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(54) **Dehumidifier**

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Description

[0001] The present invention relates to a dehumidifier for dehumidifying moisture in air.

[0002] In Figure 8, of the accompanying drawings, there is shown a sectional view of a conventional dehumidifier such as is disclosed in JP-A-63 161332 or JP-A-02 166392. These comprise a heat exchanger in which a refrigerant is passed through tubes provided with heat exchanging fins. FR-A-2 549946 discloses a modular heat exchange block with flat parallel fins.

[0003] In Figure 9, there are shown views of the shape of slits formed in fins of an evaporator of the conventional dehumidifier. In Figure 9(a), there is shown an enlarged view of an essential portion of a fin. In Figure 9 (b), there is shown a side elevation of the essential portion. In Figure (8), reference numeral 1 designates the evaporator which is arranged in an air path 15 downstream an air inlet 2, and which has aluminum fins 16 formed with slits 19 to improve a heat exchange capacity. Reference numeral 3 designates a conventional condenser which is arranged downstream the evaporator 1, and which has aluminum fins formed with slits 19 like the evaporator 1. Reference numeral 4 designates a supply air duct, reference numeral 5 designates an air supply fan, and reference numeral 7 designates an air outlet which has an outlet air direction controlling vane 6 arranged therein. Reference numeral 9 designates a drain plate which has a drain port 8 formed therein, and which is arranged to receive water deposited on the evaporator 1 due to vapor condensation. Reference numeral 10 designates a tank which is arranged below the drain port 8. A refrigerant circuit is formed by connecting through a refrigerant pipe (not shown) the evaporator 1 and the condenser 3 to a compressor 12 mounted on a bottom plate 11. Reference numeral 13 designates suction air which is sucked through the air inlet. Reference numeral 14 designates a control circuit which is arranged above the supply air duct 4 to control the operation of the air supply fan 5 and the compressor 12.

[0004] The operation of the dehumidifier will be explained.

[0005] When the compressor 12 is energized by the control circuit 14, a refrigerant gas having a high temperature and a high pressure flows into the condenser 3, and the condenser 3 is kept at a high temperature. The air supply fan 5 is also energized by the control circuit 14 to suck the suction air 13 through the air inlet 2, and the refrigerant gas in the condenser 3 is cooled and condensed by the suction air to become in a gas liquid mixing state having a high temperature and a high pressure. The refrigerant gas condensed in the condenser 3 passes through a capillary tube to become a liquid refrigerant having a low temperature and a low pressure, and the liquid refrigerant enters the evaporator 1.

[0006] The liquid refrigerant in the evaporator 1 is heated by the sucked air 13 to be evaporated into a refrigerant gas, and the refrigerant gas is inspired into the

compressor 12. At that time, the suction air 13 is simultaneously cooled to cause vapor condensation in part of moisture in the suction air which exceeds the amount of the saturated water vapor at a temperature after cooling. The water thus produced is received in the drain plate 9 and drops into the tank 10 through the drain port 8 for storing.

[0007] The suction air 13 which has been cooled and has had absolute humidity therein lowered by passing through the evaporator 1 passes through the condenser 3 to be heated. The air thus heated passes through the supply air duct 4 as dehumidified air having an ordinary temperature, and the dehumidified air is flowed out of the air outlet 7 by the air supply fan 5.

[0008] Since the conventional dehumidifier is constructed as stated earlier, when wet air is passing through the evaporator, the wet air contacts with the cooled aluminum fins to be dehumidified by vapor condensation. The water produced by the vapor condensation stays in the slits of the aluminum fins so as to prevent subsequent wet air from contacting with the fins, causing a problem that a dehumidifying capacity is lowered.

[0009] In addition, the provision of the slits in the aluminum fins decreases air volume because the provision of such slits introduces an increase in pressure loss. In order to increase the air volume for improving the dehumidifying capacity, the revolution speed of the air supply fan has to be increased. The increased revolution of the air flow fan creates a problem in that noise enlarges.

[0010] It is an object of the present invention to solve these problems, and to provide a dehumidifier capable of improving a dehumidifying capacity and minimizing an enlargement in noise.

[0011] The present invention provides a dehumidifier comprising:-

an evaporator having a plurality of fins arranged thereon;

a condenser having a plurality of fins arranged thereon, the fins being constituted by slit fins with slits;

characterised in that the fins of the evaporator are constituted by flat fins without slits.

