United States Patent

[11] 3,595,536

[72] Inventor **Wayne H. Ripley**
P.O. Box 2174, San Angelo, Tex. 76901

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[45] Patented **July 27, 1971**

[54] **AIR-COOLING DEVICE**
13 Claims, 10 Drawing Figs.

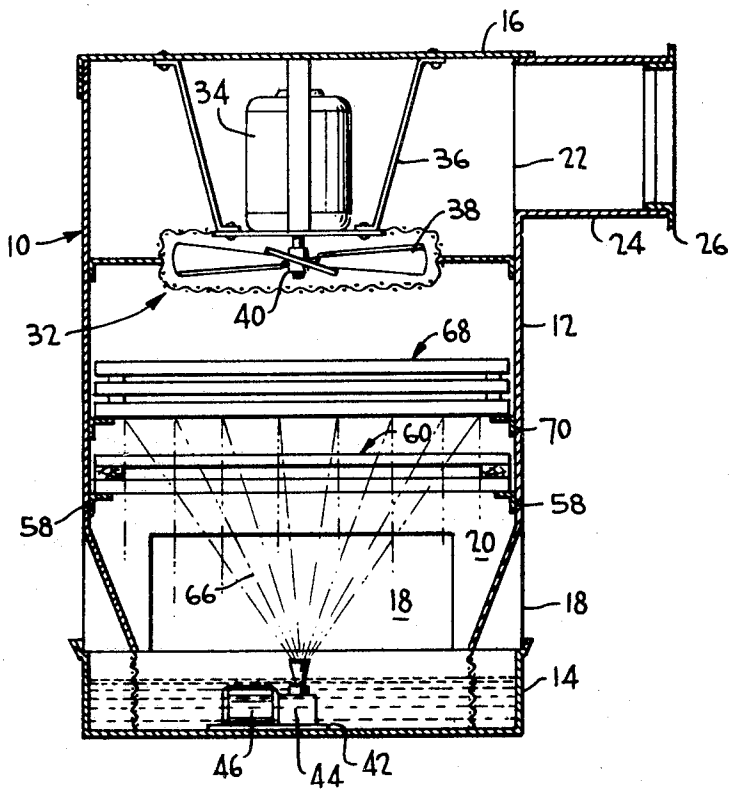
[52] **U.S. Cl.** **261/28,** 55/223, 55/259, 261/111, 261/116
[51] **Int. Cl.** **B01d 47/06**
[50] **Field of Search** ..... 55/223, 248, 257, 260, 259; 261/36, 28, 109—112, 116

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Primary Examiner—Tim R. Miles
Assistant Examiner—Steven H. Markowitz
Attorney—Jacobi, Davidson, Lilling & Siegel

ABSTRACT: An air cooler incorporating a hollow body through which warm air is caused to flow from an air inlet means over elements impregnated with liquid to an air outlet means. The warm air as it passes over the liquid impregnated elements causes the evaporation of liquid therefrom. The heat that is required to effect the evaporation of the liquid is absorbed from the air passing over such elements and the air is cooled thereby.



