April 22, 1947. I. T. HOLIHAN 2,419,234

COOLING UNIT

Filed March 11, 1944

Fig. 1.

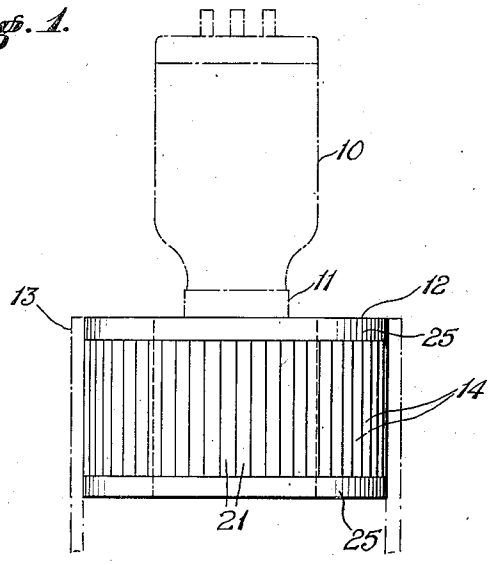


Fig. 2.

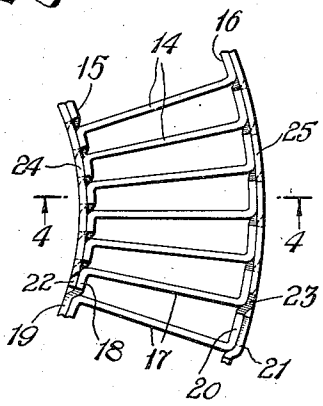


Fig. 3.

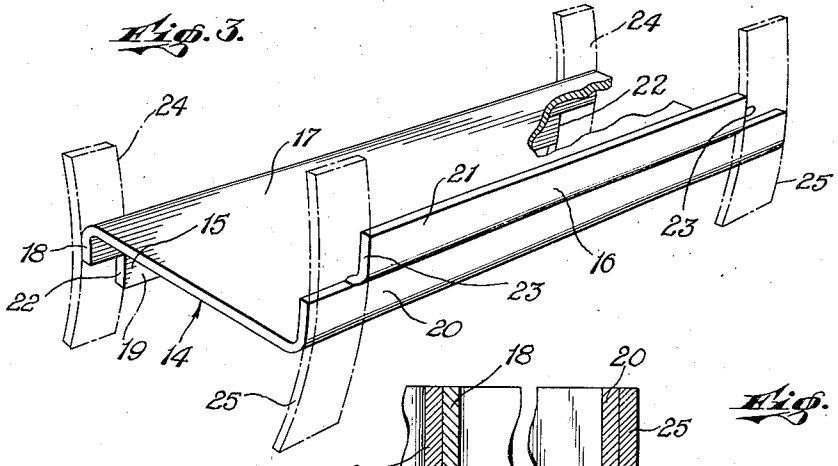
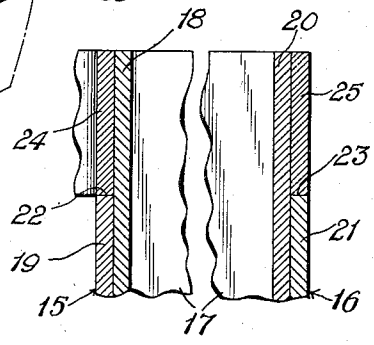


Fig. 4.



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Patented Apr. 22, 1947 2,419,234

UNITED STATES PATENT OFFICE

2,419,234

COOLING UNIT

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Application March 11, 1944, Serial No. 526,112

7 Claims. (Cl. 257—263)

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This invention relates to cooling units or heat exchange devices. More particularly, the invention relates to units or devices of this kind constructed from a plurality of similar blades or vanes having interengaging flange portions to form an assembled unit, and still more particularly, to the use of inner and outer rings at edge portions of the blades for supporting and retaining the blades in the unit relationship. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a side view of a unit made according to my invention and indicating in dot and dash lines an adaptation and use thereof.

Fig. 2 is an end view of a part of the unit shown in Fig. 1 on an enlarged scale.

