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EXHAUST FAN ✓

This invention relates to an exhaust fan, more particularly to the drive of an exhaust fan.

BACKGROUND OF THE INVENTION

- 5 Exhaust fans are commonly used in domestic situations, particularly for use in kitchens, bathrooms and toilets to remove not only fumes and odours, but also steam from baths and showers. They are also used in public buildings such as in the bathrooms and toilets of hotels, motels, and apartments. In the more humid areas, particularly in the tropical areas it known that these fans are
10 positioned in the ceiling to exhaust into the roof space, or in an outside wall to exhaust directly outside of the building.

- These exhaust fans are powered by an electric motor and this electric motor must operate at all times in moisture laden air, and particularly in the tropical areas where the atmospheric relative humidity is continually high, the electric
15 motor, fan, mountings and electrical wiring do not have a chance to dry out. This is detrimental, not only to the electric motor, but also to the metal fittings and to the fan blades and cowling which are often made of metal resulting in corrosion and rusting of the fan and other metal parts and fittings.

- Units are known where provision is made for the extraction of air from toilets, and reference is made to AU-24999/84 which is directed to a ventilator for a
20 lavatory pan, there being an electric fan having its inlet connected a duct extending from the cistern to the flush pipe of the pan. A manual switch is operated to switch on the fan, there being a valve in the flush pipe which when the water flows opens, and when the flow of flush water ceases the valve
25 returns to its closed position and in so doing operates the switch to turn off the fan.

AU14859/88 discloses a similar system with the switch being manually operated to turn on the fan, but the switch having a time delay to automatically turn off after a preset period of time.

- 30 However these exhaust fans are also driven by electric motors, and so also

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suffer from the above deficiencies. In addition the fan motors consume electricity which predominantly produced from fossil fuel.

Thus it is an object of the invention to provide an exhaust fan which will overcome one or more of the above disadvantages.

- 5 It is a further object of the invention to provide an exhaust fan which is not driven by an electric motor.

A still further object of the invention is to provide an exhaust fan which is not so susceptible to the problems of rust and corrosion.

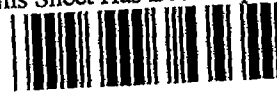
BRIEF STATEMENT OF THE INVENTION

- 10 Thus there is provided according to the invention an exhaust fan, a water driven turbine connected to drive the fan, said water driven turbine having a water inlet and an exhaust, a water supply connected to the said water inlet, said exhaust connected to a point of use of the water that passes through the turbine, characterised in that the turbine comprises a rotor operating within a
- 15 casing, said rotor comprising a plurality of spiral passages extending from the centre of the rotor to the circumference thereof, said water inlet connected to the centre of the rotor so that the water passes through the spiral passages of the rotor to the exhaust, a control tap positioned between the exhaust of the turbine and the point of use of the water whereby whenever water is used at
- 20 the point of use, the exhaust fan is driven by the turbine with the turbine being under pressure of the water at all times.

- Furthermore there is provided according to the invention a combined exhaust fan water turbine unit with the exhaust fan being direct coupled to the water turbine, said unit being adapted to be installed in a building having a water
- 25 supply and a point of use of the water, said water supply being connected to the inlet of the turbine and the point of use connected to the exhaust of the turbine, characterised in that the turbine comprises a rotor operating within a casing, said rotor comprising a plurality of spiral arms extending from the centre of the rotor to the circumference thereof, said water inlet passing to the
- 30 centre of the rotor so that the water passes through the rotor to said exhaust, a control tap positioned between the exhaust of the turbine and the point of use of the water whereby whenever water is used at the point of use, the turbine is

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driven with the turbine being under the pressure of the water supply at all times.

In a preferred form of the invention the water is taken to the position of the fan in the building.

- 5 In a still further preferred form of the invention the water turbine is connected to the fan by a drive which ensures that the fan operates at a speed suitable for exhausting the air from the area concerned.

BRIEF DESCRIPTION OF THE DRAWINGS

- 10 In order to more fully describe the invention reference will now be made to the accompanying drawings in which:-

FIG. 1 is a diagrammatic view of the invention applied to a bathroom and a toilet,

FIG. 2 is a view of the fan and drive unit,

FIG. 3 is a sectional view of one form of water turbine,

- 15 FIG. 4 is a view of the rotor of a turbine,

FIG. 5 is a view of a further water turbine,

FIG. 6 is a view of a further rotor of a turbine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

- 20 In FIG. 1 there is shown one example of the installation and use of the invention. There is shown a bath room 1 having a shower 2 and a hand basin 3, and also a toilet 4 having a cistern 5 to supply water to a toilet pan 6. A hot water supply 7 is provided to the shower 2, and it will be realised that there



would also be a hot water supply (not shown) to the hand basin 3.

The bath room 1 is fitted with an exhaust fan 8 driven by a water turbine 9 while the toilet 4 is fitted with an exhaust fan 10 driven by a water turbine 11. The cold water supply pipe 12 passes along the ceiling and is connected by
5 branch pipe 13 to the inlet to the water turbine 9, the pipe 12 extending to the inlet to the water turbine 11. The exhaust from water turbine 9 is connected by pipe 14 to the cold water tap 15 of the hand basin 3, and is also connected by branch pipe 16 to tap 17 of the shower 2. The exhaust from the turbine 11 is connected by pipe 18 to the inlet to the cistern 5.

