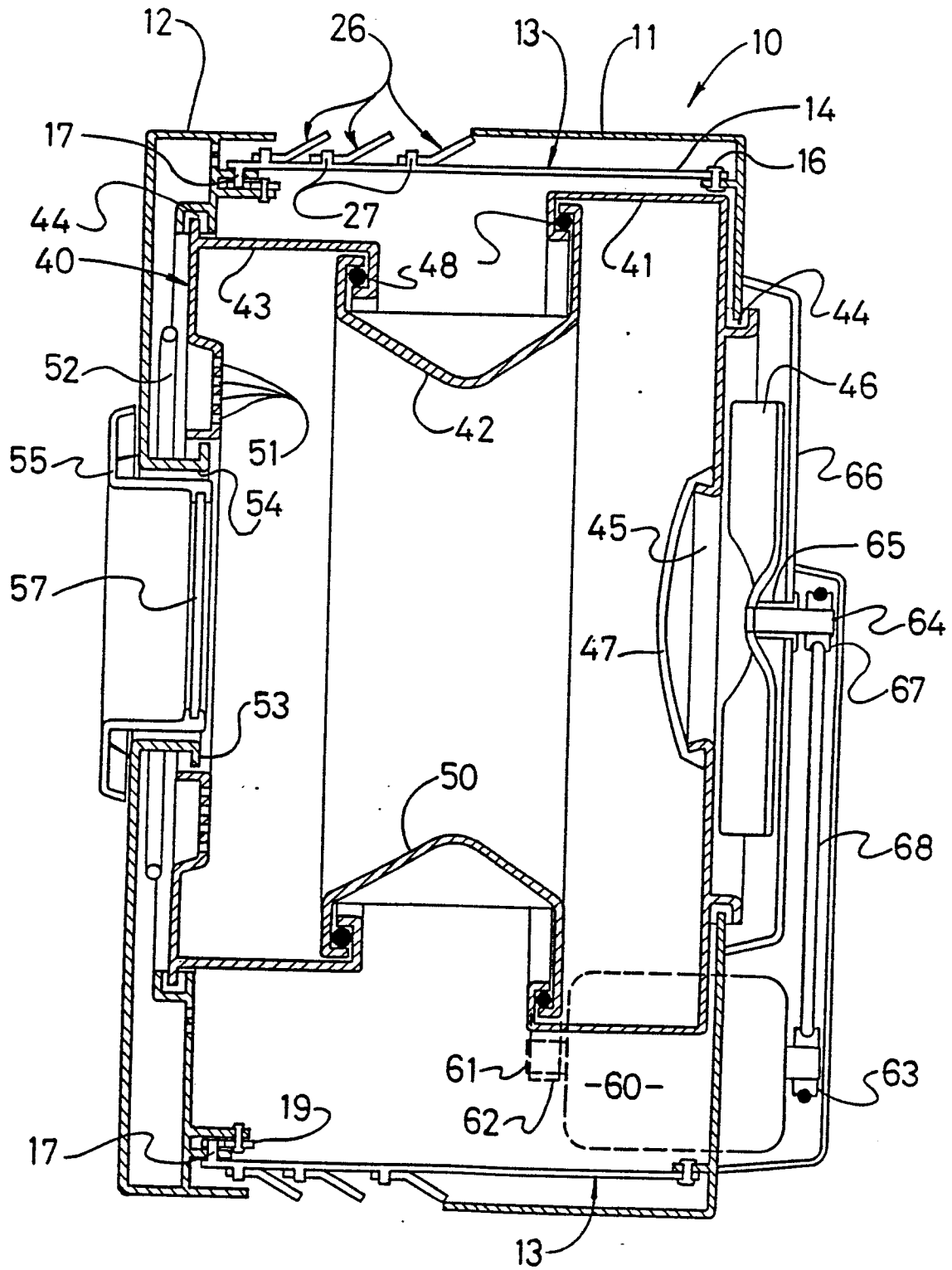
