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SPIRAL CORE PRECOOLER FOR WATER COOLERS

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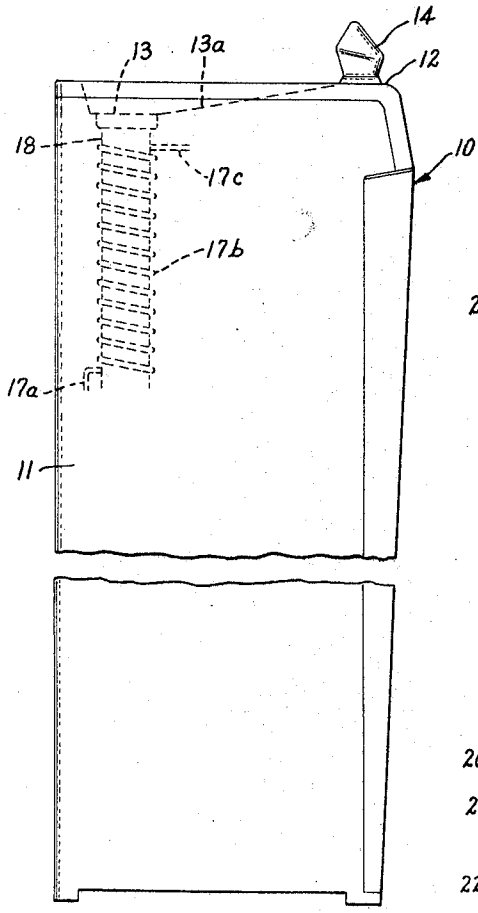