10 Thus it is seen that the water supply to the shower 2 and hand basin 3 is connected through the turbine 9 which drives the exhaust fan 8 so that if either tap 15 or tap 17 is turned on the exhaust fan 8 will immediately be driven by the water flowing through the water turbine 9, thus exhausting the steam and the like from the bathroom.

15 Similarly it will be seen that when the cistern is flushed during the refill of the water flow through the turbine 11 will drive the exhaust fan 11 to change the air in the toilet.

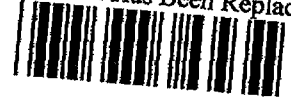
FIG. 2 is a view of a combined exhaust fan 10 and water driven turbine 11 with the fan impeller 18 being direct coupled to the driving shaft 19 of the water
20 turbine 11.

FIG. 3 shows in cross section one form of water turbine 20, the casing 21 having a water inlet 22 and a water outlet 23, the inlet 22 passing water axially to the rotor 24. The rotor 24 can have a plurality of spiral passages extending from the centre of the rotor to the circumference thereof. One form of such rotor
25 is shown in FIG. 4 where the impeller 25 has the passages 26 extending from the central inlet 27.

FIG. 5 shows a further form of turbine where again the water inlet 28 is axial to the rotor 29, the curved or spiral passages 30 extending from the axial inlet to a radial and tangential discharge 31. A still further form of rotor 32 is shown in
30 FIG. 6, again the water entering axially and discharging tangentially of the rotor.

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Thus as described the tap (6,15,17) is positioned between the point of use and the turbine, and thus it will be seen that the turbine (9,11) is always under the pressure of the water supply. It also follows that the turbine thus operates
5 in under the pressure of the water which pressure is maintained to the point of use.

Hence it will be seen the exhaust fan can be driven by one of a number of water turbines. It will be appreciated that the exhaust fan can be positioned as desired in the room, either in the wall or in the ceiling, so that steam, water
10 vapour and other gasses and odours are exhausted from the room.

While it is desired that the fan be direct coupled to the shaft of the turbine, it is to be realised that in some instances there may be either a step-up drive or a step-down drive connection between the water turbine and the fan, depending on the turbine and the fan size. Thus the driving connection between the water
15 turbine and the fan can be a belt drive or an enclosed gear train drive.

Thus when the fan is installed in a bathroom having a shower, bath, toilet, bidet and hand basin, the cold water supply to each of these is from a single point of entry and passes through the water turbine before being branched to the various points of use. In this way irrespective of which of the unit uses cold
20 water, the water turbine will operate to drive the exhaust fan.

The components of the water turbine and the fan can all be produced of a suitable plastics material, so that rust and corrosion can be eliminated. Thus the housing of the turbine and also the rotor itself can be produced of a plastics material, as can the fan blades and the surrounding casing and
25 protective grill.

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Although various forms of the invention have been described in detail, it is to be realised that the invention is not to be limited thereto but can include variations and modifications falling within the spirit and scope of the invention.

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CLAIMS

1. An exhaust fan, a water driven turbine connected to drive the fan, said water driven turbine having a water inlet and an exhaust, a water supply
5 connected to the said water inlet, said exhaust connected to a point of use of the water that passes through the turbine, characterised in that the turbine comprises a rotor operating within a casing, said rotor comprising a plurality of spiral passages extending radially from the centre of the rotor to the circumference thereof, said water inlet connected to the centre of the rotor so
10 that the water passes through the spiral passages of the rotor to the exhaust, a control tap positioned between the exhaust of the turbine and the point of use of the water whereby whenever water is used at the point of use, the exhaust fan is driven by the turbine with the turbine being under pressure of the water at all times.
- 15 2. An exhaust fan as defined in claim 1 wherein the exhaust fan is installed in a room selected from a bathroom, toilet, or other room each having a point of use of water, and said water supply is connected to the inlet to the water turbine, the exhaust from the water turbine being connected to a point of use selected from one or more of a bath, shower, hand basin or toilet cistern
20 so that whenever water is used at one of said points of use the water turbine drives the exhaust fan.
3. An exhaust fan as defined in either claim 1 or claim 2 wherein the water turbine is direct coupled to the exhaust fan.
4. An exhaust fan as defined in claim 3 wherein the exhaust fan and
25 the water turbine are connected as an integral unit.
5. An exhaust fan as defined in claim 1 or claim 2 wherein the water turbine drives the exhaust fan by a flexible drive such as a belt or chain.
6. An exhaust fan as defined in claim 1 or claim 2 wherein the water turbine drives the exhaust fan through a gear drive of either step-up or step-
30 down ratio.
7. An exhaust fan as defined in any one of the preceding claims





wherein the water turbine is selected from a reaction turbine, or a positive pressure turbine.