[0012] The fins of the condenser or the evaporator may be provided with a plurality of surface irregularities.

[0013] In accordance with the present invention, the fins of the evaporator are constituted by flat fins without slits to ease the dropping of the water deposited on the fins. As a result, the dehumidifying capacity can be improved, and an enlargement in noise can be minimized.

[0014] In addition, the provision of the irregularities on the fins of the condenser or evaporator can provide ease with which the water deposited on the fins can drop. As a result, the dehumidifying capacity can be improved with an enlargement in noise minimized.

[0015] The invention will be further described by way of example with reference to the accompanying draw-

ings, in which:-

Figures 1(a) and (b) are respectively a front view and a side view of the evaporator according to a first embodiment of the present invention;

Figures 2(a) and (b) are respectively an enlarged view and a side view of an essential part of an aluminum fin shown in Figure 1;

Figures 3(a) and (b) are respectively a front view and a side view of the condenser according to the first embodiment;

Figures 4(a) and (b) are respectively an enlarged view and a side view of an essential part of an aluminum fin shown in Figure 3;

Figure 5 is a characteristic graph showing a relation between air volume and a dehumidifying capacity according to the first embodiment;

Figure 6 is a characteristic graph showing a relation between air flow and noise according to the first embodiment;

Figures 7(a) and (b) are respectively an enlarged view and a side view of an essential part of the evaporator according to a second embodiment of the present invention;

Figure 8 is a sectional view of a conventional dehumidifier; and

Figures 9(a) and (b) are respectively an enlarged view and a side view of an essential part of a fin of a conventional evaporator.

EMBODIMENT 1

[0016] In Figures 1 - 6, there are shown views of the dehumidifier according to a first embodiment of the present invention. In Figure 1(a), there is shown a front view of an evaporator. In Figure 1(b), there is shown a side view of the evaporator. In Figure 2(a), there is shown an enlarged view of an essential part of an aluminum fin shown in Figure 1(b). In Figure 2(b), there is shown a side view of the essential part. In Figure 3(a), there is shown a front view of a condenser. In Figure 3(b), there is shown a side view of the condenser. In Figure 4(a), there is shown an enlarged view of an essential part of an aluminum fin shown in Figure 3(b). In Figure 4(b), there is shown a side view of the essential part shown in Figure 4(a). In Figure 5, there is shown a graph of a relationship between air volume and a dehumidifying capacity. In Figure 6, there is shown a graph of a relationship between air volume and noise. In these Figures, identical parts are indicated by the same reference numerals as those of the conventional dehumidifier stated above, and explanation of these parts will be omitted. Reference numeral 16a designates aluminum fins of the evaporator 1. Reference numeral 16b designates aluminum fins of the condenser. Reference numeral 17 designates a refrigerant pipe. Reference numeral 18 designates holes for passing the refrigerant pipe 17. Reference numeral 19 designates slits which are

formed in the aluminum fins 16b.

[0017] The operation of the dehumidifier will be explained. When a compressor (not shown) is energized, the operation starts, and a refrigerant gas having a high temperature and a high pressure flows into the condenser 3. The refrigerant gas is cooled and condensed in the condenser 3. On the other hand, a liquid refrigerant having a low pressure and a low temperature flows into the evaporator 1, and the liquid refrigerant is heated in the evaporator 1 to be evaporated. When wet air flows through the evaporator 1, the wet air contacts with the cooled aluminum fins 16a to form vapor condensation so as to be dehumidified. Water which has been produced by the vapor condensation smoothly drops downward because the aluminum fins 16a have no slits formed therein unlike the conventional one. As a result, the aluminum fins 16a can contact with subsequent wet air to dehumidify the air.

[0018] In the conventional dehumidifier, the evaporator has had aluminum fins formed with slits in order to increase a heat exchange capacity. In accordance with the first embodiment, ease with which the water deposited on the aluminum fins of the evaporator can drop can contribute to an improvement in the dehumidifying capacity in comparison with an increase in the heat exchange amount in the conventional evaporator as shown in Figure 5. It has been proved that the aluminum fins according to the first embodiment can improve the dehumidifying capacity in comparison with the conventional aluminum fins with slits by about 7%.

