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WATER DISTRIBUTOR CHAMBER FOR HEAT EXCHANGERS AND PARTITIONS THEREFOR

Filed May 11, 1960

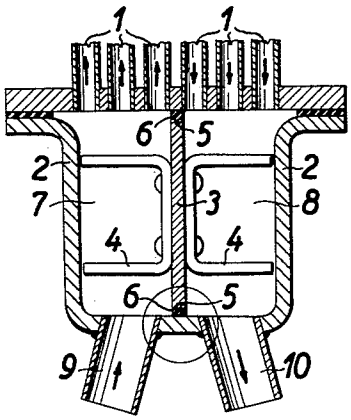


Fig. 1

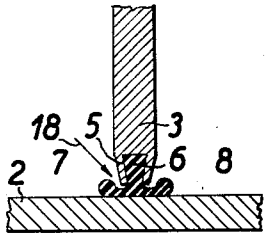


Fig. 2

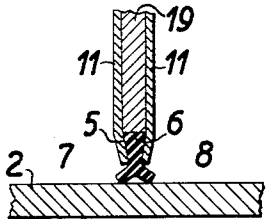


Fig. 3

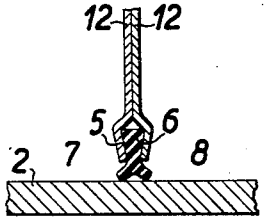


Fig. 4

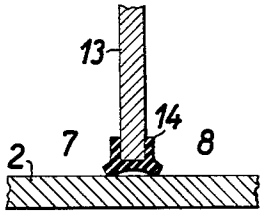


Fig. 5

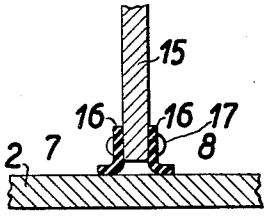


Fig. 6

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WATER DISTRIBUTOR CHAMBER FOR HEAT EXCHANGERS AND PARTITIONS THEREFOR

László Heller, László Forgó, and János Bódas, all of Budapest, Hungary, assignors to Licencia Találmányokat Értekesito Vallalat, Budapest, Hungary

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This invention relates to water distributor chambers and to partitions for the same.

Air condensation systems comprising heat exchangers and co-operating with steam turbines of power plants are already known. Air condensation means that steam withdrawing from the turbines of the power plant is condensed in a mixing condenser by means of cooling water which is warmed up thereby and then cooled down in surface heat exchangers whereafter the recooled water is supplied into the mixing condenser again. With up-to-date heavy duty stream turbines, the heat exchange surfaces of said air condensation systems are extensive and consist of a number of relatively small parts called cooler elements. Preferably, the cooler elements are superposed and erected outdoors. The cooling water to be recooled is supplied at the bottom of the heat exchangers where also the recooled water is withdrawn. Viz., the heat exchanger consists of a plurality of parallelly connected finned pipes a group of which is traversed by the cooling water supplied at the bottom of the heat exchanger and returned at the top of it. Thereafter the cooling water flows downwards through another group of said parallelly connected finned pipes. The bottom and the top of the heat exchanger are each provided with a water chamber serving for the parallel connection of the finned pipes of each group of such pipes. The cooling water flowing in one group of finned pipes upwards and in another group downwards, the bottom or lower water chamber has to be provided with a partition on one side of which the cooling water enters the heat exchanger and on the other side of which it is withdrawn therefrom.

For the sake of protection against corrosion, the water distributor chambers of heat exchangers used in connection with air condensation systems consist, as a rule, of aluminum. Preferably, the chambers are produced by means of pressing. However, the partition cannot be accommodated in the water distributor chamber simultaneously with pressing and has to be fixed therein by means of welding subsequently. Such manufacturing procedure is, on the one hand, substantially expensive due to the welding technology of aluminum and, on the other hand, it may cause warped surfaces in the water distributor chambers whereby a suitable packing is rendered difficult and cumbersome. Moreover, welding is disadvantageous also as regards protection against corrosion, since foreign matter may be introduced into the welding seam, by which corrosion is enhanced.