8. A combined exhaust fan water turbine unit with the exhaust fan being direct coupled to the water turbine, said unit being adapted to be
- 5 installed in a building having a water supply and a point of use of the water, said water supply being connected to the inlet of the turbine and the point of use connected to the exhaust of the turbine, characterised in that the turbine comprises a rotor operating within a casing, said rotor comprising a plurality of spiral passages extending radially from the centre of the rotor to the
- 10 circumference thereof, said water inlet connected to the centre of the rotor so that the water passes through the spiral passages of the rotor to said exhaust, a control tap positioned between the exhaust of the turbine and the point of use of the water whereby whenever water is used at the point of use, the turbine is driven with the turbine being under the pressure of the water supply
- 15 at all times.

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ABSTRACT

EXHAUST FAN

An exhaust fan is driven by a water turbine. The water turbine is connected between the water supply and point of use so that when the water is used, e.g., shower, bath, toilet, the fan is driven by the water turbine.

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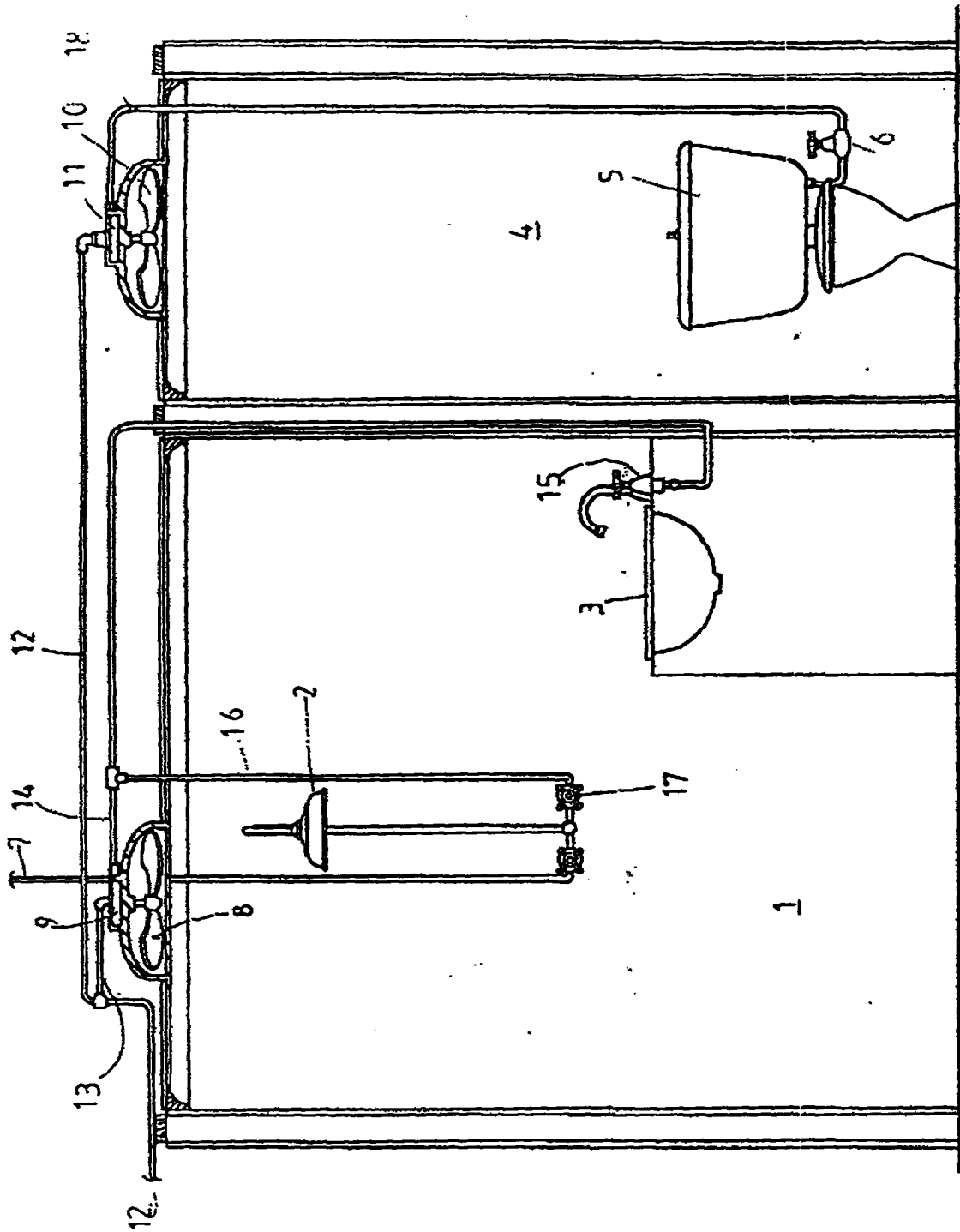
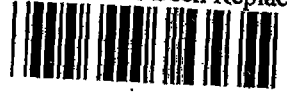


FIG 1

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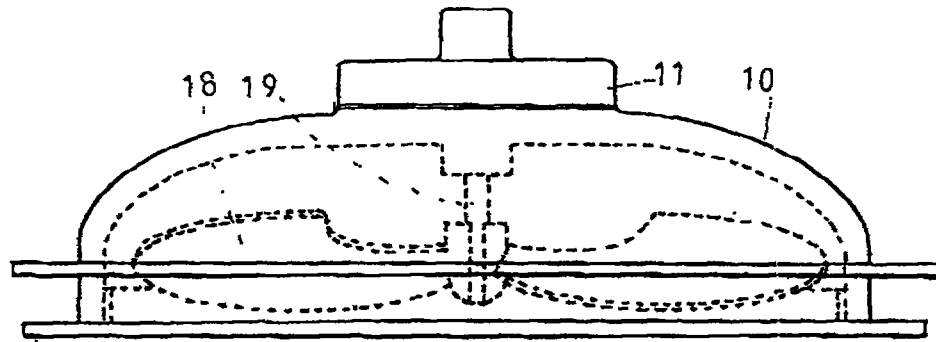