[0019] The absence of the slits in the aluminum fins of evaporator can improve aerodynamic characteristics to increase air volume without substantially increasing the revolution of the air supply fan. As shown in Figure 6, an enlargement in noise can be minimized, and an increase in air volume can be obtained.

EMBODIMENT 2

[0020] In Figure 7, there are shown views of an aluminum fin of the evaporator of the dehumidifier according to a second embodiment of the present invention. In Figure 7(a), there is shown an enlarged view of an essential part of the aluminum fin. In Figure 7(b), there is shown a side view of the essential part. In these Figures, reference numeral 16c designates aluminum fins which have a plurality of irregularities 20 formed therein. Such arrangement can increase the heat exchange amount of the aluminum fins 16c and improve a dehumidifying capacity without providing the aluminum fins 16c with slits.

Claims

1. A dehumidifier comprising:-

an evaporator (1) having a plurality of fins ar-

ranged thereon;
a condenser (3) having a plurality of fins (16b)
arranged thereon;

characterised in that the fins of the evaporator (1) are constituted by flat fins without-slits (16a) and the fins (16b) of the condenser (3) are constituted by slit fins with slits (19).

2. A dehumidifier according to claim 1, **characterised in that** the fins (16b) of the condenser (3) have a plurality of surface irregularities (19). 10
3. A dehumidifier according to claim 1 or 2, wherein the fins (16c) of the evaporator are provided with a plurality of surface irregularities (20). 15
4. A dehumidifier according to claim 1, 2 or 3 wherein the fins of the evaporator and the condenser have a refrigerant pipe (17) press-fitted therein, the refrigerant pipe being connected to a compressor (12). 20
5. A dehumidifier according to claim 1, 2, 3 or 4 further comprising an air supply fan (5) for supplying air to the fins of the evaporator and the condenser for dehumidifying. 25

Patentansprüche

1. Entfeuchter, welcher aufweist:

einen Verdampfer (1) mit mehreren darauf angeordneten Rippen;
einen Kondensator (3) mit mehreren darauf angeordneten Rippen (16b);

dadurch gekennzeichnet, dass die Rippen des Verdampfers (1) durch flache Rippen (16a) ohne Schlitz gebildet sind und die Rippen (16b) des Kondensators (3) durch geschlitzte Rippen mit Schlitz (19) gebildet sind. 40

2. Entfeuchter nach Anspruch 1, **dadurch gekennzeichnet, dass** die Rippen (16b) des Kondensators (3) mehrere Oberflächenunregelmäßigkeiten (19) haben. 45
3. Entfeuchter nach Anspruch 1 oder 2, bei dem die Rippen (16c) des Verdampfers mit mehreren Oberflächenunregelmäßigkeiten (20) versehen sind. 50
4. Entfeuchter nach Anspruch 1, 2 oder 3, bei dem die Rippen des Verdampfers und des Kondensators ein durch Presspassung eingesetztes Kühlmittelrohr (17) haben, welches Kühlmittelrohr mit einem Kompressor (12) verbunden ist. 55

5. Entfeuchter nach Anspruch 1, 2, 3 oder 4, weiterhin aufweisend ein Luftzuführungsgebläse (5) zum Zuführen von Luft zu den Rippen des Verdampfers und des Kondensators zur Entfeuchtung.

Revendications

1. Déshumidificateur comprenant :

un évaporateur (1) ayant une pluralité d'ailettes agencées dessus;
un condensateur (3) ayant d'une pluralité d'ailettes (16b) agencées dessus ;

caractérisé en ce que les ailettes de l'évaporateur (1) sont constituées par des ailettes plates sans fentes (16a) et **en ce que** les ailettes (16b) du condensateur (3) sont constituées par des ailettes fendues avec des fentes (19).

2. Déshumidificateur selon la revendication 1, **caractérisé en ce que** les ailettes (16b) du condensateur (3) ont une pluralité d'irrégularités de surface (19).
3. Déshumidificateur selon la revendication 1 ou 2, dans lequel les ailettes (16c) de l'évaporateur ont une pluralité d'irrégularités de surface (20).
4. Déshumidificateur selon la revendication 1, 2 ou 3 dans lequel les ailettes de l'évaporateur et du condensateur possèdent un tuyau réfrigérant (17) monté par pression à l'intérieur de l'évaporateur et du condensateur, le tuyau de réfrigérant étant raccordé à un compresseur (12).
5. Déshumidificateur selon la revendication 1, 2, 3 ou 4 comprenant en outre un ventilateur d'alimentation d'air (5) pour fournir de l'air aux ailettes de l'évaporateur et du condensateur pour déshumidifier.