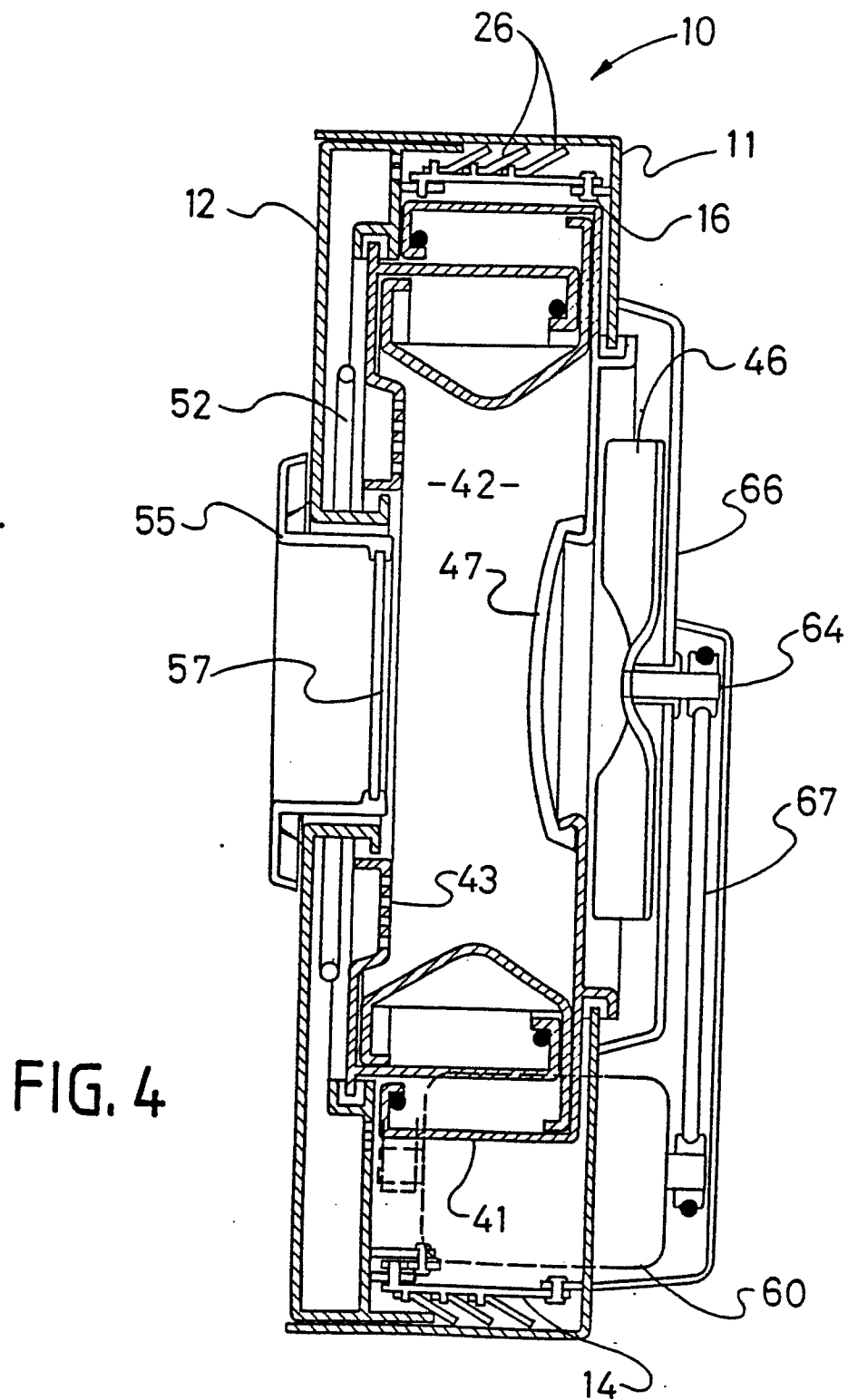