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SHEET 1 OF 2

FIG. 1

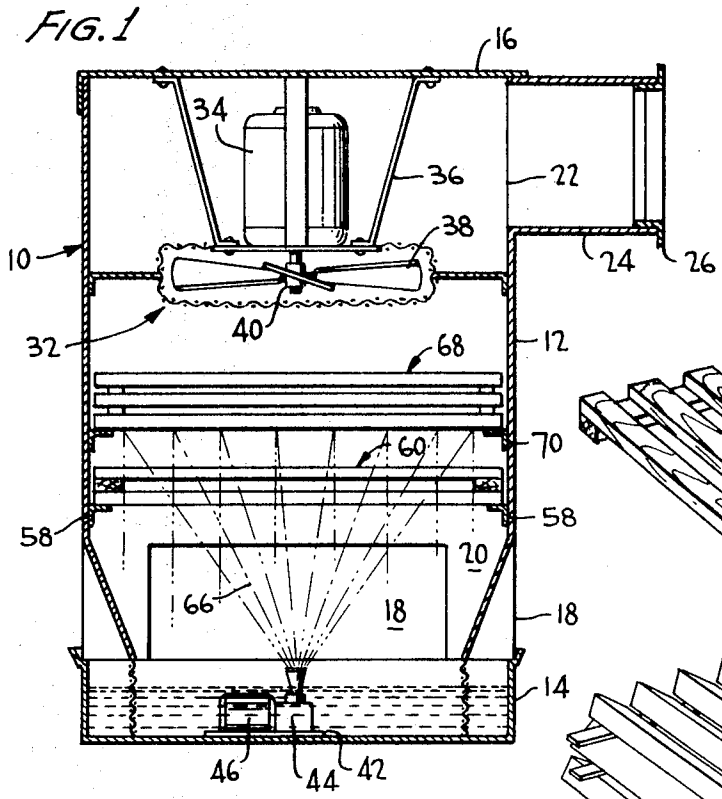


FIG. 3

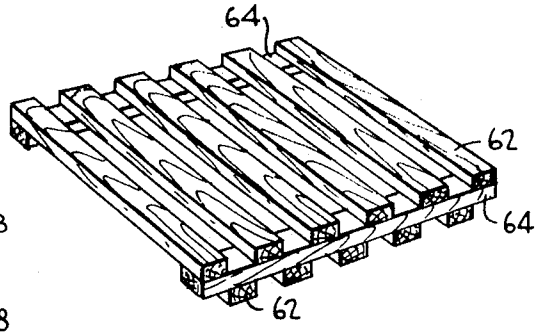


FIG. 4

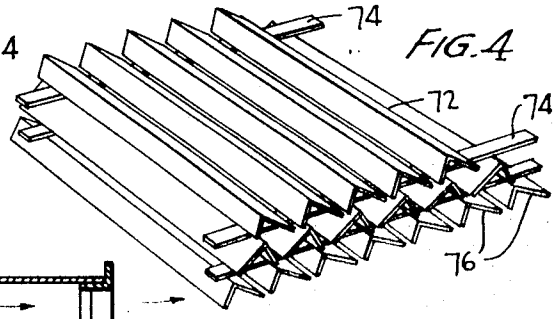


FIG. 2

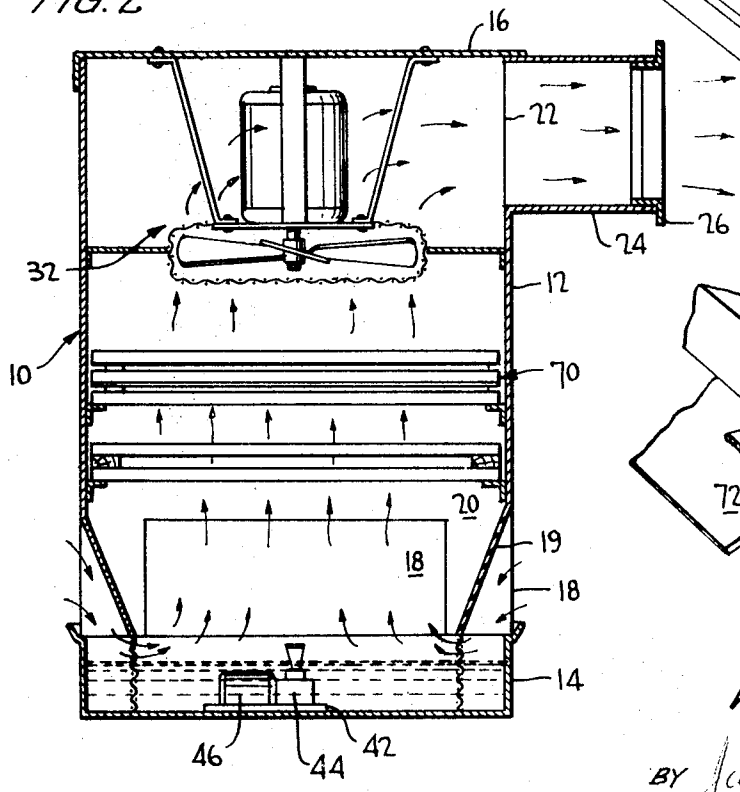
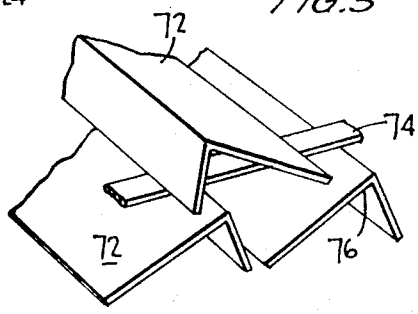