Fig. 3 is an enlarged perspective view of one of the blades or vanes which I employ in constructing the complete unit, indicating in dot and dash lines the arrangement of the retaining or coupling rings thereon; and

Fig. 4 is an enlarged and broken sectional view substantially on the line 4—4 of Fig. 2, showing portions of inner and outer rings at one end of the unit.

My invention deals with the formation of cooling or heat exchange units of various kinds and classes, and to illustrate one adaptation and use, I have diagrammatically outlined in Fig. 1 of the drawing at 10 an electric discharge device, such for example as a radio tube, including an anode portion 11 upon which one of my improved cooling units 12 is arranged. At 13 is also indicated in dot and dash lines electric contact means engaging the outer peripheral surface of the unit 12.

In constructing units of the class under consideration for use on the anodes of electric discharge devices of the kind under consideration, it is desirable to produce a more or less continuous contact surface on the inner surface of the tubular body which forms the complete unit. One advantage of such contact is to minimize air spaces or gaps, and further to provide the greatest possible heat flow outwardly through the blades of the unit for effective and efficient cooling in the circulation of air through the passages formed between the blades of the unit.

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In constructing the unit 12, a plurality of similar blades 14 are employed, and these blades are assembled through the medium of inner and outer interlocking flanges 15 and 16 to form a tubular body having inner and outer tubular walls of two ply or double wall thickness. The body portions 17 of the blades 14 join the flange portions 15 and 16, and form the radial webs which join the inner and outer tubular wall portions, as will clearly appear from a consideration of Fig. 2 of the drawing.

The flange 15 extends to one side surface of the body 17, and has an inner flange portion 18 and an offset flange portion 19 offset outwardly with respect to the body 17 but inwardly with respect to the resulting unit, as will appear from a consideration of Fig. 2 of the drawing. The flange 16 extends to the other side surface of the body 17, and has an inner flange portion 20 and an outwardly offset flange portion 21. The flanges 20 and 21 are both of greater width than the flanges 18 and 19 which compensates for the different diameters of the tubular portions of the resulting unit. These flanges are also curved to produce the desired difference in diameters of the inner and outer walls of the unit.

The structure of the unit thus described is illustrative of one adaptation and use of my invention, and is shown and described in the application of Donald L. Spender, Serial Number 524,831, filed March 1, 1944.

The distinctive feature of my invention resides in shaping blades of the general type and kind described above to provide means for attaching coupling rings, sleeves or cylinders therewith for supporting and holding the blade assemblage in unit form, and to dispense with the necessity of using other fastening or coupling means. This result is accomplished by cutting out end portions of the flanges 19 and 21 to form notches therein as at 22 and 23 respectively. These notches will provide on inner and outer surfaces and both ends of the blade assemblage, annular recesses for the reception of inner and outer rings, sleeves or bands 24 and 25 respectively. These rings, sleeves or bands 24 and 25 will be made to given diameters, and will be circumferentially solid so that the same can be forceably driven or pressed onto an assemblage of blades

14. By using the proper number of blades and with the reasonable amount of clearances provided between the interfitting offset flange portions, the blades will be forced into firm position with respect to each other and within and between the pairs of rings 24—25.

It will be understood that by increasing or decreasing the number of blades or vanes employed, within predetermined limits, pairs of rings 24 and 25 of different diameters may be employed. On the other hand, where insertion or removal of a single blade of the one standard construction would not suffice to produce the desired assemblage between the selected diameter rings or bands, one special blade or vane having slightly narrower or slightly larger flanges can be inserted. The rings or bands 24 and 25 in addition to supporting the blades or vanes in the assemblage forming the unit, also operate to maintain the inner and outer diameters of the unit and produce at the ends of the unit circumferential continuous inner and outer surfaces.

In addition to employing a drive or snug fit of the rings or bands 24 and 25 upon the blades or vanes, other means such as welding, brazing, soldering or the like may be employed to secure the blades together and the rings or bands to the blades.