FIG. 1

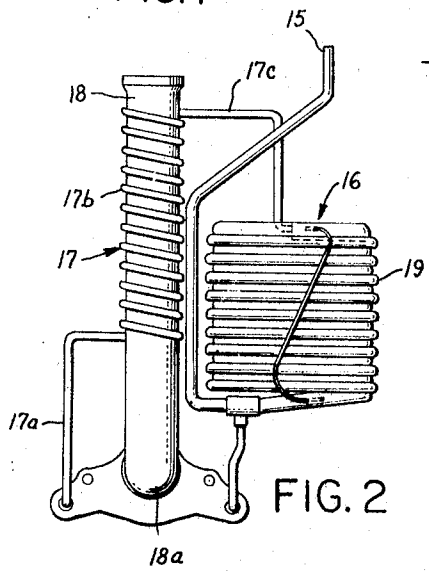


FIG. 2

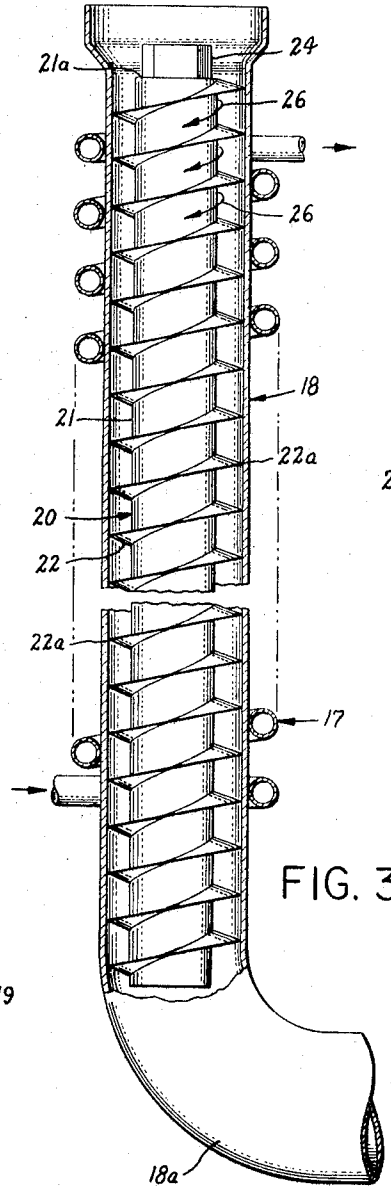


FIG. 3

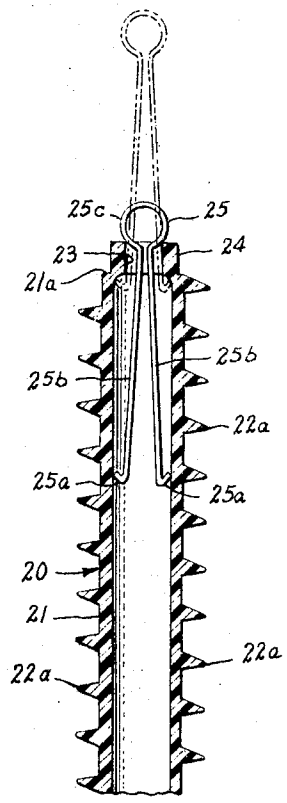


FIG. 4

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SPIRAL CORE PRECOOLER FOR WATER COOLERS

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ABSTRACT OF THE DISCLOSURE

A spiral core precooler for water coolers including a drain tube having a water tube wound about its external surface through which the incoming water is conducted, and having a one piece non-metallic core removably positioned within the drain tube, the core comprising an elongated hollow central portion of circular cross-sectional configuration surrounded by a spiral fin which directs the cooled waste water in a spiral path downwardly through the drain tube and against the internal surface thereof.

BACKGROUND OF THE INVENTION

Field of the invention

My invention relates to fluid dispensing devices, and more particularly to an improvement in water coolers of the type wherein a precooler means is provided for the purpose of cooling the incoming water by the chilled waste water diverted down the drain tube.

Description of the prior art

To improve the operating efficiency of water coolers a number of attempts have been made, as evidenced by reference to the prior art, at utilizing the cooling effect of what is most commonly referred to as the waste water of the water cooler. This is the water which is dispensed from the spout or other suitable dispensing means of the water cooler but which for one reason or another remains unconsumed. In normal practice, this waste water while still at a substantially cool temperature exits through the drain tube of the water cooler to the external drainage system to which the aforesaid water cooler is connected. Recognizing the cooling potential available in this waste water, the prior art has conceived and has employed with a limited degree of success a variety of different means all of which function essentially as heat exchangers whereby the waste water as it passes through the drain tube is brought into heat transfer relation with and thereby serves to cool the incoming water being supplied from a suitable source.

In more specific terms, the primary function of the above-referenced means, conventionally known in the art as precoolers, is to cool the incoming water by the heat exchange method from an incoming temperature of approximately 80° F. In doing so, the waste water which is at a temperature in the order of 50° F. reduces to a substantial extent the total refrigeration load required to be performed by the refrigeration or cooling unit of the water cooler.

As an exemplification of the teachings of the prior art, the precooler is oftentimes constructed such that the incoming water tube is wrapped around the drain tube with the latter having inernally inserted therein a spiral coil which usually has been formed on a spiral winding machine from a brass or copper strip of suitable width. The spiral coil is normally manually threaded into the drain tube following which the final assembly is dipped into a lead bath. This latter step binds the spiral coil to the inside wall of the drain tube. One particular problem associated with this type of construction is that oftentimes the spiral coil has a tendency to become stuck and/or bunched up intermediate the length of the drain tube.

This of course results in an inefficient thermal exchange between the previously cooled water flowing along the spiral coil and the incoming water flowing through the pipe externally wrapped around the drain tube.

Once such precoolers are in actual service for a time, it has been found that sediment, dirt, etc., accumulates in the spiral coil and the heat transfer efficiency of the precooler drops rather sharply. That is, the capacity of the water cooler as measured by its ability to dispense water at the desired temperature may drop by approximately ⅓ because of the loss of effective heat transfer. More importantly, when this condition exists there is no sure way to clean the spiral coil. As a matter of fact, recognizing the inherent unhealthiness which this type of unsanitary condition represents, some states are even thinking of outlawing this type of precooler because of its inability to be thoroughly flushed clean.

Another disadvantage of prior art types of precoolers is that with higher capacity water coolers there is a tendency for more water to be wasted. This additional waste water is then diverted to the drain tube where the spiral coil is unable to handle the flow with the result that the excess water spills over the spiral coil into the open center of the drain tube and is not utilized for heat transfer purposes.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide a novel and improved precooler for water coolers which will eliminate the present production and service problems associated with prior art precoolers as used by industry today.

