March 1, 1960 O. SCHARLI 2,927,250

COOLING ARRANGEMENT FOR SEMI-CONDUCTOR RECTIFIERS

Filed Sept. 16, 1957

Fig. 1.

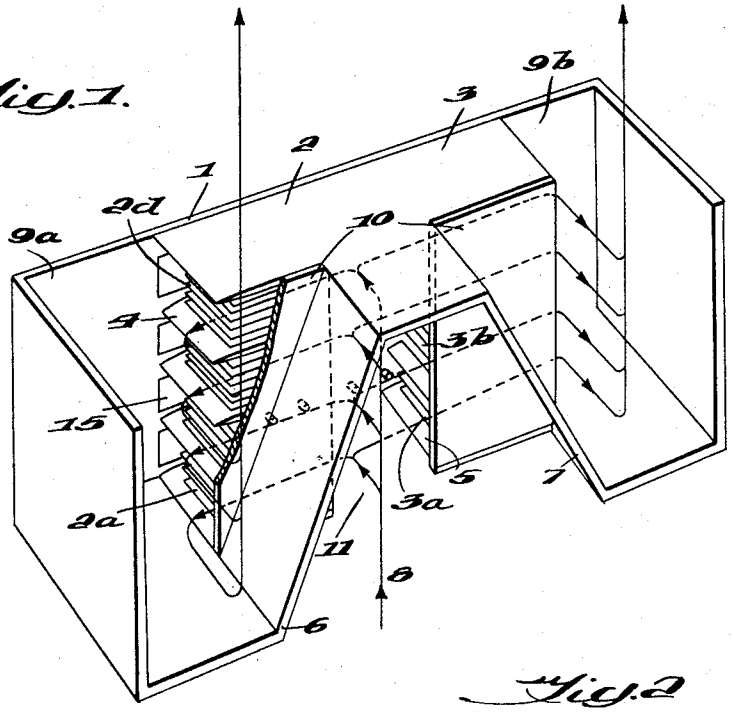
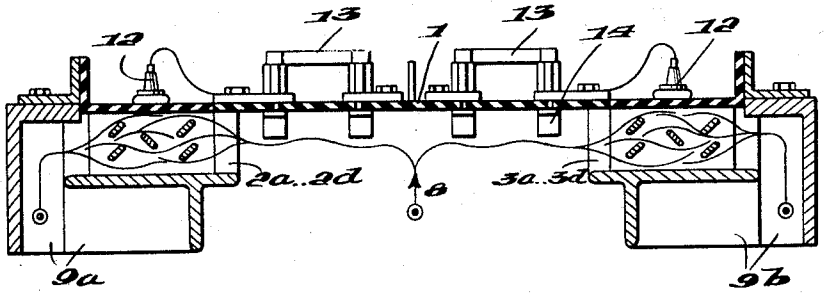


Fig. 2



INVENTOR

Otto Scharli

BY Pierce, Scheffler & Parker

ATTORNEYS

United States Patent Office 2,927,250 Patented Mar. 1, 1960

2,927,250

COOLING ARRANGEMENT FOR SEMI-CONDUCTOR RECTIFIERS

Otto Scharli, Baden, Switzerland, assignor to Aktiengesellschaft Brown, Boveri and Cie, Baden, Switzerland, a joint-stock company

Application September 16, 1957, Serial No. 684,356

Claims priority, application Switzerland September 22, 1956

2 Claims. (Cl. 317—100)

This invention relates to an arrangement for the air cooling of rectifiers of the semi-conductor type.

With semi-conductor type rectifiers, e.g. germanium or silicon rectifier cells which permit of a very high specific current load, intensive air cooling is required. According to the present invention, rib air coolers are employed, such coolers have a most favorable heat transfer characteristic, and all coolers are arranged to receive the coolant air at its entrance temperature. That is to say, the coolers all receive the coolant air at the temperature at which it enters the rectifier device.

More particularly, the present invention arranges the coolers consisting of parallel ribs in two groups that stand parallel opposite each other, the coolant air enters at an admission point between the two groups of coolers and divides in half, each half of the air supply going through its corresponding group of coolers and then being exhausted through an outlet which is separated from the inlet by inclined walls. These inclined walls converge in the upward direction to establish therebetween an air entrance passageway of progressively decreasing cross-sectional area. These same inclined walls at the other sides thereof establish in conjunction with other walls air outlet passageways of progressively increasing cross-sectional area whereby the cooling effect of the flow of coolant air through all of the air coolers of each group is rendered more uniform.