FIG 2

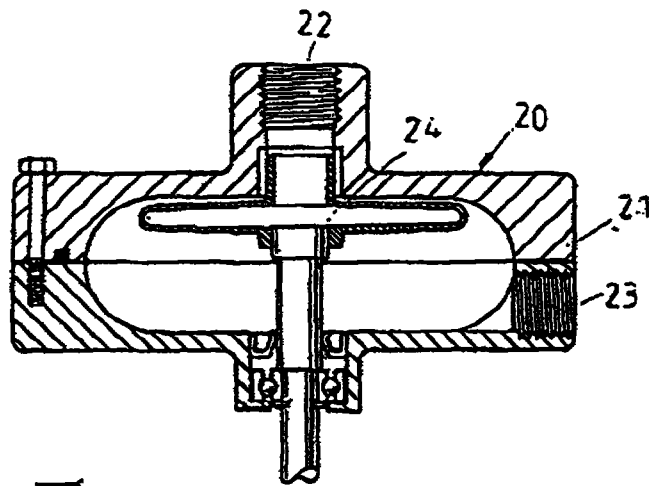


FIG 3

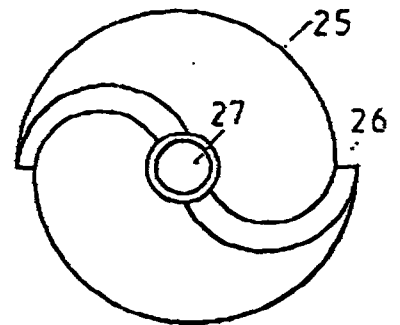


FIG 4

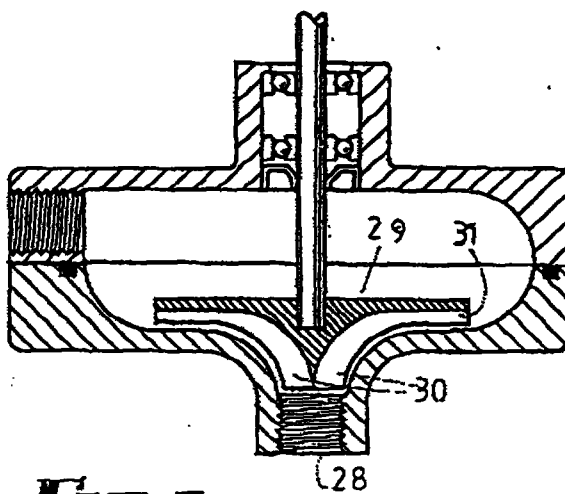


FIG 5

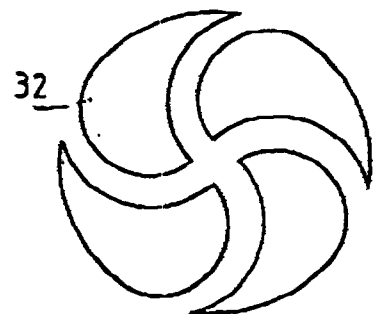
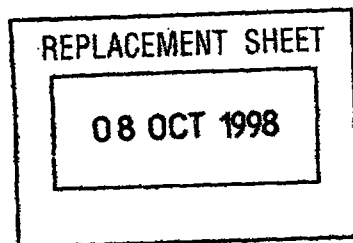


FIG 6

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suffer from the above deficiencies. In addition the fan motors consume electricity which predominantly produced from fossil fuel.

Thus it is an object of the invention to provide an exhaust fan which will overcome one or more of the above disadvantages.

- 5 It is a further object of the invention to provide an exhaust fan which is not driven by an electric motor.

A still further object of the invention is to provide an exhaust fan which is not so susceptible to the problems of rust and corrosion.

BRIEF STATEMENT OF THE INVENTION

- 10 Thus there is provided according to the invention an exhaust fan driven by a water turbine connected to a water supply and a point of usage of the water so that whenever the water is used at the point of usage the exhaust fan operates.

- 15 In a preferred form of the invention the water is taken to the position of the fan in the building.

In a still further preferred form of the invention the water turbine is connected to the fan by a drive which ensures that the fan operates at a speed suitable for exhausting the air from the area concerned.

BRIEF DESCRIPTION OF THE DRAWINGS.

- 20 In order to more fully describe the invention reference will now be made to the accompanying drawings in which:-

FIG. 1 is a diagrammatic view of the invention applied to a bathroom and a toilet,

FIG. 2 is a view of the fan and drive unit,

- 25 FIG. 3 is a sectional view of one form of water turbine,

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FIG. 4 is a view of the rotor of a turbine,

FIG. 5 is a view of a further water turbine,

FIG. 6 is a view of a further rotor of a turbine,

FIG. 7 is a view of an axial flow turbine,

5 FIG. 8 is a view of an impulse turbine, and

FIG. 9 is a view of a positive displacement motor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is shown one example of the installation and use of the invention. There is shown a bath room 1 having a shower 2 and a hand basin
10 3, and also a toilet 4 having a cistern 5 to supply water to a toilet pan 6. A hot water supply 7 is provided to the shower 2, and it will be realised that there would also be a hot water supply (not shown) to the hand basin 3.