It is another object of the present invention to provide such a precooler for water coolers wherein the spiral core thereof is completely removable thereby providing for ease of cleaning and flushing as well as ease of replacement.

A still further object of the present invention is to provide such a precooler for water coolers which is preferably of low cost one piece molded plastic construction whereby the need for lead dipping is eliminated and whereby there is provided a precooler which is relatively inexpensive to manufacture, easy to assemble, but yet which is durable in service.

Yet another object of the present invention is to provide such a precooler for water coolers wherein all the waste water is channeled for heat transfer purposes to the drain tube wall and wherein there is no spill over of the waste water from the spiral core even when used with high capacity water coolers.

Yet a further object of the present invention is to provide such a precooler for water coolers having a built-in deflector means at the top of the spiral core which has an overflow hole therein whereby if foreign matter should clog the spiral core, the waste water will back up and pass through the overflow hole, and wherein this same overflow hole may be used as a means of lifting the spiral core out from the drain tube for cleaning purposes, etc.

SUMMARY OF THE INVENTION

In accordance with a preferred form of the present invention there is provided a drain tube assembly including a precooler core unit for use in fluid dispensing devices comprising a drain tube having wound about its external surface a water tube through which incoming water is conducted. A one piece molded plastic core is removably positioned within the drain tube. The core comprises an elongated hollow central portion of circular cross-sectional configuration surrounded by a spiral fin which directs cooled waste water in a spiral path downwardly through the drain tube and against the internal surface thereof. The hollow central portion opens at each end

so that overflow water can be directed downwardly through the hollow. The top of the central portion is preferably molded in the configuration of a hexagonal head nut to permit unscrewing of the core out of the drain tube if it becomes stuck therein. A spring wire may be inserted within the hollow to permit pulling of the core outwardly of the drain tube.

The invention will be more fully understood from the following detailed description and its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of a water cooler having a drain tube assembly including a precooler in accordance with the present invention, the drain tube assembly being illustrated in skeleton;

FIG. 2 is a side elevational view of the cooling unit assembly for the water cooler of FIG. 1 illustrated as being removed therefrom;

FIG. 3 is a fragmentary enlarged sectional view of the drain tube assembly of the cooling unit assembly of FIG. 2 illustrated as including a precooler in accordance with the present invention; and

FIG. 4 is a fragmentary sectional view of the one piece molded plastic spiral precooler core of the drain tube assembly of FIG. 3 in accordance with the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing, the invention is shown as incorporated in a water cooler of conventional design generally designated by reference numeral **10**, and which comprises a housing **11** having a top wall **12** in which there is a basin or sink **13**. A dispensing outlet or bubbler **14**, attached to the top wall **12** of the housing **11** at one side of the basin **13**, is supplied with chilled water through a pipe **15** leading from the cooling or refrigeration unit **16** illustrated in FIG. 2. Conventional means not shown are provided in a manner well-known in the art for the purpose of controlling the flow of chilled water in the pipe **15** and the dispensing of water from the bubbler **14**.

Turning now to a more specific description of the flow of water through the water cooler **10** to the bubbler **14**, water is normally brought from a suitable source of supply to the site of installation of the water cooler **10** by means such as a pipe leading from the city water main. The latter pipe is in turn connected by suitable means (not shown) to the lower end **17***a*, as viewed with reference to FIG. 2 of the drawing, of water pipe **17**. The main portion **17***b* of water pipe **17** is externally wound around drain tube **18** in good heat transfer relation with respect thereto while the upper end **17***c* of pipe **17** extends from the drain tube **18** to the chiller coil **19** of cooling unit assembly **16**. After being chilled to the desired temperature by chiller coil **19**, the water is conducted by means of water pipe **15** to the bubbler **14** from whence it is dispensed in response to actuation of conventional valve means (not shown).