FIG. 5



INVENTOR,
WAYNE H. RIPLEY

BY Jacobi & Hanson

ATTORNEYS

FIG. 6

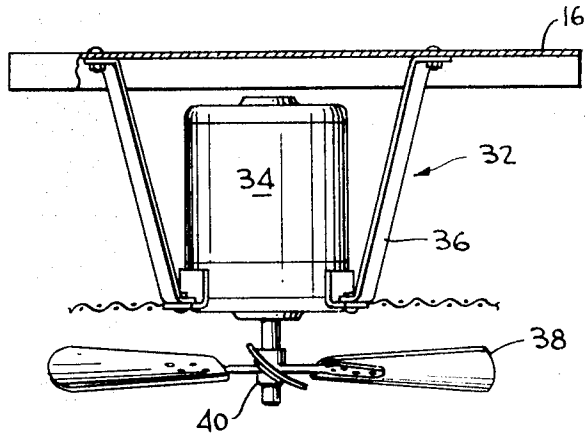


FIG. 7

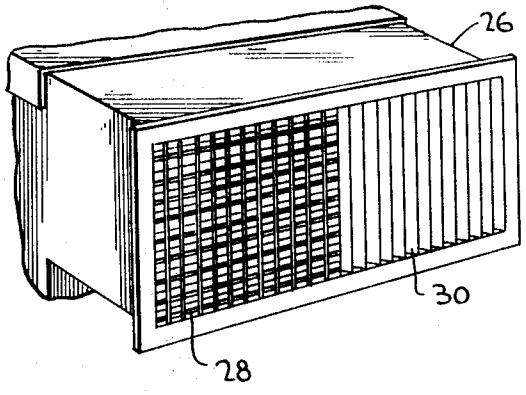


FIG. 8

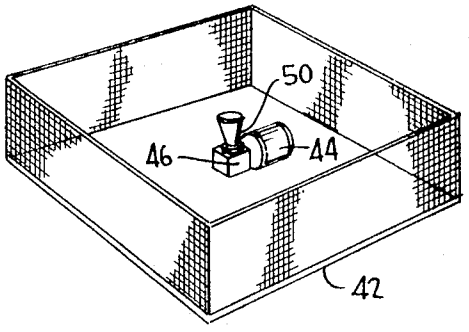


FIG. 9

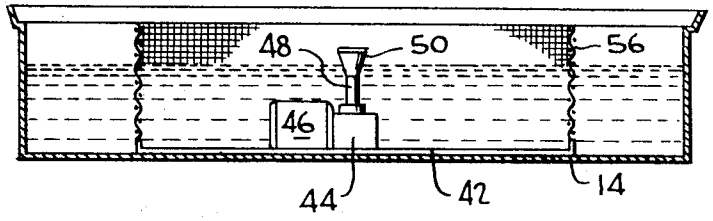
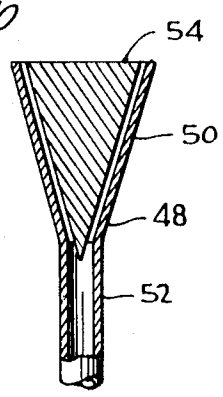


FIG. 10



INVENTOR,
WAYNE H. RIPLEY
BY Jacobs & Hardison
ATTORNEYS

AIR-COOLING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a cooling device and more particularly to a cooler for air wherein the air to be cooled is passed over elements saturated with a liquid that is to be evaporated by the passage of air over such elements. The heat required to effect the vaporization of this liquid is removed from the air in passing over the liquid saturated elements and results in a lowering of the temperature of the air.

While many systems have been devised and are commercially available for reducing air temperatures, such systems generally involve the use of a complete mechanical refrigeration system of the type wherein a medium such as Freon is compressed to the liquid state in a compressor and evaporated in cooling coils over which the air to be cooled is passed. Such systems are costly to install, require frequent servicing and often become quite noisy after long periods of operation.

Taking into consideration the foregoing deficiencies, it is a primary object of the present invention to provide an air cooler that is reliable in operation.

Another object of the invention is to provide an air cooler which has but few moving parts and is, therefore, inexpensive to maintain and service.

Yet another object of the invention is to provide an air cooler that is quiet in operation.