The bath room 1 is fitted with an exhaust fan 8 driven by a water turbine 9 while the toilet 4 is fitted with an exhaust fan 10 driven by a water turbine 11.
15 The cold water supply pipe 12 passes along the ceiling and is connected by branch pipe 13 to the inlet to the water turbine 9, the pipe 12 extending to the inlet to the water turbine 11. The exhaust from water turbine 9 is connected by pipe 14 to the cold water tap 15 of the hand basin 3, and is also connected by branch pipe 16 to tap 17 of the shower 2. The exhaust from the turbine 11 is
20 connected by pipe 18 to the inlet to the cistern 5.

Thus it is seen that the water supply to the shower 2 and hand basin 3 is connected through the turbine 9 which drives the exhaust fan 8 so that if either tap 15 or tap 17 is turned on the exhaust fan 8 will immediately be driven by the water flowing through the water turbine 9, thus exhausting the steam and
25 the like from the bathroom.

Similarly it will be seen that when the cistern is flushed during the refill of the water flow through the turbine 11 will drive the exhaust fan 11 to change the air in the toilet.

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FIG. 2 is a view of a combined exhaust fan 10 and water driven turbine 11 with the fan impeller 18 being direct coupled to the driving shaft 19 of the water turbine 11.

5 FIG. 3 shows in cross section one form of water turbine 20, the casing 21 having a water inlet 22 and a water outlet 23, the inlet 22 passing water axially to the rotor 24. The rotor 24 can have a plurality of spiral passages extending from the centre of the rotor to the circumference thereof. One form of such rotor is shown in FIG. 4 where the impeller 25 has the passages 26 extending from the central inlet 27.

10 FIG. 5 shows a further form of turbine where again the water inlet 28 is axial to the rotor 29, the curved or spiral passages 30 extending from the axial inlet to a radial and tangential discharge 31. A still further form of rotor 32 is shown in FIG. 6, again the water entering axially and discharging tangentially of the rotor.

15 FIG. 7 shows in cross section an axial flow turbine 33 having an inlet 34 and exhaust 35. The drive shaft 36 is attached to a rotor 37, the drive shaft being supported in a spider 38 and bearings 39. The rotor 37 in this example is in the general form of a marine propeller.

20 In impulse turbine 40 is shown in FIG. 8 in which a jet of water from the inlet 41 impinges on the curved blades 42 of the rotor 43, the water exhausting through outlet 44.

An example of a positive displacement turbine 45 is shown in FIG. 9, the turbine having an inlet 46 and an outlet 47. The rotor 48 has a plurality of sliding vanes 49 against which the water acts to drive the turbine.

25 Hence it will be seen the exhaust fan can be driven by one of a number of water turbines. It will be appreciated that the exhaust fan can be positioned as desired in the room, either in the wall or in the ceiling, so that steam, water vapour and other gasses and odours are exhausted from the room.

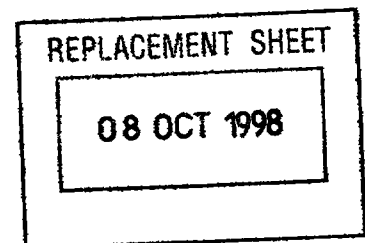
30 While it is desired that the fan be direct coupled to the shaft of the turbine, it is to be realised that in some instances there may be either a step-up drive or a step-down drive connection between the water turbine and the fan, depending

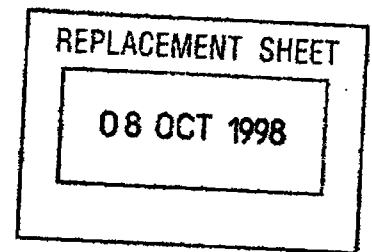
on the turbine and the fan size. Thus the driving connection between the water turbine and the fan can be a belt drive or an enclosed gear train drive.

5 Thus when the fan is installed in a bathroom having a shower, bath, toilet, bidet and hand basin, the cold water supply to each of these is from a single point of entry and passes through the water turbine before being branched to the various points of use. In this way irrespective of which of the unit uses cold water, the water turbine will operate to drive the exhaust fan.

10 The components of the water turbine and the fan can all be produced of a suitable plastics material, so that rust and corrosion can be eliminated. Thus the housing of the turbine and also the rotor itself can be produced of a plastics material, as can the fan blades and the surrounding casing and protective grill.

15 Although various forms of the invention have been described in detail, it is to be realised that the invention is not to be limited thereto but can include variations and modifications falling within the spirit and scope of the invention.