In a manner well-known in the art, a suitable refrigerant is circuated through chiller coil **19** by means of a motor-compressor-condenser unit (not shown) suitably supported within the lower portion of housing **11** of water cooler **10**. The aforesaid motor-compressor-condenser unit has not been illustrated in the drawing inasmuch as the construction and operation of such units are well-known to those skilled in the art and inasmuch as it forms no part of the instant invention.

As the water which normally is at an incoming temperature approximating 80° F. flows through the main portion **17***c* of pipe **17**, a thermal transfer occurs in a manner to be more fully set forth hereinafter between the said incoming water and the chilled waste water passing through the drain tube **18** whereby the incoming water becomes precooled. The aforesaid chilled waste water represents the unconsumed portion of the water dispensed from the bubbler **14**. By virtue of the sloping bottom **13***a* with which the basin **13** is provided, the stream of water issuing from the bubbler **14** which is not consumed is inherently collected regardless of where it impinges on the said bottom **13***a* and then runs down the inside of drain tube **18** which is attached by suitable means (not shown) to the bottom **13***a* of basin **13**. From the bottom **18***a* of drain tube **18** as viewed with reference to FIG. 2 of the drawing the waste water passes to an external drainage system to which the water cooler **10** is connected by suitable means (not shown).

As illustrated in FIG. 3 of the drawing, a precooler core unit **20** is removably positioned within the drain tube **18**. In accordance with the illustrated preferred embodiment of the invention, the precooler core unit **20** is of one piece molded plastic construction and comprises an elongated hollow central portion **21** of circular cross-sectional configuration surrounded by a spiral fin **22** which directs chilled waste water from the basin **13** in a spiral path downwardly through the drain tube **18** and against the internal surface thereof. The frictional engagement between the outermost portions **22***a* of the spiral fin **22** and the internal surface of the drain tube **18** at a multiplicity of points along with the engagement of the lower end of the precooler core unit **20** with the curved bottom portion **18***a* of drain tube **18** serves to retain the precooler core unit **20** in place once the latter has been inserted into the drain tube **18**. The hollow central portion **21** is open at each end so that overflow water can be directed downwardly through the hollow. The top of the central portion **21** is preferably molded in the configuration of a hexagonal head nut **24** to permit unscrewing of the precooler core unit **20** out of the drain tube **18** if it becomes stuck therein. A spring wire **25** may also be inserted within the hollow central portion **21** in the manner illustrated in FIG. 4 of the drawing to permit pulling of the precooler core unit **20** outwardly of the drain tube **18**.

Referring further to FIG. 3 of the drawing, the unconsumed chilled water issuing from the bubbler **14** and collected by the basin **13** in the manner previously set forth hereinabove will upon entering the drain tube **18** be diverted outwardly, i.e., radially with respect to the hollow central portion **21** by virtue of its engagement with the hexagonal head nut **24** and the shoulder portion **21***a* formed therebetween at the top of the hollow central portion **21**. In actual practice very little if any waste water will under normal conditions enter the overflow hole **23** centrally located in the top surface of the hexagonal head nut **24**.

After being directed outwardly on to the spiral fin **22**, the waste water flows downwardly in a spiraling fashion, as indicated by the arrows **26** depicted in FIG. 3, in the spiral passageway formed by the spiral fin **22** between the hollow central portion **21** and the internal surface of the drain tube **18**. In doing so, the waste water is in direct contact with the inner wall of the drain tube **18** which provides for a good thermal transfer between the chilled waste water and the incoming water flowing through the water pipe **17** which surrounds the outer wall of the drain tube **18**. This good thermal transfer is further assisted by the fact that the incoming water flows counter to the direction of the flow of the chilled waste water, i.e., from bottom to top as viewed with reference to FIG. 2 of the drawing whereby the incoming water progressively encounters through the medium of heat exchange through the walls of water pipe **17** and drain tube **18** waste water which theoretically is at lower and lower temperatures.

Unlike prior art forms of precoolers, the above-described drain tube **18** and precooler core unit **20** construction permits an increase in the amount of waste water flowing through the above-referenced spiral passageway

when used with higher capacity water coolers. The only apparent limitation placed on the amount of waste water flow in the drain tube **18** is imposed by the physical dimensions of the aforesaid spiral passageway. That is, the waste water flow can theoretically be increased until such time as the spiral passageway is completely filled and the water begins backing up. The actual dimensions of the spiral passageway are dependent and of course determined with reference to the capacity of the particular water cooler with which the precooler core unit **20** is to be used.