Still another object of the invention is o provide an air cooler in which the cooling action is brought about by the evaporation of liquid such as water, from a liquid-impregnated material.

A further object of the invention is to make use of wood as the material which is impregnated with the liquid to be evaporated.

A still further object of the invention is to make use of redwood as the material which is impregnated with the liquid to be evaporated.

An additional object of the invention is to provide an air cooler impregnating liquid storage means, such as a removable reservoir, and removable means associated with such reservoir for spraying said impregnating liquid onto the material from which it is to be evaporated.

Another additional object of the invention is to provide an air cooler with air inlet openings, having means associated therewith, that permit air to be readily drawn into the cooler but preclude the flow of water therefrom.

A further additional object of the invention is to provide the air cooler with a baffle structure, downstream of the liquid-impregnated material, to return to the liquid supply reservoir any unevaporated liquid that passes beyond the liquid-impregnated material.

A specific object of the invention is to provide an air cooler according to the teachings of the present invention which is simple in construction, durable and made of materials of relatively low cost.

The invention will be better understood and objects other than those set forth will become apparent after reading the following detailed description thereof. Such description refers to the annexed drawings presenting preferred and illustrative embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view through the air cooler of the present invention showing, in particular, the path of the water spray;

FIG. 2 is a vertical sectional view of the air cooler showing, in particular, the path of airflow through the air cooler;

FIG. 3 is a perspective view of the water-retaining baffle assembly;

FIG. 4 is a perspective view of a water-retaining baffle assembly;

FIG. 5 is an enlarged partial perspective view showing the relative arrangement of several of the baffle elements that make up the baffle assembly;

FIG. 6 is a sectional view through a portion of the top of the air cooler showing the airflow producing means depending therefrom;

FIG. 7 is a perspective view of the air delivery means;

FIG. 8 is a perspective view of the removable liquid spray unit assembly;

FIG. 9 is a sectional view through the liquid storage reservoir with the removable liquid spray unit assembly disposed therein;

FIG. 10 is a sectional view through a liquid spray nozzle that may be employed with the air cooler of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings, and initially considering the exemplary embodiment of the inventive air cooler, the reference numeral **10**, in FIGS. **1** and **2**, designates the overall air cooler. The air cooler **10** includes a housing or hollow body portion **12**, which, while illustrated in the drawings as being square in cross section, may, nevertheless, have any desired polygonal cross-sectional shape to meet particular installation requirements, and it may even be circular or oval in cross section.

The housing **12** of the air cooler is hollow and formed of any suitable material. It is, preferably, formed of metal and is arranged to be removably mounted on a liquid storage reservoir **14**. The upper end of the hollow body portion **12** is closed by a removable cover unit **16** of metal or similar material. Hollow body portion **12** is provided at its lower end with a plurality of laterally spaced peripheral openings **18** that provide for communication between interior **20** of the main body portion **12** and the surrounding atmosphere.

A cooled air outlet **22** is provided at the upper end of the hollow body portion **12** of the air cooler **10**. The outlet **22** extends completely across the width of the hollow body portion **12** and has attached thereto an air delivery duct **24**. A cooled air discharge member **26** is mounted on the end of air delivery duct **24**. Discharge member **26** includes a pair of individually adjustable air-directing louver devices **28**, **30** that may be adjusted to meet the requirements of a particular installation.

In order to produce a flow of air from the atmosphere surrounding the air cooler **10**, through inlet openings **18**, hollow body portion **12**, delivery duct **24** and adjustable air directing louvers **28** and **30**, a motor operated fan or blower means **32** is provided. The fan or blower means **32** may be actuated by any conventional motor means, and in the drawings this means has been illustrated by an electric motor **34**, suspended from removable cover **16** by a plurality of support straps **36**, and arranged to rotate fan blades **38** projecting from a hub member **40**. The electric motor **34** is included in a conventional electric circuit under the control of manual or thermostatic switch means, not illustrated.

The liquid storage reservoir **14** is shown in FIG. **9** removed from the hollow body portion **12** of air cooler **10**. Mounted on a support base **42** that is removable from liquid storage reservoir **14** is a pump **44** that is driven by an electric motor **46**. The electric motor **46**, like electric motor **34**, forms a part of a conventional electric circuit, not shown, including a conventional circuit opening and closing switch means. The pump **44** is supplied by liquid contained in reservoir **14** and discharges such liquid as a spray by a conventional spray nozzle **48**. A well-known spray nozzle construction has been illustrated in FIG. **10** and includes a flared body portion **50** connected to the pump **44** by a pipe section **52** and a tapered deflector member **54** located within the flared body portion **50**. A filtering means, such as screen member **56**, is arranged around pump **44** to preclude the entrance of any foreign matter into the pump **44**.