FIGURE 1 (a)

FIGURE 1 (b)

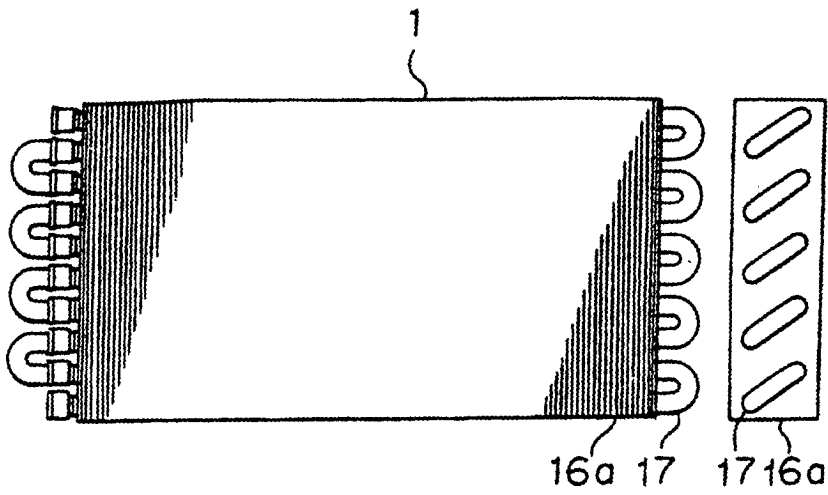


FIGURE 2 (a)

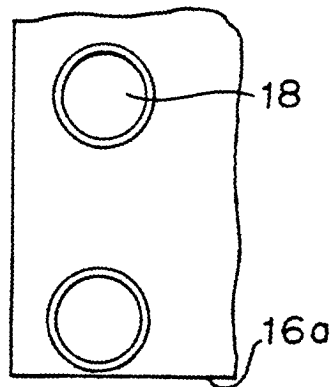


FIGURE 2 (b)

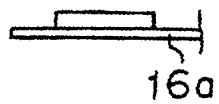


FIGURE 3 (a)

FIGURE 3 (b)

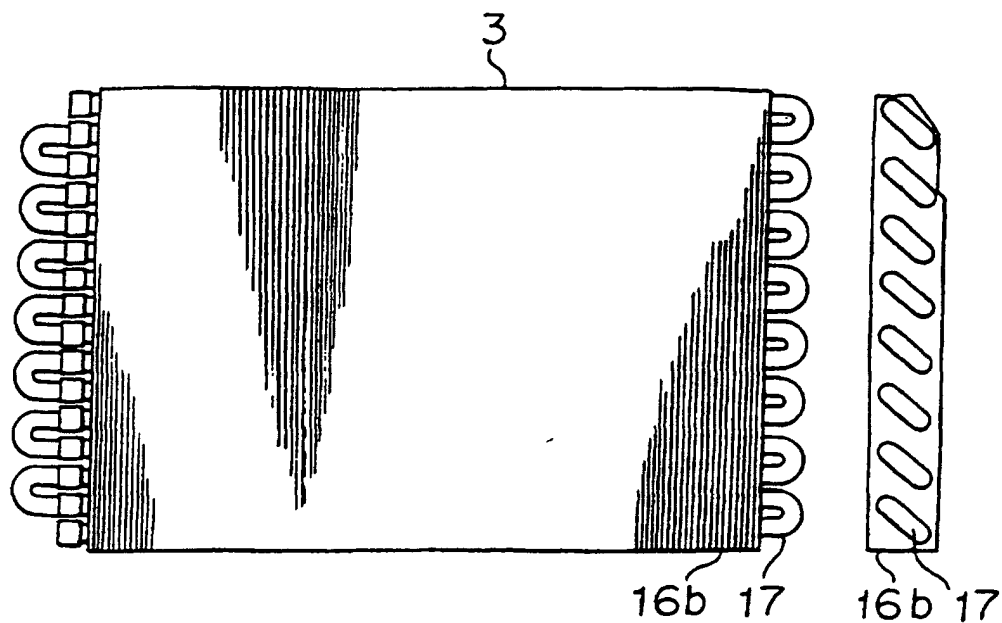


FIGURE 4 (a)