FIG. 3



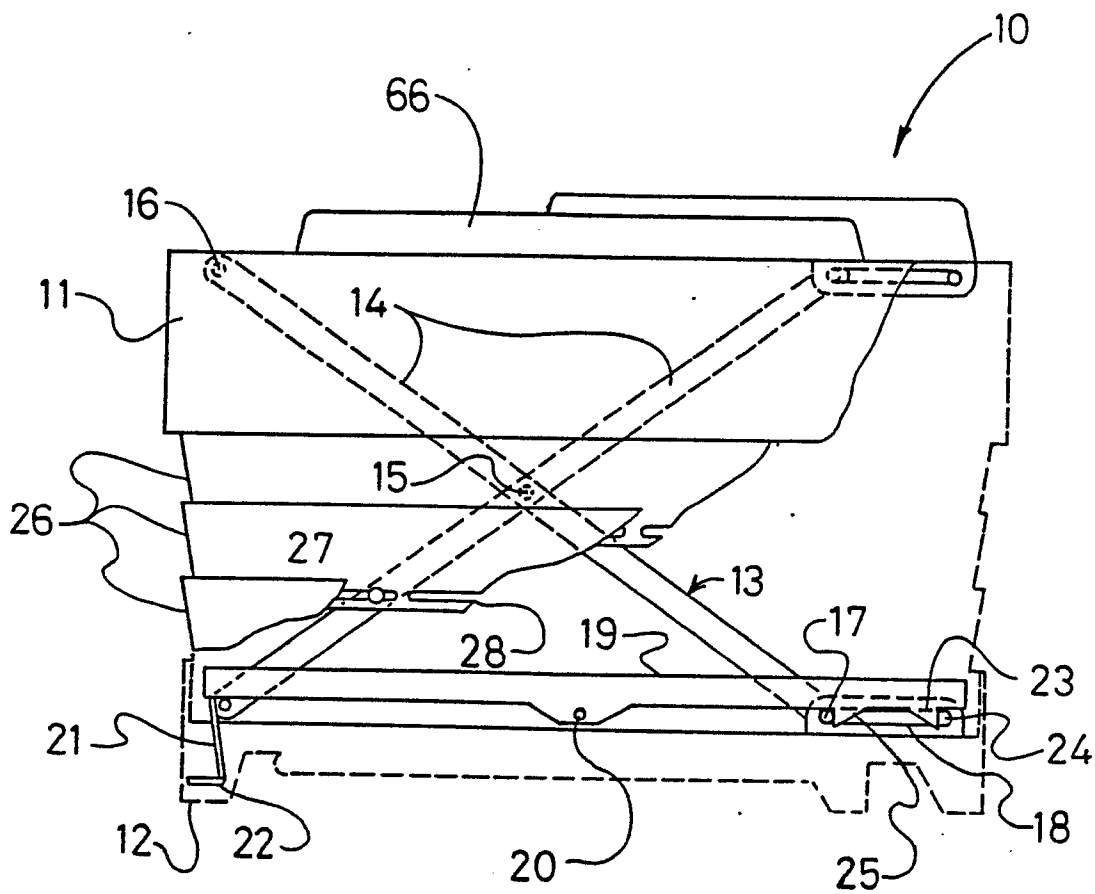


FIG. 5

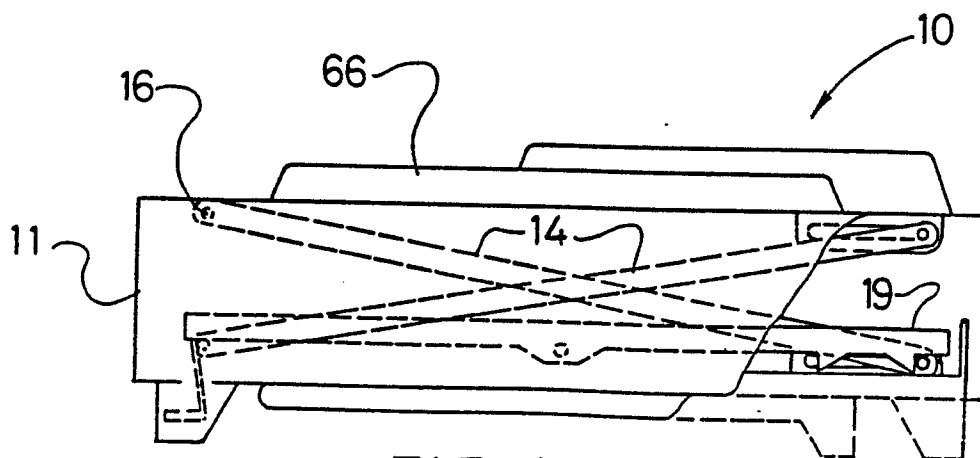