Mounted transversely of the hollow body portion **12** on, for example, angle supports **58** is a liquid impregnable assembly **60**.

The liquid impregnable assembly **60** is shown in greater detail in FIG. **3** and comprises a plurality of rows of spaced liquid-impregnable elements **62** supported, respectively, in

vertical spaced relationship on supporting members **64**. These liquid-impregnable elements **62** are arranged so that the elements **62** of each row are positioned in staggered relationship with respect to the liquid-impregnable elements **62** of each adjacent row The liquid-impregnable elements **62** may be made of any suitable material capable of absorbing a liquid, which may be water These elements **62** are, preferably, made from any of many species of wood, but it has been found that redwood is not only more durable but functions to absorb and permit evaporation of liquids therefrom more readily than other woods.

The liquid which has been drawn from the reservoir **14** by pump **44** is discharged by the pump **44** through spray nozzle **48** in the form of a spray, illustrated in FIG **1** of the drawings by numeral **66**, onto the liquid-impregnable elements **62** of the liquid-impregnable assembly **60**. Any of such liquid, from the spray **66**, that is not absorbed by the liquid impregnating assembly **60** and passes on beyond the liquid-impregnable assembly **60**, is intercepted by a liquid-returning baffle assembly **68** mounted, for example, on angle supports **70**

The liquid-returning baffle assembly comprises a plurality of rows of discrete angular shaped baffle elements **72** that rest on a plurality of supporting bars **74** with the opening in the angle **76** directed toward the liquid reservoir **14**

In order to prevent the leakage of any liquid being returned to the reservoir **14** by the baffle assembly **68** through air inlet opening **18**, each of the inlet openings **18** is provided with a lip or deflector member **19** that is arranged to divert such returning liquid to reservoir **14**.

In order to operate the air cooler **10** and deliver cool air from the discharge member **26**, the electric circuit controlling the electric motor **34** is completed by a manual or thermostatic switch (not illustrated). The blades **38** of the fan **32** are then operated in a manner to draw air into inlet openings **18** and discharge such air, after passing over the liquid impregnated baffle assembly **60**, through the air delivery duct **24** and adjustable louver devices **28** and **30**. The warm air which enters the air cooler **10** through inlet openings **18** in passing over the, preferably, redwood elements **62** of the liquid-impregnable assembly **60** evaporates liquid from the elements **62** thereof The heat that is required to evaporate this liquid from the elements **62** is absorbed from the air passing over the elements **62** and as a result thereof such air is cooled Because the liquid-impregnable elements **62** are arranged in several rows that extend transversely of the body portion **12** of the air cooler **10** with the elements of each row arranged in staggered relation to the elements of each adjacent row, a thorough contact is established between the warm air passing over the liquid-impregnable elements **62** of the liquid-impregnable assembly **60** and the liquid-impregnable elements **62**

The liquid-impregnable elements **62** are maintained impregnated with liquid by the action of a liquid spray means that is supported on a base **42** that is removably mounted in a liquid reservoir **14** that also is removably attached to the lower end of the hollow body portion or housing **12** of the air cooler **10** The pump **44** of the liquid spray means draws liquid from the liquid reservoir **14**, when its associated electric motor **46** is actuated, and discharges such liquid by means of the nozzle **48** onto the liquid-impregnable elements **62**

Should any of the impregnating liquid discharged from the spray nozzle **48** pass beyond the liquid-impregnable elements **62**, such liquid will encounter the discrete angular shaped baffle elements **72** of the baffle assembly **68** and be returned to the impregnating liquid reservoir **14** The liquid being returned to the liquid reservoir **14** by the baffle elements **72** of the baffle assembly is prevented from leaking to the exterior of the air cooler **10** through air inlet openings **18** by the lip or deflector members **19**.