The main object of the present invention is to obviate the aforesaid inconveniences. According to the invention, a construction for the lower or bottom water distributor chamber is provided in which the partition forms an individual component and may be accommodated in the water distributor chamber loosely and subsequently. Furthermore, the partition may consist of a smooth plate of e.g. aluminum the position of which in the water distributor chamber is fixed by e.g. U-shaped spacers. Due to loose fitting between water distributor chamber and partition, there is a gap along the brim or periphery of the partition, which gap is closed by a suitably shaped packing band made of rubber and fixed to the partition. The shape of the cross-sectional area of the band is selected so that, with the pressures prevailing in the chambers separated by the partition being different, the packing band is pressed into the gap between water distributor chamber and partition by the action of the pressure difference. Thus, with increasing pressure difference, the packing action of the rubber band increases. The pressure difference may act from either direction.

Thus, the invention is concerned with water distributor chambers with at least one partition between a pair of flow passages, and consists in that the partition is loosely fitted in the water distributor chamber, a gap between water distributor chamber and partition being sealed by at least one self-packing rubber band.

The invention will be described hereinafter in greater details by taking reference to the accompanying drawings which show, by way of example, embodiments of the water distributor chamber according to the invention and several embodiments of its partition.

FIG. 1 shows a longitudinal sectional view of an embodiment of the water distributor chamber according to the invention.

FIGS. 2 to 6 show cross-sectional views of various embodiments of the partition.

In the drawing, reference character 2 designates a water distributor chamber according to the invention which is subdivided into a pair of chambers 7 and 8 by means of a partition 3. The chamber 7 is arranged between an inlet stub 9 and a first group of pipes 1, whereas a second group of pipes 1 opens into the chamber 8 which, in turn, is connected with an outlet stub 10. The partition 3 serves to separate both chambers 7 and 8 from each other in such a manner that the introduced cooling water flows first on one side of the partition 3 and through the pipes 1 of only one of the pipe groups and then through the pipes 1 of the other group of pipes whereafter the recooled water is withdrawn from the water distributor chamber 2 on the other side of the partition 3 as indicated by arrows in FIG. 1.

The partition 3 being loosely arranged in the water distributor chamber 2 as required by the invention, gaps are formed along its brims or periphery through which both chambers 7 and 8 communicate with each other. In order to prevent such communication a rubber band 5 is provided between water distributor chamber 2 and partition 3, the rubber band 5 being arranged in a peripheral groove 6 of partition 3. The shape and size of the cross-sectional area of the rubber band 5 is selected so that by overpressure prevailing either in chamber 7 or in chamber 8 the rubber band 5 is pressed into the gap between water distributor chamber 2 and partition 3 by an increased pressure. Thus, the greater the overpressure the greater the sealing action of the rubber band 5.

The rubber band 5 can be fixed to the partition 3 in various manners.

FIG. 2 shows the respective portions of the embodiment according to FIG. 1 on a larger scale. Reference character 18 indicates the direction of the overpressure which, in the instant case, is supposed to prevail in chamber 7. As shown in the drawing, the rubber band 5 accommodated in a peripheral groove 6 of the plate-like body of the partition 3 has a Y-shaped cross-sectional area. One branch of the Y is located in the peripheral groove 6 whereas both other branches lie against the inner wall surface of the water distributor chamber 2 and provide for the required sealing action. The thickened end portions of these branches serve for preventing the rubber band 5 sliding out from the groove 6 under the action of an overpressure.

The embodiment shown in FIG. 3 differs from the previous one insofar as the plate-like body of the partition consists of three plates fixed to one another. A medial

plate 19 is sandwiched between a pair of outer plates 11 in such a manner that between both outer plates 11 a peripheral groove 6 is formed. The rubber band 5 is accommodated in this groove in the aforesaid manner.

FIG. 4 shows an embodiment wherein the plate-like body of the partition consists of two plates 12 fixed to each other, their end portions facing the inner wall surface of the water distributor chamber 2 being spaced from each other so as to form a groove 6. The rubber band 5 is accommodated in this groove 6 likewise in the above described manner.

With the embodiment shown in FIG. 5, the partition is formed by an integral plate-like body 13 the edge of which is interengaged by a pair of branches of a rubber band 14 having an X-shaped cross-sectional area. Both other branches of the rubber band 14 serve for the sealing action in the above described manner.

