

# **AN APPARATUS FOR COOLING AN ENCLOSED SPACE AND A METHOD FOR CLEANING THE APPARATUS**

## **FIELD OF INVENTION**

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This invention relates to an apparatus for cooling an enclosed space and a method for cleaning the apparatus and refers particularly, though not exclusively, to an indoor air conditioning unit that requires reduced maintenance.

## **10 BACKGROUND**

Indoor air conditioning units require regular maintenance to keep the units in efficient working condition. Specialized labour is required to dismantle the casing of air conditioning units, and to clean the cooling coils in the air conditioning units.

15 Such maintenance is costly and is a substantial expense to businesses when the number of units to be serviced is high.

Energy requirements, and consequently, costs for business have been escalating as air-conditioned working environments become more common. Some air conditioning systems claim to be able to minimize the energy usage for cooling a space of a pre-determined size. Such systems are commonly known as "inverter" air conditioning systems. However, such systems are usually technically more complex and require specialized labour to maintain them in serviceable order. It becomes questionable whether the savings in energy costs are greater than the additional cost of maintenance required for such systems.

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## **SUMMARY**

There is provided an apparatus for cooling an enclosed space of a pre-determined size, including: at least one cooling coil positioned at an inclined position in a casing; and at least one fluid outlet directed at the at least one cooling coil located in the casing for spraying fluid onto the at least one cooling coil for cleaning the at least one cooling coil, wherein the cooling coil positioned at an inclined position aids

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the flow of fluid in the at least one cooling coil and wherein the fluid outlet sprays fluid onto the at least one cooling coil during cleaning of the at least one cooling coil. The casing may have a reservoir for collecting fluid, and a conduit for draining the fluid. The apparatus may preferably have a casing with a lid hingedly attached to a body of the casing, the lid comprising at least one fan unit. It is preferable that at least one cooling coil used is lower than the rating recommended for the enclosed space of a pre-determined size. Advantageously, the fluid outlets are nozzles and the fluid is water. The apparatus may further including at least one condenser unit. Advantageously, at least one cooling coil of lower capacity is matched with at least one condenser unit of a higher corresponding capacity for enhanced cooling. The apparatus may use a refrigerant such as, for example, R411, R137A, R22, R409, or R410. Preferably, the apparatus may further including at least one filter positioned adjacent to the at least one cooling coil.

There is also disclosed a method for cleaning the cooling coil of the apparatus for cooling an enclosed space of a pre-determined size, including: activating the at least one fluid outlet to spray fluid onto the cooling coil; letting the fluid flow into the coil to rid the coil of organic growth and other particulate matter; and collecting the fluid and channeling the fluid away from the apparatus.

## DESCRIPTION OF DRAWINGS

In order that the invention may be better understood and readily put into practical effect, there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being in reference to the accompanying illustrative drawings in which:

Figure 1 is a perspective view of a preferred embodiment of the present invention; and

Figure 2 is a flow chart of the method of the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

In a preferred embodiment of the present invention as shown in Figure 1, there is provided an apparatus 20 for cooling an enclosed space of a pre-determined size, such as, for example, 100 m<sup>2</sup>. The apparatus 20 may have at least one cooling coil 22 positioned at an inclined position in a casing 24. The positioning of the cooling coil 22 at an inclined position aids the flow of fluid in the at least one cooling coil 22. At least one filter (not shown) may be positioned adjacent to the at least one cooling coil 22. In this instance, "adjacent" may be at or before the cooling coil. The casing 24 shown in Figure 1 may be wall mounted in an enclosed space. However, the casing 24 may be modifiable such that the apparatus 20 may be ceiling mounted or mounted in any possible way as well.

The apparatus 20 may also have at least one fluid outlet 26 (two are shown in Figure 1) such as, for example, a spray nozzle, located in the casing 24 for spraying fluid onto the at least one cooling coil 22 to clean the at least one cooling coil 22. The fluid outlet 26 may spray a high pressured jet of fluid to forcibly remove any organic growth and other particulate matter from the cooling coil 22 during cleaning of the at least one cooling coil 22. The fluid discharged from the fluid outlet 26 may be water or cleaning solutions that are neither corrosive nor toxic. The fluid from the outlet 26 may be accumulated in a reservoir (not shown) in the casing 24 at a base 32 of the casing 24. The base 32 of the casing 24 may be inclined at a gradient so that the reservoir may be drained through a conduit 34. The conduit 34 may be a hose or a pipe.

The apparatus 20 may include at least one fan unit 28 (two are shown in Figure 1). The fan unit 28 may be used to blow the cool air surrounding the cooling coil 22 out of the casing 24 through an opening 30 in the casing 24. The fan unit(s) 28 may be incorporated in a hinged or lidded or flip-top surface 36 of the casing 24 hingedly attached to a main body 25 of casing 24 by means of one or more hinges 38. The hinged or lidded or flip-top surface 36 is shown in "open" position in Figure 1. In the apparatus 20 as configured, when the hinged or lidded or flip-top surface 36 is "closed", the fan unit(s) 28 blow directly onto the cooling coil 22. Opening the

hinged or lidded or flip-top surface facilitates access to and the cleaning of the cooling coil 22, as well as fan unit 28. The hinged or lidded or flip-top surface 36 may be maintained at a "closed" position using clips, latches, or magnets (not shown). The flip-top surface 36 may also be maintained at an "open" position using  
5 at least one hydraulic strut located at a lengthwise end (either 40 or 42) of the flip-top surface 36. The fan unit may be of any suitable type including a cylindrical form.