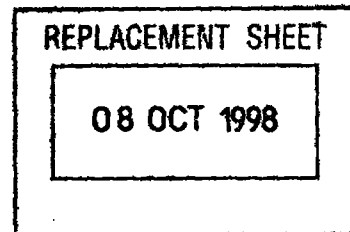


1. An exhaust fan, a water driven turbine connected to drive the fan, said water turbine being adapted to be connected between a water supply and a point of use of the water so that whenever water is used the turbine drives the exhaust fan.
- 5 2. An exhaust fan as defined in claim 1 wherein the exhaust fan is installed in a room selected from a bathroom, toilet, or other room having a point of use of water, and said water supply is connected to the inlet to the water turbine, the outlet from the water turbine being connected to a point of use selected from one or more of a bath, shower, hand basin or toilet cistern
10 so that whenever water is used at a point of use the water turbine drives the exhaust fan.
3. An exhaust fan as defined in either claim 1 or claim 2 wherein the water turbine is direct coupled to the exhaust fan.
4. An exhaust fan as defined in claim 3 wherein the exhaust fan and
15 the water turbine are connected as an integral unit.
5. An exhaust fan as defined in claim 1 or claim 2 wherein the water turbine drives the exhaust fan by a flexible drive such as a belt or chain.
6. An exhaust fan as defined in claim 1 or claim 2 wherein the water turbine drives the exhaust fan through a gear drive of either step-up or step-
20 down ratio.
7. An exhaust fan as defined in any one of the preceding claims wherein the water turbine is selected from a reaction turbine, an impulse turbine or a positive pressure turbine.
8. A combined exhaust fan water turbine unit with exhaust fan being
25 direct coupled to the water turbine, said unit being adapted to be installed in a building having a point of use of water, said unit being hydraulically connected between a water supply and a point of use of the water so that whenever water is used the exhaust fan is operated.

EXHAUST FAN

ABSTRACT

An exhaust fan is driven by a water turbine. The water turbine is connected between the water supply and point of use so that when the water is used, e.g., shower, bath, toilet, the fan is driven by the water turbine.



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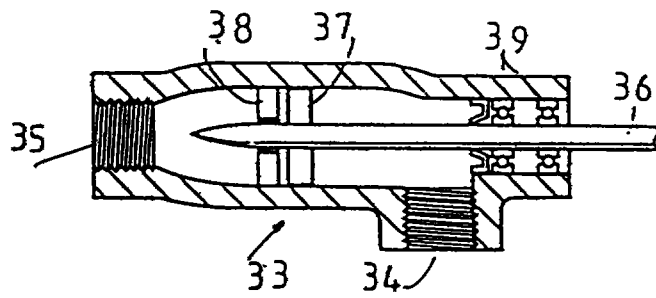


FIG 7

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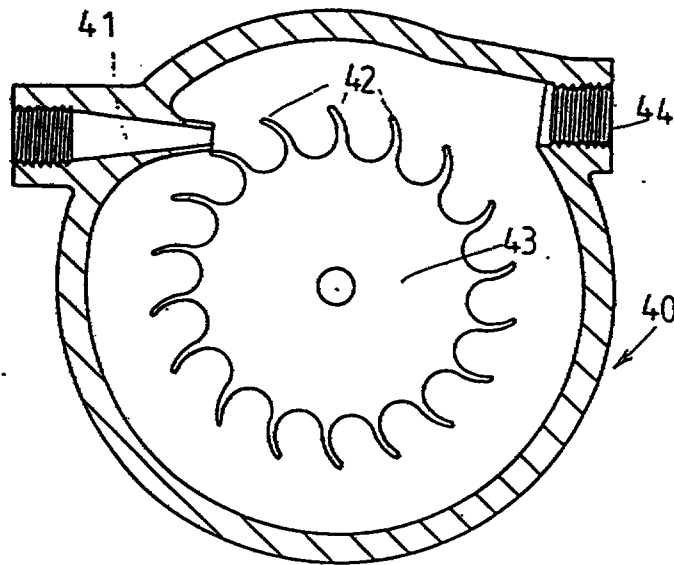


FIG 8

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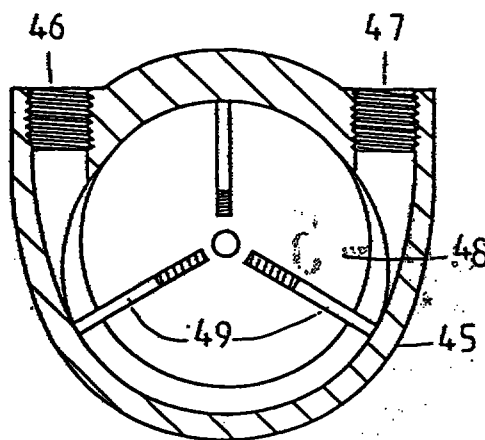


FIG 9

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EXHAUST FAN

ABSTRACT

An exhaust fan is driven by a water turbine. The water turbine is connected between the water supply and point of use so that when the water is used, e.g., shower, bath, toilet, the fan is driven by the water turbine.

