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COOLING TOWERS

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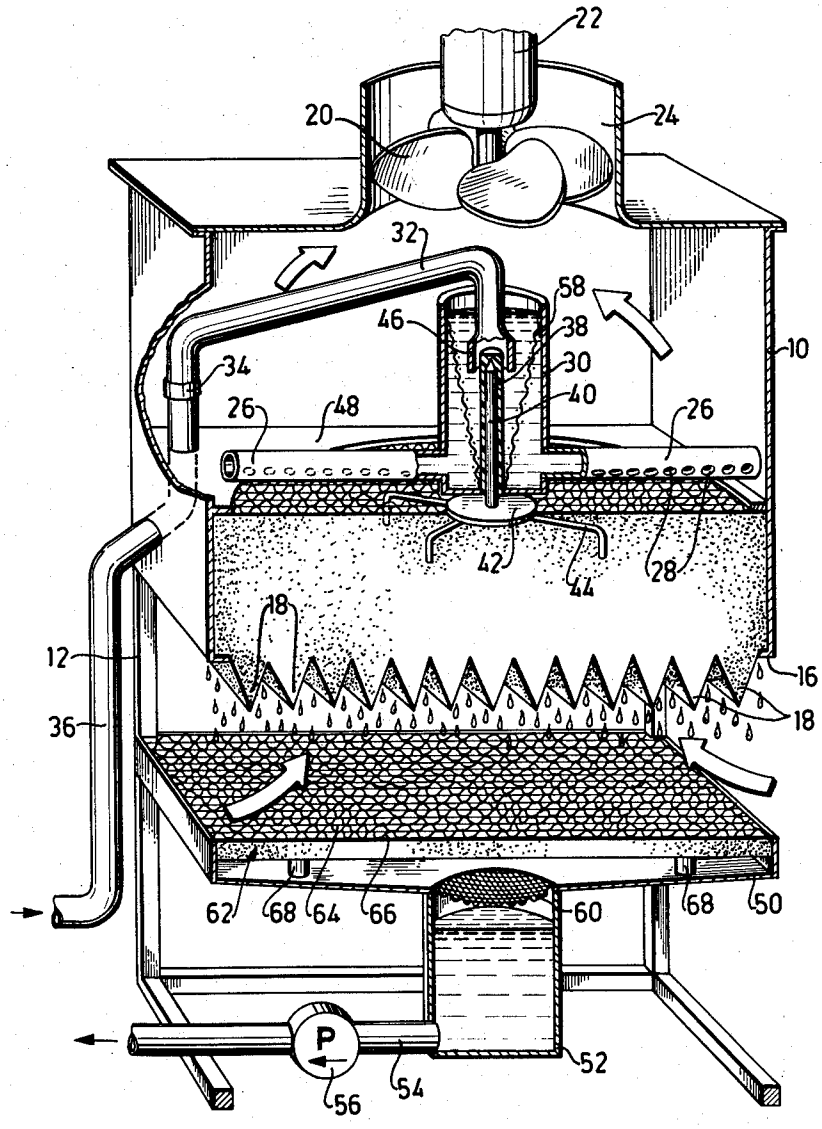

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COOLING TOWERS

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This invention generally relates to cooling towers.

More particularly this invention relates to cooling tower of the evaporative type having a casing and a gas and liquid contact body located within said casing and means to bring a liquid and a gas into direct contact with one another. In most cases the liquid is water and the gas air.

Still more particularly the invention relates to cooling towers of the evaporative type having a casing and an air and water contact body housed within said casing and formed with a plurality of narrow channels extending through said body, and a liquid distributing or spraying device mounted above said body for supply of and distribution of water into the channels thereof, and means to cause said water to drain from the underside of said body and to fall down on a water collecting and draining surface, and means to maintain open communication between the lower part of said contact body and the surrounding atmosphere to cause air to flow upwards through the channels of said body.

One main object of the invention is to improve cooling towers of the type in consideration so as to avoid wetting of the surroundings thereof.