On the other hand should the chilled waste water back up in the spiral passageway, this back up of water will continue until such time as the waste water begins to exit through the overflow hole **23** suitably provided for this purpose in the hollow central portion **21**. Inasmuch as the precooler core unit **20** has a hollow interior and an opening at either end, any waste water entering overflow hole **23** will pass through the said hollow interior of precooler core unit **20** and exit at the lower end thereof whereupon it enters the curved bottom **18***a* of drain tube **18** from whence it passes into the external drainage system to which the water cooler **10** is connected as previously described.

To clear a blockage in the spiral passageway or to remove the precooler core unit **20** for the purposes of periodic cleaning, etc., it is merely necessary to remove the drain (not shown) in the basin **13** which conventionally spans the open upper end of drain tube **13** and then remove the precooler core unit **20** from the interior of the drain tube **18**. As a convenient way of grasping and lifting the precooler core unit **20** from the drain tube **18**, there may be provided a spring wire **25** configured as illustrated in FIG. 4 of the drawing.

When in use, the upturned end portions **25***a* of legs **25***b* of spring wire **25** engage the interior under side of shoulder portion **21***a* as illustrated in dotted lines in FIG. 4, exerting a force thereagainst to facilitate the said removal of the precooler core unit **20**. When not in use, the spring wire **25** may be pushed into the hollow interior of precooler core unit **20** as shown in solid lines in FIG. 4 until the enlarged circular head portion **25***c* of the spring wire **25** abuts the top surface of the hexagonal head and nut **24** surrounding overflow hole **23**. It has been found that the spring wire **25** even when in this latter position will not seriously impede the flow of waste water through overflow hole **23**, should conditions such as a blockage in the spiral passageway, etc. necessitate such a flow. On the other hand if desired, the spring wire **25** may be removed from the precooler core unit **20** merely by pinching together the legs **25***b* thereof against their inherent outward spring bias whereupon they may be passed through overflow hole **23**.

In those instances wherein the precooler core unit **20** may become stuck in the drain tube **18**, after removal of the spring wire **25** in the manner set forth hereinabove, a suitable tool may be applied to the hexagonal head nut **24** to permit unscrewing of the precooler core unit **20** from the drain tube **18**. Under these conditions, the spiral fin **22** functions in essentially the same fashion as a screw thread.

Thus, in accordance with the present invention there has been provided a drain tube assembly having included therein a precooler core unit **20**. The latter is preferably manufactured from a relatively inexpensive plastic material which is corrosive resistant insofar as the water and foreign matter with which it may come in contact are concerned. Further the precooler core unit **20** is normally formed in a low cost molding operation as a one piece member comprising a hollow central portion **21** of circular cross-sectional configuration surrounded by a spiral fin **22** and having a hexagonal head nut **24** molded at the top of the hollow central portion. The said precooler core unit **20** is capable of functioning efficiently insofar as heat transfer is concerned even with water coolers of relatively high capacity. In addition and most importantly, the precooler core unit **20** is easily removable from within the drain tube **18**, and when so removed can easily be cleaned both with regard to its exterior and interior surfaces. Finally the provision of a hollow interior which communicates with openings at either end of the hollow central portion **21** permits the precooler core unit **20** to continue to function even when a blockage occurs in the spiral passageway, etc., albeit at a substantially lower efficiency.