FIG. 6

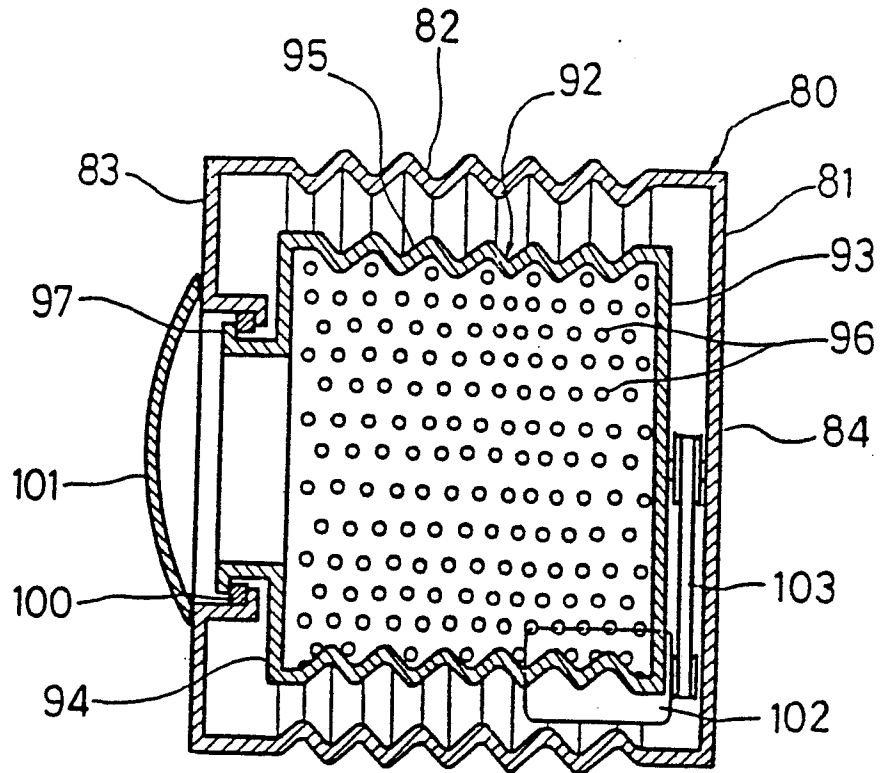


FIG. 7

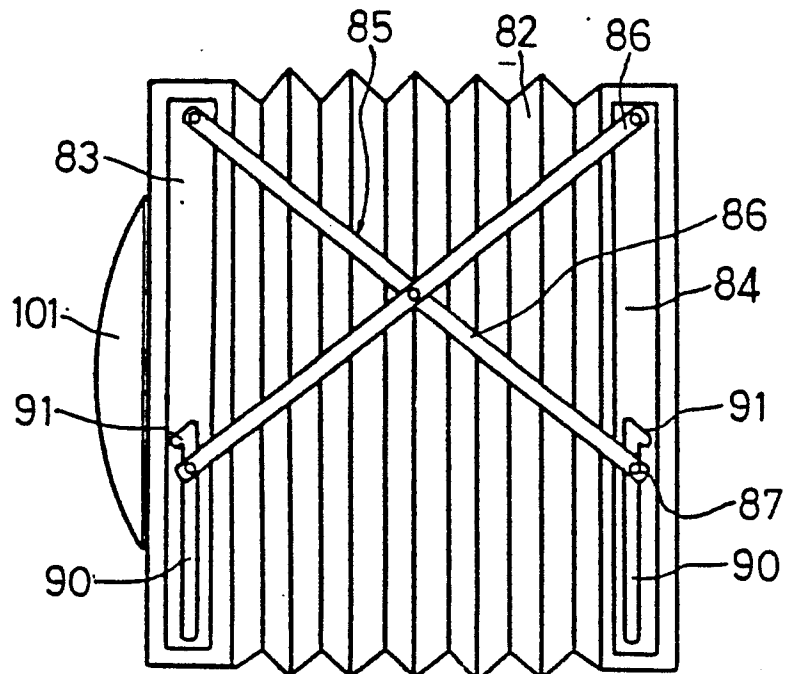