A further object of the invention is to provide a cooling tower which adjacent its water collecting and draining surface is provided with means preventing water drops impinging on said surface from splashing back with an angle relative the horizontal plane acute enough to allow the drops to find their way outside the casing of the tower.

Still a further object of the invention is to provide a cooling tower having a water collecting and draining system comprising at least one trough with low lateral walls so as to have small vertical dimensions and provided with means preventing water drops drained off from the underside of the contact body and falling down onto the bottom of said trough from splashing out of said trough, wetting the surroundings of the cooling tower and getting wasted.

Further objects and advantages of the invention will become apparent from the following description, considered in connection with the accompanying drawing which forms part of this specification and in which an embodiment of the invention is presented in a perspective sectional view.

Referring to the drawing, reference numeral **10** denotes a casing carried by support legs **12**. Preferably the entire rectangular cross-section of said casing **10** is occupied by a contact body or fill **14**. Said fill is suitably of the type disclosed in the Patent No. 2,809,818 to Carl Georg Munters to the specification of which reference is made for a more detailed description of the fill in consideration. Generally spoken the fill is composed of alternately even and corrugated sheets or partition walls made of paper. The sheets are bonded together to form packings resting with their base on a flange **16** projecting rectangularly from the casing **10**. The paper sheets are highly water absorptive and have good structural strength when in a wetted state due to impregnation with a suitable substance such as some phenolic resin. The spacing between the even sheets may be so small that the water would be capable by surface tension to bridge over and block the channels between the sheets, and in order

to render possible a flow by which the channels are kept open the fills are formed at the base with inclined cuts so as to obtain a sawtooth-like shape and to create flaps or projections **18**. The air is fed to the underside of the fill **14** through openings formed in the casing **10** and through the space between the legs **12**. The air flows upwards through the many channels of the fill within which it meets the water flowing downwards through the channels. Part of said water is evaporated into the air causing a cooling effect. The air is caused to stream through the apparatus due to the suction effect exercised by a fan **20** driven by an electric motor **22**, both said fan and said motor being located in a duct **24** formed in the upper portion of the casing. Since the casing **10** is open below the fill **14**, the air has free access from all directions to the underside of said fill.

The water is distributed over the upper face of the fill by means of a liquid distributing device provided with one or a plurality of sprayer arms **26**, the number of which in the embodiment shown is two, which are positioned diametrically opposite and formed with discharge openings **28** most suitably arranged in a part-helical row. The arms **26** are carried by and freely communicate with a top-open container **30** which is closed at its base end entered from above by a tube **32**. Said tube is at **34** detachably connected with another tube **36**.

Disposed centrally within the suitably cylindrical-shaped container **30** is a sleeve **38** anchored with its lower end at the bottom of, and projecting upwards within said container. The upper end of the sleeve **30** is closed and constitutes a preferably conically shaped bearing surface for the correspondingly conical top portion of a pivot **40** projecting from below upwards into said sleeve. The pivot **40** is mounted on a holder having the shape of a disc **42**, for example, and an arm-cross **44** the downwardly bent end portions of which enter channels of the fill **14**. In this simple manner the correct position of the pivot and the liquid distributing device is ensured. The pivot **40** projects with a play through the sleeve **38**. This latter may be made of some non-metallic material such as a synthetical plastic material possessing favorable sliding properties. As will easily be understood, the pivot **40** operates inside a bearing space sealed from the more or less impure water. The tube **32** has a widened end portion **46** opening with some play over the sleeve **38**.

The discharge openings **28** are arranged in the lower part of the arms **26** in such a manner as to impart to the jets of water discharged from said openings a horizontally acting flow component causing rotation of the distributing device. The magnitude of the reaction force produced in this way is determined by the height of the water column in the container **30** which height may be some or several decimetres. Since the sprayer arms **26** follow a circular path and consequently sprinkle a surface having a circular outer boundary, the corner portions of the fill **14** are covered by a plate **48**.