One practical embodiment of the invention is illustrated in the accompanying drawings wherein Fig. 1 is a view of the improved cooling arrangement in perspective, and Fig. 2 is a longitudinal horizontal section.

With reference now to the drawings, it will be seen that the cooling arrangement comprises a housing structure having a back vertical wall in the form of a plate 1, the front or inner surface of this plate having mounted thereon the coolers, 2*a*—2*d* and 3*a*—3*d* arranged in two vertically extending, parallel spaced groups 2 and 3. The cooling ribs of these coolers extend parallel and opposite one another and are separated by horizontal air conducting walls 4 and 5. The back wall 1 forms a part of the channels for the admission and discharge of the cooling air. A wall 10 extending parallel with the back wall 1 and spaced inwardly therefrom and having a centrally located opening 11 therein presented to the air inlet 8 makes it possible for the air entering inlet 8 and the opening 11 to divide in the manner indicated by the arrows in Fig. 1, one half of the air flowing through the coolers of group 2 between walls 1 and 10 and the other half of the air flowing through the coolers of group 3 between walls 1 and 10. Located normal to and standing in front of the interior wall 10 and symmetrically placed with respect to the central opening 11 are a pair of inclined walls 6 and 7. The inner sides of these inclined walls form in part the air entrance passageway or inlet 8 and they are convergent in the upward direction thereby to present a progressive decrease in the cross-sectional area of the air inlet passageway 8. The outer sides of the inclined walls 6, 7 in conjunction with the back wall 1 and vertical side walls 17 establish an exit or discharge passageways 9*a*, 9*b* each of progressively increasing cross-sectional area in the direction of air flow. After leaving the coolers in group 2 the air is discharged upwardly through the passageway 9*a* formed by the walls, and similarly the air after leaving the coolers in group 3 is discharged upwardly through the passageway 9*b*.

The back wall 1 which preferably is made of insulating material serves for the attachment of the coolers with the semiconductor cells 12 placed thereon. At the location of the cooler units 2*a*, 3*a*, etc., the back wall 1 includes apertures 15 through which these units are passed and to which they are fastened.

In the space on the rear face of the back wall 1 between the two adjacent groups of coolers, safety units 13 are provided. These safety units are fastened to the outer face of back wall 1 by bolts 14, the bolts being located on the inner face of wall 1 between the two groups of cooler units and in the path of the cooling air and thus also being cooled. In this way, the safety units receive always the same temperature, this being advantageous for uniform performance and response of the safety units.

In conclusion, it is to be understood that the one practical embodiment of the invention which has been illustrated may be departed from in minor detail without, however, departing from the spirit and scope of the inventive concept as defined in the appended claims.

I claim:

1. In a semi-conductor rectifier arrangement, the combination comprising a housing structure having a vertical back wall, a vertical interior wall parallel with and spaced from said back wall, said interior wall having a central opening therein, rectifier units mounted on said back wall and disposed in the space between said back and interior walls, said rectifier units being arranged in two groups on each side respectively of said opening in said interior wall and the rectifier units of each group being arranged in superposed relation, a ribbed cooler unit associated with each rectifier unit and establishing with said rear and interior walls two corresponding groups of horizontal divided superposed passageways for air flow therethrough, said housing including also a pair of inclined walls located normal to and standing in front of said interior wall and symmetrically placed with respect to said central opening in said interior wall, the inner sides of said inclined walls forming in part an entrance passageway for air and being convergent in the upward direction thereby to present a progressive decrease in the cross sectional area of said entrance passageway, and a pair of parallel upstanding side walls extending forwardly from said back wall, each said side wall and said back wall and the outer side of one of said inclined walls forming in part an exit passageway of progressively increasing cross sectional area for air after passing through one of said groups of cooler units.

2. A semi-conductor rectifier unit arrangement as defined in claim 1 and which further includes safety units, said safety units being secured in place on the outer face of said back wall intermediate said two groups of cooler units by bolts similarly located on the inner face of said back wall and hence in the air stream and which are thus cooled by said air stream prior to passing through said two groups of cooler units.

References Cited in the file of this patent

UNITED STATES PATENTS

1,537,228	Gargan	May 12, 1925
2,189,909	Korber	Feb. 13, 1940
2,824,939	Claybourn	Feb. 25, 1958