While only one embodiment of my invention has been shown, it will be appreciated that many modifications thereof may readily be made by those skilled in the art. For example if so desired, the subject precooler core unit may be made from other suitable non-metallic materials and/or of two-part construction, i.e., wherein a hollow circular tube is inserted through the center of an extended spiral coil. I therefore intend by the appended claims to cover the above modifications as well as all other modifications which fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A drain tube assembly for use in fluid dispensing devices comprising:

(a) a drain tube having an internal surface, an external surface, and a substantially hollow interior;

(b) said drain tube further having a substantially circular cross-sectional configuration and a curved bottom portion;

(c) fluid conducting means supported in juxtaposed relation to said external surface of said drain tube in good heat transfer relation relative thereto;

(d) said fluid conducting means comprising an incoming water supply tube wound circumferentially around said external surface of said drain tube;

(e) a non-metallic precooler core unit supported in said substantially hollow interior of said drain tube for easy removal therefrom, said non-metallic precooler core unit having transverse dimensions corresponding to the transverse dimensions of said hollow interior of said drain tube;

(f) said non-metallic precooler core unit comprising an elongated central portion and spiral fin means surrounding said elongated central portion, said spiral fin means creating a closed wall fluid conducting spiral passageway between said elongated central portion and said internal surface of said drain tube;

(g) said non-metallic precooler core unit being supported within said hollow interior of said drain tube by means of frictional engagement between said spiral fin means and said internal surface of said drain tube, and engagement of a lower part of said core unit with said curved bottom portion of said drain tube; and

(h) said fluid conducting spiral passageway directing fluid flowing downwardly through said drain tube against said internal surface of said drain tube to enable a thermal transfer to occur between fluid flowing in said fluid conducting means and fluid flowing in said fluid conducting spiral passageway.

2. A drain tube assembly for use in fluid dispensing devices comprising:

(a) a drain tube having an internal surface, an external surface, and a substantially hollow interior;

(b) fluid conducting means supported in juxtaposed relation to said external surface of said drain tube in good heat transfer relation relative thereto;

(c) a one piece molded plastic precooler core unit supported in said substantially hollow interior of said drain tube for easy removal therefrom, said precooler core unit having transverse dimensions corresponding to the transverse dimensions of said hollow interior of said drain tube;

(d) said precooler core unit comprising an elongated central portion and spiral fin means surrounding said

elongated central portion, said spiral fin means creating a closed wall fluid conducting spiral passageway between said elongated central portion and said internal surface of said drain tube;

(e) said fluid conducting spiral passageway directing fluid flowing downwardly through said drain tube against said internal surface of said drain tube to enable a thermal transfer to occur between fluid flowing in said fluid conducting means and fluid flowing in said fluid conducting spiral passageway;

(f) said elongated central portion having molded at one end thereof a hexagonal head nut, said hexagonal head nut being engageable with a suitable tool to permit said precooler core unit to be unscrewed out of said substantially hollow interior of said drain tube;

(g) said hexagonal head nut being provided with an overflow hole; and

(h) said elongated central portion further having a hollow interior and an opening at the other end thereof, said hollow interior and said opening communicating with said overflow hole to provide overflow fluid bypass means through said substantially hollow interior of said drain tube.

3. A drain tube assembly for use in fluid dispensing devices as set forth in claim 1 wherein:

(a) said non-metallic precooler core unit is of one piece molded plastic construction; and

(b) said elongated central portion has molded at one end thereof a hexagonal head nut, said hexagonal head nut being engageable with a suitable tool to permit said non-metallic precooler core unit to be unscrewed out of said substantially hollow interior of said drain tube.

4. A drain tube assembly for use in fluid dispensing devices as set forth in claim 3 wherein:

(a) said hexagonal head nut is provided with an overflow hole; and

(b) said elongated central portion has a hollow interior and an opening at the other end thereof, said hollow interior and said opening communicating with said overflow hole to provide overflow fluid bypass means through said substantially hollow interior of said drain tube.

5. A drain tube assembly for use in fluid dispensing devices as set forth in claim 4 further comprising a grasping and lifting means removably supported within said overflow hole, said grasping and lifting means comprising a spring wire frictional retained in said overflow hole for movement between a precooler core unit removal assist position and a precooler core unit normal operating position.

6. A drain tube assembly for use in fluid dispensing devices as set forth in claim 2 wherein:

(a) said fluid conducting means comprises an incoming water supply tube wound circumferentially around said external surface of said drain tube; and

(b) the direction of flow of fluid in said fluid conducting means is counter to the direction of flow of fluid in said fluid conducting spiral passageway.

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