The embodiment shown in FIG. 6 is different from the previous one in that the partition 15 which, otherwise, is formed by an integral plate-like body is provided with a pair of rubber bands 16 and 17 of L-shaped cross-sectional area and riveted to the partition 15. The extremities of the rubber bands 16 and 17 facing the inner wall surface of the water distributor chamber 2 become bent when occupying their operational position whereby a suitable sealing action is obtained.

In order to fix the partition 3 in its operational position a pair of U-shaped spacers 4 are provided which prevent the partition 3 from occupying an oblique position in the water distributor chamber 2. In the instant case, the U-shaped spacers 4 are riveted to the partition 3. Obviously, such spacers prevent a transverse displacement of the partition 3 as regards FIG. 1 and the other figures and exclude an oblique position thereof.

In manufacture, pressing having taken place, the bottom of the bell-shaped portion of the water distributor chamber is provided with bored passages for receiving the pipe stubs 9 and 10 which are then welded to said bores.

A partition according to any of FIGS. 2 to 6 is provided with suitable spacers 4 and a rubber band as has been described above. Thereafter, the partition is, together with its spacers, positioned in the cavity or trough of the bell-shaped portion of the water distributor chamber 2, e.g. in the manner illustrated in FIG. 1. Then, the branches of the rubber band 5 become crushed and lie against the inner wall surface of the water distributor chamber 2 as shown in FIG. 2 so as to provide a suitable sealing action.

Finally, a lid closing the bell-shaped portion of the water distributor chamber 2 is put on, a packing ring being interposed, and the lid being fixed by means of not represented screws. Thereby, also portions of the rubber band 5 adjacent to the inner wall surface of the lid become crushed and provide the required sealing action. Furthermore, the lid is provided with a plurality of bores for receiving the pipes 1.

Obviously, the water distributor chamber according to the invention has a number of advantages with respect to known constructions of like nature. To begin with, fixing by means of welding can be totally dispensed with as has been said above. Moreover, the water distributor chambers according to the invention are of much simpler construction and of lesser production costs than water distributor chambers with welded partitions. A further advantage consists in that the partitions do not have to exactly fit the bell-shaped portion of such chambers. The gap along the peripheries of the partition may be larger than in case of e.g. welded water distributor chambers. As there is no welding, there are no heat-warped surfaces so that exact packings are easier to realize. The danger of corrosion is lesser than with welded water distributor chambers, as has likewise been mentioned. Using partitions according to the invention it is possible to produce water distributor chambers and header boxes in a uniform manner since the partitions necessary for water distributor chambers form separate components and can be accommodated in their operational positions subsequently.

Having thus described the invention, what is claimed and sought to be protected by Letters Patent is:

1. A fluid distribution chamber for heat exchangers comprising, in combination, means defining a substantially bell-shaped smooth-surfaced cavity having a bottom end wall and a side wall, and an open upper end; said end wall having inlet and outlet openings, inlet and outlet nipples respectively secured to said inlet and said outlet openings, a cover sealing said open end and formed with two groups of apertures, said cover having a substantially smooth inner surface portion; fluid outlet conduits secured in one group of apertures opposing said inlet nipple; fluid return conduits secured in the other groups of apertures opposing said outlet nipple; a substantially planar partition fitting loosely within said cavity, and extending vertically between said end wall and said cover, the upper and lower edges of said partition respectively adjacent said cover and said bottom wall, the side edges of said partition respectively adjacent said side wall of said cavity, said partition positioned to divide said cavity into inlet and outlet chambers with said inlet nipple opening and the outlet apertures on one side of said partition and said outlet nipple opening and the inlet apertures on the other side of said partition, sealing gasket means of resilient non-metallic material extending around the peripheral edges of said partition in fluid-tight engagement therewith, said gasket means having legs diverging in opposed directions relative to the plane of said partition and in resilient fluid-tight engagement with substantially smooth surface portions of said end wall, said cover, and said side wall; and spacers extending between opposite surfaces of said partition and said side wall; said legs being forced into fluid-tight engagement with said end wall, cover, and side wall substantially smooth surface portions by pressure differentials between said chambers.