(Fig. 1)

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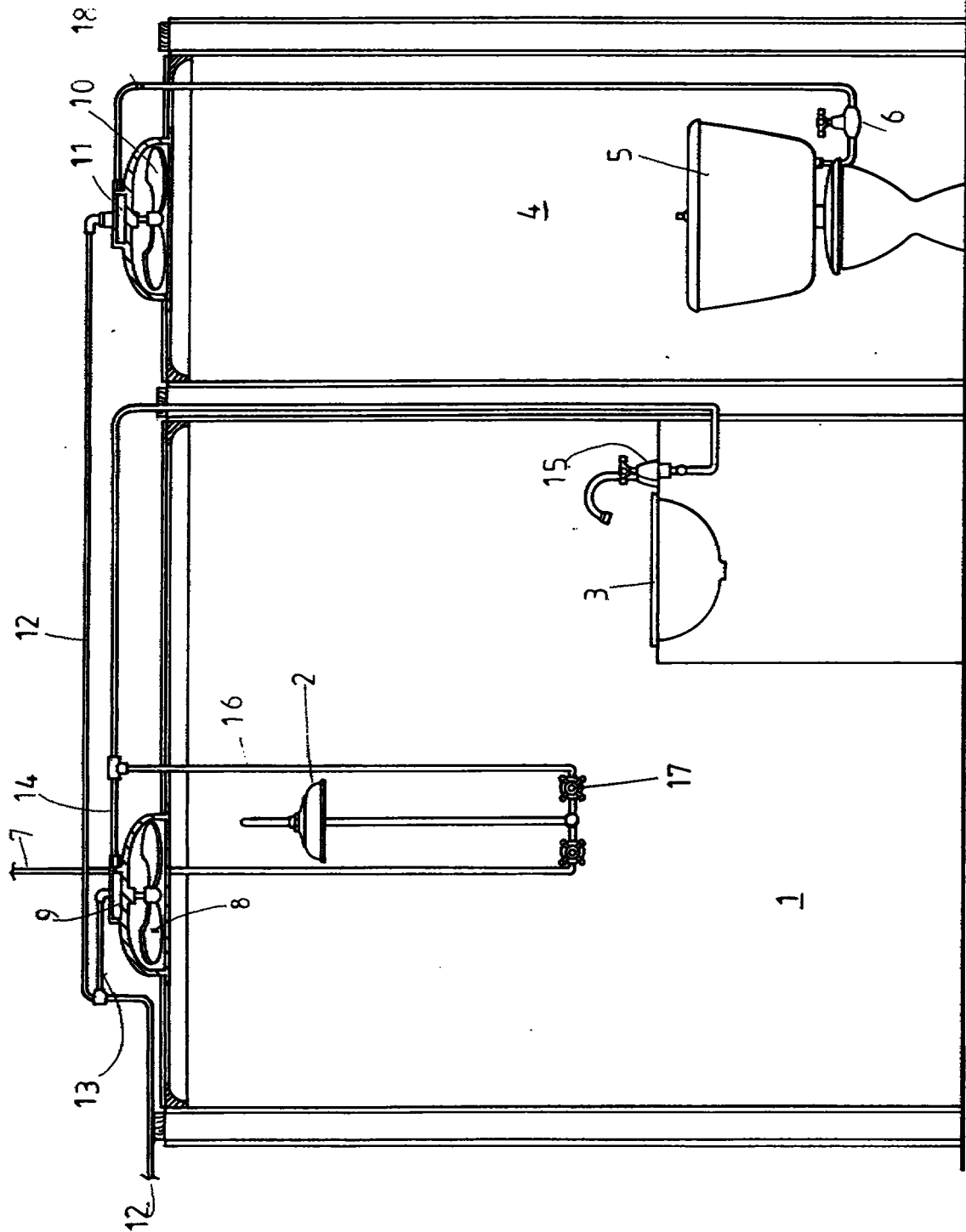


FIG 1

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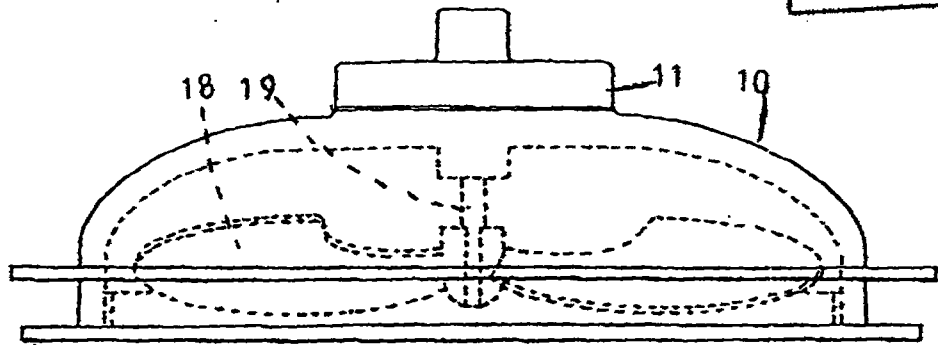