FIG. 8

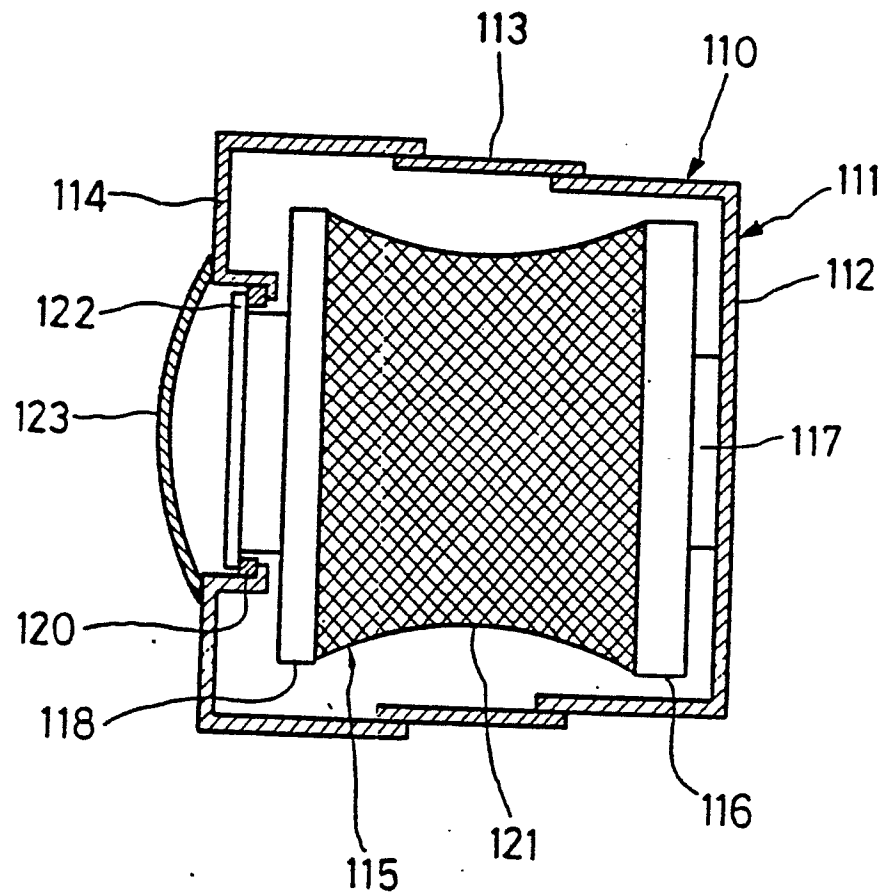


FIG. 9

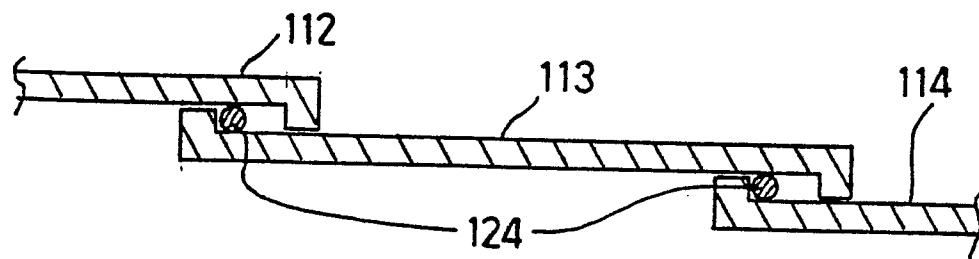


FIG. 10