After reading the foregoing detailed description, it will be apparent that the objects of the invention set forth initially have been successfully achieved. Accordingly,

I claim:

1. An air cooler comprising a hollow body portion provided with fluid inlet opening means and fluid outlet opening means, liquid-impregnable means disposed in said hollow body portion; means for effecting the entrance of air through said inlet opening means and the discharge of said air through said outlet opening means, said liquid-impregnable means being constructed of redwood, means for discharging a spray of liquid onto said liquid impregnable means, said means to discharge a spray of liquid comprising a liquid reservoir removably attached to said hollow body portion and a pump means located in said reservoir arranged to draw liquid from said reservoir and discharge said liquid upwardly through spray means, said inlet opening means comprising a plurality of inlet openings spaced laterally about the periphery of said hollow body portion below said liquid-impregnable means but above said reservoir, and baffle means disposed in said hollow body portion, downstream of said liquid-impregnable means, to return to said reservoir any unevaporated liquid contained in the air flowing beyond said liquid-impregnable means and a lip deflector means arranged adjacent each of said inlet openings in a manner to catch and divert any liquid being returned from said baffle means to said reservoir away from said openings, whereby said air is cooled by its passage over said liquid-impregnable means where it evaporates impregnating liquid from said liquid-impregnable means and is cooled by the loss of heat required to effect such evaporation

2. An air cooler as defined in claim **1** wherein said spaced strips of redwood lie in the same plane.

3. An air cooler as defined in claim **1** wherein said liquid-impregnable means comprises a plurality of layers of spaced strips extending across said hollow body portion with the strips of each layer being staggered with respect to the strips in each adjacent layer.

4. An air cooler means as defined in claim **1** wherein said liquid-impregnable means comprises a plurality of layers of spaced strips of redwood that extend transversely across said hollow body portion with the strips of each row being staggered with respect to the strips in each adjacent row. spray means is provided for impregnating the redwood with liquid which includes a liquid reservoir removably attached to the lower end of the hollow body portion, a supporting base removably supported within said reservoir, a sprayer and pump means mounted on said supporting base arranged to draw liquid from said reservoir and discharge said liquid through said sprayer onto said liquid-impregnable means, and filtering means surrounding said pump means to preclude the entrance of any foreign matter into said pump means; baffle means is disposed downstream of said liquid-impregnable means to return to said reservoir any unevaporated liquid contained in the air flowing beyond said liquid-impregnable means which includes a plurality of rows of discrete angular shaped baffle elements with the baffle elements of each row arranged in staggered relation with respect to the baffle elements of an adjacent row; said fluid inlet opening means includes a plurality of inlet openings formed at the lower end of said hollow body, below said but above said reservoir, spaced laterally about the periphery of said body portion and having, respectively, lip deflector means arranged adjacent each of said air inlet openings to catch and divert any liquid being returned from said baffle means to said reservoir; said outlet means includes a plurality of individually adjustable louver means for directing cooled air from said hollow body portion, a removable closure is provided for the upper end of said hollow body portion, and an electric motor driven air fan is mounted on said removably mounted closure means for effecting the entrance of air through said inlet opening means and the discharge of such air through said individually adjustable louver means

5. An air cooler as defined in claim **1** wherein said baffle means comprises at least one row of angular-shaped baffle elements.

6. An air cooler as defined in claim **5** wherein said baffle means comprises a plurality of rows of angular shaped baffle

elements, with the baffle elements of each row arranged in staggered relation to the baffle elements in adjacent rows.

7. An air cooler as defined in claim 6 wherein said baffle elements are discrete elements.

8. An air cooler as defined in claim 1 wherein a supporting base is removably supported within said removable reservoir and said spray means are mounted on said supporting base to discharge a spray of liquid upwardly onto said liquid-impregnable means.

9. An air cooler as defined in claim 8 wherein said reservoir is provided with a filtering means surrounding said pump means to preclude the entrance of foreign matter into said pump means.

10. An air cooler as defined in claim 1 wherein said fluid outlet means is located at the upper end of the hollow body portion and is arranged to discharge cooled air laterally from said hollow body portion.

11. An air cooler as defined in claim 10 wherein said fluid outlet means comprises a pair of individually adjustable louver means.

12. An air cooler as defined in claim 11 wherein said means for effecting the entrance of air through said inlet opening means and the discharge of air through said outlet opening means comprises a motor-driven fan means.

13. An air cooler as defined in claim 12 wherein said motor-driven fan is supported from a removable closure means.