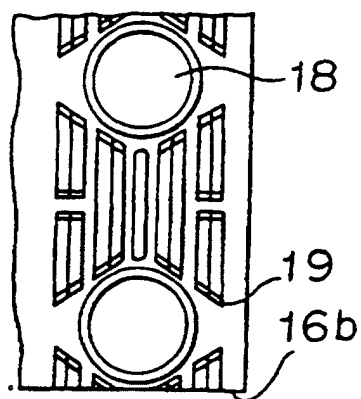


FIGURE 4 (b)

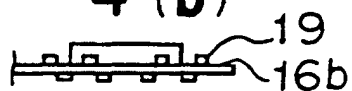


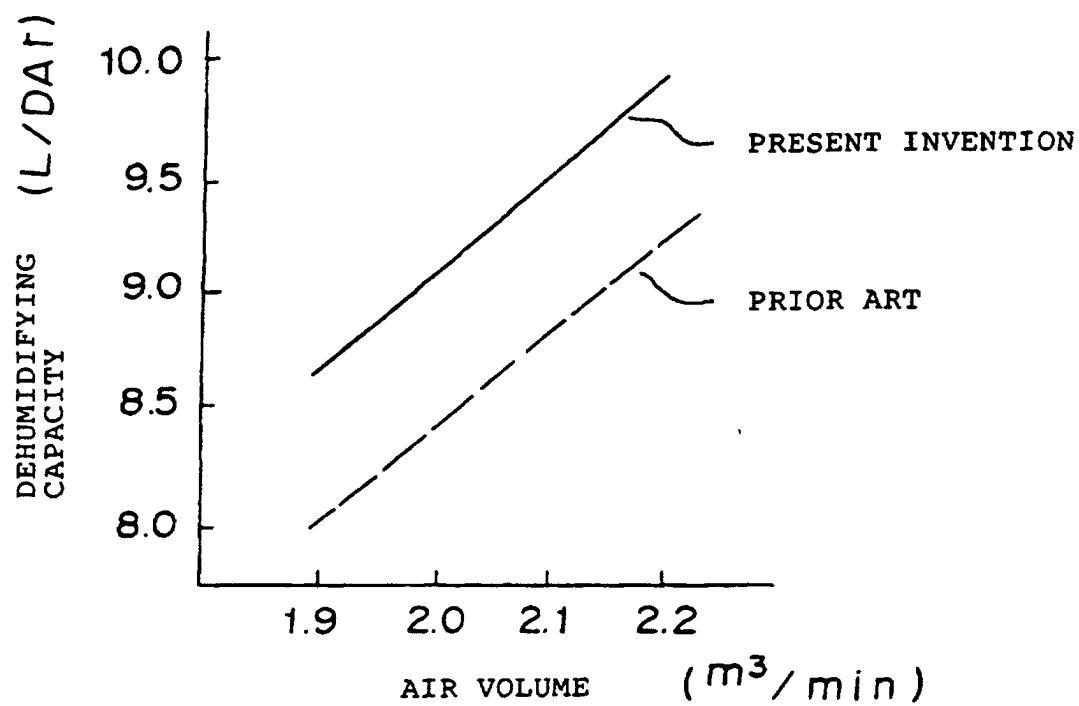
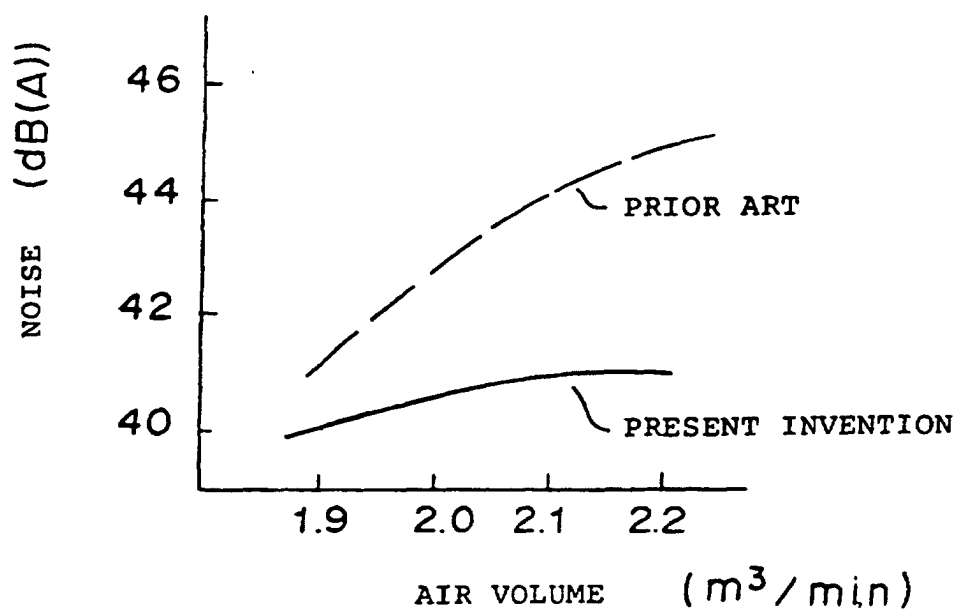
FIGURE 5**FIGURE 6**