The water drained from the free ends of the flaps **18** is collected in a trough **50** and flows therefrom into a pan **52** from which the cooled water is supplied by a pump **56** through a conduit **54** to a place of utilization such as the condenser of a refrigerating machine. From there the water returns through the tubes **36**, **32** to the container **30** of the distributing device for renewed cooling. Screens **58**, **60** destined for separation and removal of larger solid particles entrained with the water may be provided in the container **30** and above the pan **52**, respectively.

Mounted within the trough **50** is a kind of grate generally designated by **62** and composed of vertically edgewise disposed strips having a breadth of one or a few centimetres only. In the same manner as the sheets of the fill **14** the strips may be alternately even and corrugated, as is indicated at **64** and **66**. The strip material

is advantageously the same as that used to form the fill which means that it should have water-absorbing property and be constituted by a fibrous material such as paper given wet-strength by impregnation with a phenolic resin, for example. The strips of paper which form the grate are preferably of less thickness than the diameter of the water drops impinging against them. The spacing between the strips is shown in the drawing to be greater than the spacing between the sheets of the fill **14**, but it may be of the same magnitude. It is essential that the water drops falling down from the free ends of the projections **18** can pass in an unobstructed manner through the channels of the grate **62** and that a rebounding out of the grate is possible with so great an angle of inclination relative the horizontal plane that the rebounded drops cannot reach outside the casing **10**. In this way the place where the apparatus is erected, is protected against wetting. As is readily understood, the air draught through the lower lateral openings which follows an inward direction from outside, assists in retaining the splash water within the trough. The grate **62** suitably rests on a support **68** in order to allow the water to drain off along an unobstructed path at the bottom of the trough **50** to the pan **52**. As a result of the invention the lateral walls of the trough **50** can be made low so as not to reduce the width of the air openings formed in the lateral walls of the casing of the cooling tower.

The free ends of the projections or flaps **18** may also be arranged in spaced relation above narrow troughs or channels following the longitudinal extention of said projections and collecting the drops of water drained off to deliver the water to a common collecting channel. These troughs or channels together form the common drain or discharge surface for the water and they are at a minor distance from their base or bottom provided with a grate system of the kind embodying the present invention so as to avoid all splash.

While one more or less specific embodiment of the invention has been shown and described, it is to be understood that this is for purpose of illustration only, and that the invention is not to be limited thereby, but its scope is to be determined by the appended claims.

What we claim is:

1. In a cooling tower having a casing, a gas and liquid contact body formed with a plurality of channels located within said casing, a spraying device disposed above said contact body and formed for supply and distribution of water to the channels of said body from the underside of which the water supplied to the body drops down onto a collecting and draining surface, means to keep the lower part of said contact body and the surrounding atmosphere in open communication for supply of air in an upward direction through the channels of said body, grate-shaped means mounted in spaced relation above said collecting and draining surface and composed of edgewise vertically disposed strips of paper thickness and of less thickness than the diameter of the water drops impinging against them forming channels between themselves, said grate-shaped means with strips of the thickness mentioned being adapted to prevent water drops impinging on said collecting and draining surface from splashing back in an upward direction with such acute angle relative the horizontal plane as to cause wetting of the surroundings outside said casing.

2. In a cooling tower having a casing, a gas and liquid contact body formed with a plurality of channels located within said casing, a spraying device disposed above said contact body and formed for supply and distribution of water to the channels of said body from the underside of which the water supplied to the body drops down onto a collecting and draining surface, means to keep the lower part of said contact body and the surrounding atmosphere in open communication for supply of air in an upward direction through the channels of said body, grate-shaped means mounted in spaced relation above said collecting and draining surface and composed of edgewise vertically disposed strips of paper thickness and of less thickness than the diameter of the drops of water impinging against them forming channels between themselves, said grate-shaped means being adapted to prevent water drops impinging on said collecting and draining surface from splashing back in an upward direction with such acute angle relative the horizontal plane as to cause wetting of the surroundings outside said casing, said strips being made of a fibrous material having water absorbing capacity.

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