FIG 2

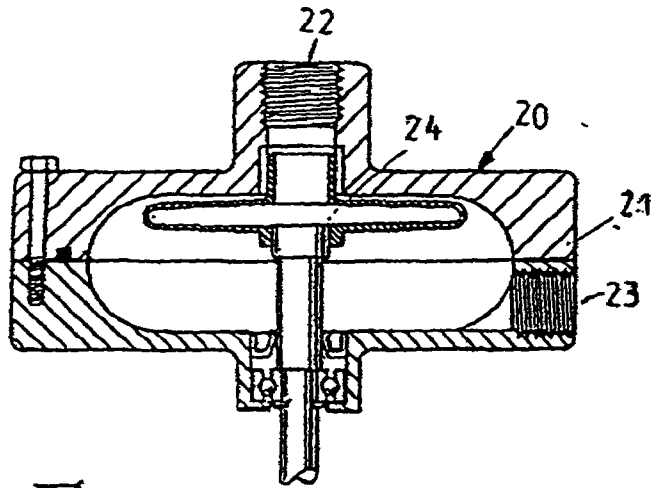


FIG 3

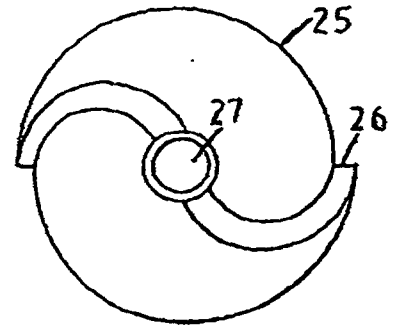


FIG 4

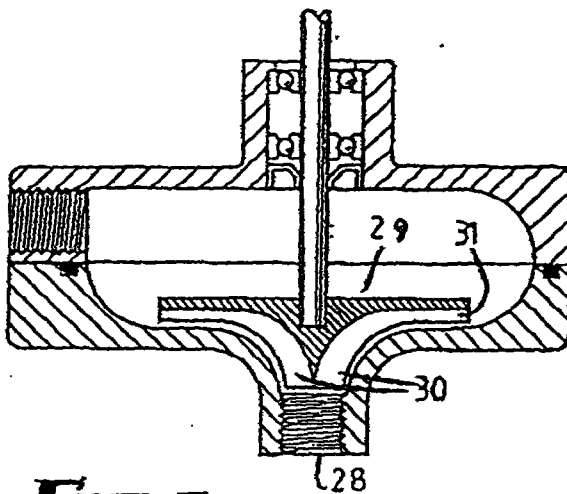


FIG 5

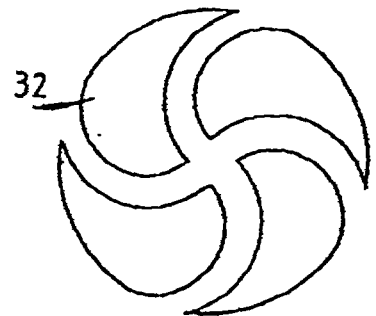


FIG 6

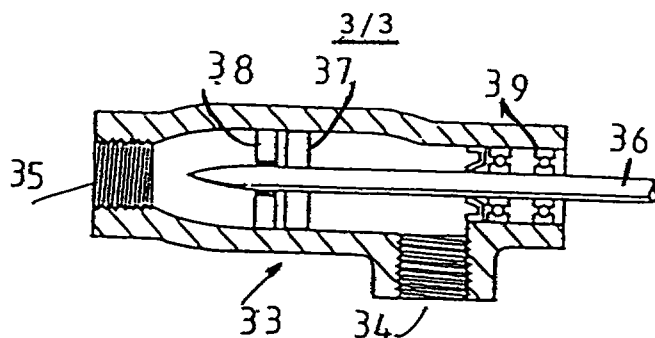


FIG 7

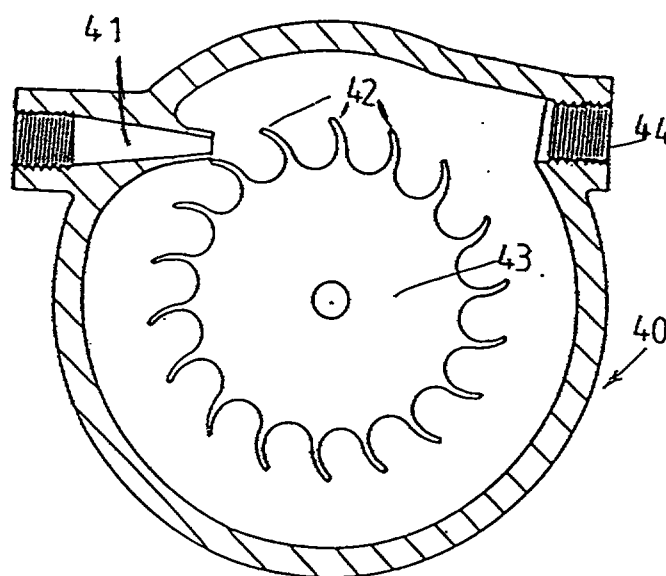


FIG 8

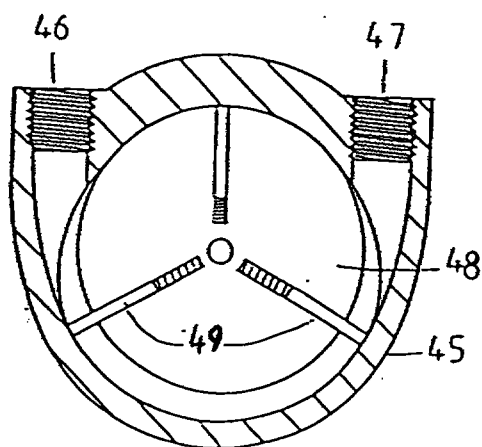


FIG 9

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