FIGURE 7 (a)

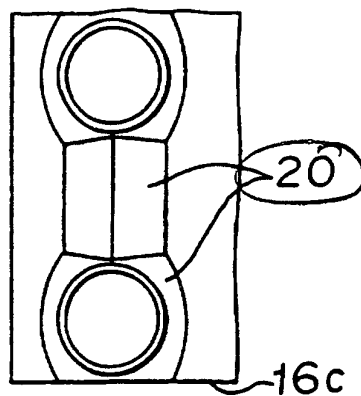


FIGURE 7 (b)



FIGURE 8

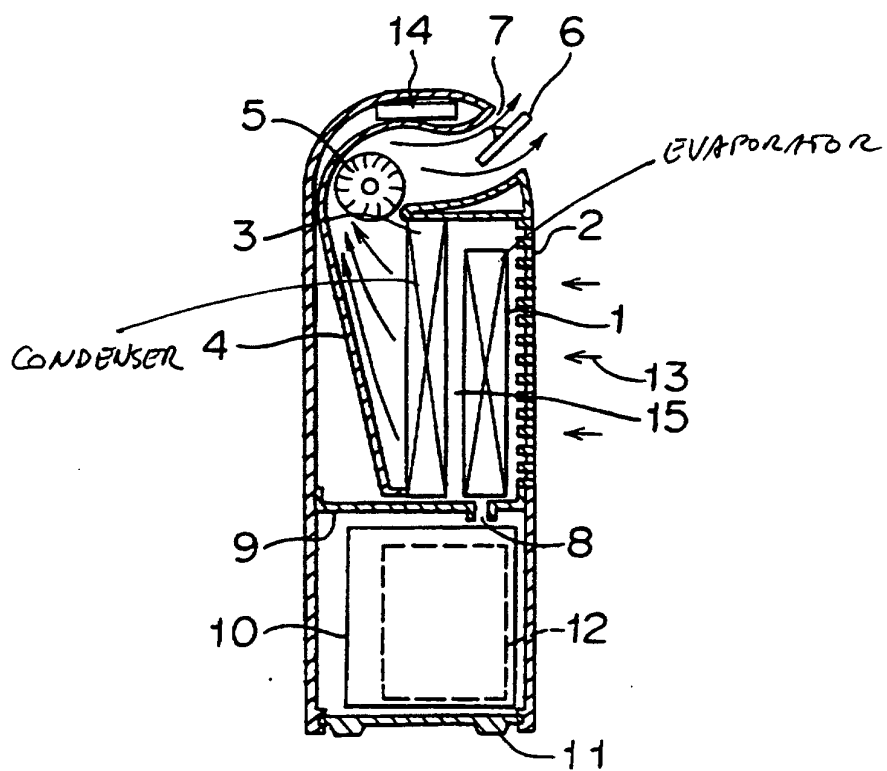


FIGURE 9 (a)

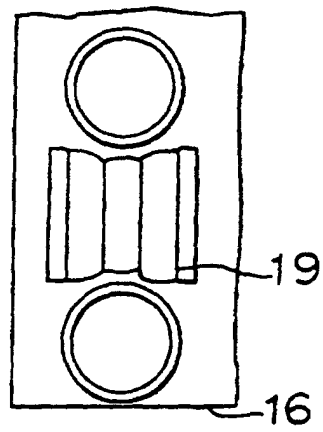


FIGURE 9 (b)