The cooling coil 22 used in the apparatus 20 may be of a lower than the rating recommended for the enclosed space of a pre-determined size. The at least one  
10 cooling coil 22 of lower capacity may be matched with at least one condenser unit (not shown) of a higher corresponding capacity for enhanced cooling. While the apparatus 20 is usually installed in an enclosed environment, the at least one condenser will probably be installed in an external environment given the heat and noise that it radiates.

15 In a cooling coil 22 of lower recommended rating, the refrigerant running within the coil 22, such as, for example R411, R137A, R22, R409, or R410 evaporates at a quicker rate because of its smaller size compared to a cooling coil of a higher rating. This may increase the cooling effect of the apparatus 20 such that the post-  
20 coil temperature is lower compared to when a cooling coil of a higher recommended rating is employed. The lower post-coil temperature may denote an improved cooling effect of the apparatus 20 compared to air conditioning units utilizing condensers and cooling coils of the recommended rating.

25 Referring to Figure 2, there is shown a method for cleaning the cooling coil of the apparatus 20. The at least one fluid outlet 26 may be activated to spray fluid onto the cooling coil 22 (50). Subsequently, the fluid is allowed to flow under the influence of gravity, and the force from the fluid outlet 26 into the coil 22 displaces or dissolves the coil of any organic growth and any other particulate matter, such  
30 as, for example, dust and pollen particles (52) that may be on the coil 22. Finally, the fluid flows out from the coil 22 and is collected in the reservoir in the casing 24 before the fluid is channeled from the apparatus 20 through the conduit 34 (54). Due to the hinged or lidded or flip-top surface 36 of the casing 24, it is not

necessary to remove numerous screws and perform dis-assembly of the apparatus 20 to be able to clean the coil 22.

5 Whilst there has been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications may be made to details of design or construction without departing from the present invention.

10 The present invention extends to all features disclosed either individually, or in all possible permutations and combinations.

## CLAIMS

1. An apparatus for cooling an enclosed space of a pre-determined size, including:
  - 5 at least one cooling coil positioned at an inclined position in a casing; and  
at least one fluid outlet directed at the at least one cooling coil located in the casing for spraying fluid onto the at least one cooling coil for cleaning the at least one cooling coil,  
wherein the cooling coil positioned at an inclined position aids the flow of  
10 fluid in the at least one cooling coil and wherein the fluid outlet sprays fluid onto the at least one cooling coil during cleaning of the at least one cooling coil.
2. An apparatus for cooling an enclosed space of a pre-determined size with a casing with a lid hingedly attached to a body of the casing, the lid comprising at  
15 least one fan unit, the apparatus including:
  - at least one cooling coil positioned at an inclined position in a casing; and  
at least one fluid outlet directed at the at least one cooling coil located in the casing for spraying fluid onto the at least one cooling coil for cleaning the at least one cooling coil,  
20 wherein the cooling coil positioned at an inclined position aids the flow of fluid in the at least one cooling coil and wherein the fluid outlet sprays fluid onto the at least one cooling coil during cleaning of the at least one cooling coil.
3. The apparatus as claimed in either claim 1 or 2, wherein the at least one  
25 cooling coil used is lower than the rating recommended for the enclosed space of a pre-determined size.
4. The apparatus as claimed in any one of claims 1 to 3, wherein the fluid outlets are nozzles.
- 30 5. The apparatus as claimed in any one of claims 1 to 4, wherein the fluid is water.

6. The apparatus as claimed in claim 1, further including at least one fan unit.
7. The apparatus as claimed in any one of claims 1 to 6, further including at least one condenser unit.
- 5 8. The apparatus as claimed in any one claims 1 to 7, wherein the casing has a reservoir for collecting fluid, and a conduit for draining the fluid.
9. The apparatus as claimed in claim 2, wherein the at least one cooling coil of lower capacity is matched with at least one condenser unit of a higher corresponding capacity for enhanced cooling.
- 10 10. The apparatus as claimed in any one of claims 1 to 9, wherein the apparatus uses a refrigerant selected from the group consisting of: R411, R137A R22, R409, and R410.
- 15 11. The apparatus as claimed in any one of the preceding claims, further including at least one filter positioned adjacent to the at least one cooling coil.
- 20 12. A method for cleaning the cooling coil of the apparatus as claimed in any one of claims 1 to 11, including:  
activating the at least one fluid outlet to spray fluid onto the cooling coil;  
letting the fluid flow into the coil to rid the coil of organic growth and other particulate matter; and  
25 collecting the fluid and channeling the fluid away from the apparatus.