2. A fluid distribution chamber for heat exchangers comprising, in combination, means defining a substantially bell-shaped smooth-surfaced cavity having a bottom end wall and a side wall, and an open upper end; said end wall having inlet and outlet openings, inlet and outlet nipples respectively secured to said inlet and said outlet openings, a cover sealing said open end and formed with two groups of apertures, said cover having a substantially smooth inner surface portion; fluid outlet conduits secured in one group of apertures opposing said inlet nipple; fluid return conduits secured in the other groups of apertures opposing said outlet nipple; a substantially planar partition fitting loosely within said cavity, and extending vertically between said end wall and said cover, the upper and lower edges of said partition respectively adjacent said cover and said bottom wall, the side edges of said partition respectively adjacent said side wall of said cavity, said partition positioned to divide said cavity into inlet and outlet chambers with said inlet nipple opening and the outlet apertures on one side of said partition and said outlet nipple opening and the inlet apertures on the other side of said partition, sealing gasket means of resilient non-metallic material extending around the peripheral edges of said partition in fluid-tight engagement therewith, said gasket means having legs diverging in opposed directions relative to the plane of said partition and in resilient fluid-tight engagement with substantially smooth surface portions of said end wall, said cover, and said side wall; and spacers extending between opposite surfaces of said partition and said side wall; said legs being forced into fluid-tight engagement with said end wall, cover, and side wall substantially smooth surface portions by pressure differentials between said chambers; said partition comprising a plate-like body formed by a middle plate sandwiched between a pair of outer plates, the edges of said outer plates protruding above

the edge of said inner plate so as to form a peripheral groove therewith for the reception of said gasket.

3. A fluid distribution chamber for heat exchangers comprising, in combination, means defining a substantially bell-shaped smooth-surfaced cavity having a bottom end wall and a side wall, and an open upper end; said end wall having inlet and outlet openings, inlet and outlet nipples respectively secured to said inlet and said outlet openings, a cover sealing said open end and formed with two groups of apertures, said cover having a substantially smooth inner surface portion; fluid outlet conduits secured in one group of apertures opposing said inlet nipple; fluid return conduits secured in the other groups of apertures opposing said outlet nipple; a substantially planar partition fitting loosely within said cavity, and extending vertically between said end wall and said cover, the upper and lower edges of said partition respectively adjacent said cover and said bottom wall, the side edges of said partition respectively adjacent said side wall of said cavity, said partition positioned to divide said cavity into inlet and outlet chambers with said inlet nipple opening and the outlet apertures on one side of said partition and said outlet nipple opening and the inlet apertures on the other side of said partition, sealing gasket means of resilient non-metallic material extending around the peripheral edges of said partition in fluid-tight engagement therewith, said gasket means having legs diverging in opposed directions relative to the plane of said partition and in resilient fluid-tight engagement with substantially smooth surface portions of said end wall, said cover, and said side wall; and spacers extending between opposite surfaces of said partition and said side wall; said legs being forced into fluid-tight engagement with said

end wall, cover, and side wall substantially smooth surface portions by pressure differentials between said chambers; said partition comprising a plate-like body formed by a pair of plates fixed to each other, surface portions of said plates adjacent their edges being spaced to form a peripheral groove for the reception of said gasket therein.

4. A fluid distribution chamber for heat exchangers, as claimed in claim 1, in which said partition is a plate-like body having a peripheral groove and said gasket means comprises a rubber band of Y-shaped cross-sectional area, said rubber band having one branch of its Y-shaped cross-sectional area engaged in said peripheral groove.

5. A fluid distribution chamber for heat exchangers, as claimed in claim 1, in which said gasket means comprises a rubber band of X-shaped cross-sectional area, said partition comprising a plate-like body having its peripheral edges sandwiched between a pair of branches of the cross-sectional area of said rubber band.

6. A fluid distribution chamber for heat exchangers, as claimed in claim 1, in which said partition is a plate-like body, and said gasket means comprises a pair of rubber bands of L-shaped cross-sectional area, each of said rubber bands being fixed to said plate-like body by means of one of its branches and having its other branch constituting one of said diverging legs.

References Cited in the file of this patent

UNITED STATES PATENTS

1,803,034	Potter	Apr. 28, 1931
2,469,758	Alcock	May 10, 1949
2,900,173	Pickford	Aug. 18, 1959
2,984,529	Dailey	May 16, 1961