In the construction shown, and as will be apparent from a consideration of Fig. 4 of the drawing, the rings or bands 24 and 25 are of the same thickness as the flanges 19 and 21 respectively, so as to maintain flush inner and outer surfaces on the tubular wall portions, and further the width of the rings or bands 24 and 25 correspond to the depth of the notches 22 and 23 so that outer edges of the rings or bands 24 will be flush with corresponding edges of the flanges 18 and 21.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A cooling unit for electric discharge devices of the class described, said unit comprising a plurality of similar blades, each blade having an offset flange at side portions thereof, the flange of common sides of the blades overlapping and interfitting one with the other to form inner and outer tubular wall portions on said unit, the blades having body portions extending radially between and spacing said inner and outer wall portions, said blades forming spaced circulating passages extending longitudinally through said unit, the offset portions of the flanges at both sides of each blade having recesses at the ends of each blade, forming on the resulting inner and outer tubular wall portions circumferential recesses, and rings mounted in said recesses in supporting the blades in assembled relationship.

2. A cooling unit for electric discharge devices of the class described, said unit comprising a plurality of similar blades, each blade having an offset flange at side portions thereof, the flange of common sides of the blades overlapping and interfitting one with the other to form inner and outer tubular wall portions on said unit, the blades having body portions extending radially between and spacing said inner and outer wall portions, said blades forming spaced circulating passages extending longitudinally through said unit, the offset portions of the flanges at both sides of each blade having recesses at the ends of each blade, forming on the resulting inner and outer tubular wall portions circumferential recesses, rings mounted in said recesses in supporting the blades in assembled relationship, and said rings being of a thickness corresponding to the thickness of the outer flange portions to lie flushly with exposed surfaces of the outer flange portions.

3. A cooling unit for electric discharge devices of the class described, said unit comprising a plurality of similar blades, each blade having an offset flange at side portions thereof, the flange of common sides of the blades overlapping and interfitting one with the other to form inner and outer tubular wall portions on said unit, the blades having body portions extending radially between and spacing said inner and outer wall portions, said blades forming spaced circulating passages extending longitudinally through said unit, the offset portions of the flanges at both sides of each blade having recesses at the ends of each blade, forming on the resulting inner and outer tubular wall portions circumferential recesses, rings mounted in said recesses in supporting the blades in assembled relationship, and said rings being of a width corresponding to the width of the circumferential recesses on said inner and outer wall portions.

4. A blade for producing devices of the class described by the use of a plurality of such blades held in assemblage by retaining rings, said blade comprising an elongated body portion, one side edge of the body portion having a flange extending in the direction of one surface thereof, the other side edge of the body portion having a flange extending in the direction of the opposite surface of said body, said flanges extending the full length of the body, and each of said flanges having outwardly offset portions shorter than said flanges forming recesses at the ends of said body for the reception of said retaining rings.

5. In devices of the character described, means forming a plurality of partitioned circulating passages extending longitudinally of the device, said means comprising a plurality of similar blades, the body portions of the blades forming the partitioning means of the resulting device, said blades having means at opposed edges thereof for forming other boundary walls of said passages, one of said last named walls being formed by interfitting and overlapping flange portions on said blades, the interfitting flange portions of said wall having recesses at the ends thereof forming on said wall circumferential end recesses, rings mounted in said circumferential recesses for retaining the blades against displacement from each other, said interfitting flanges forming a smooth outer surface on said wall, and said rings having outer surfaces flush with the outer surface of said wall.

6. A tubular unit of the class described, comprising a plurality of similar blades arranged side by side in spaced relationship to each other, said blades being arranged radially wtih respect to the axis of said unit, means spacing inner ends of said blades, the outer ends of the blades being spaced by interfitting and overlapping offset flanges, said flanges forming an outer tubular wall for said unit, said wall at the ends of the unit having circumferential recesses formed by recessed portions in parts of said interfitting flanges, and ring members mounted in said annular recesses and snugly engaging said blades in supporting the blades in said unit assemblage.

7. A tubular unit of the class described, comprising a plurality of similar blades arranged side by side in spaced relationship to each other,

said blades being arranged radially with respect to the axis of said unit, means spacing inner ends of said blades, the outer ends of the blades being spaced by interfitting and overlapping offset flanges, said flanges forming an outer tubular wall for said unit, said wall at the ends of the unit having circumferential recesses formed by recessed portions in parts of said interfitting flanges, the ring members mounted in said annular recesses and snugly engaging said blades in supporting the blades in said assemblage, said means forming an inner circumferential wall for said unit, said last named wall having circumferential grooves at the ends of said unit, and rings mounted in said grooves.

IRVING T. HOLIHAN.

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