March 27, 1956 A. H. B. WALKER ET AL 2,740,075

METAL RECTIFIER ASSEMBLIES

Filed June 16, 1954 3 Sheets-Sheet 1

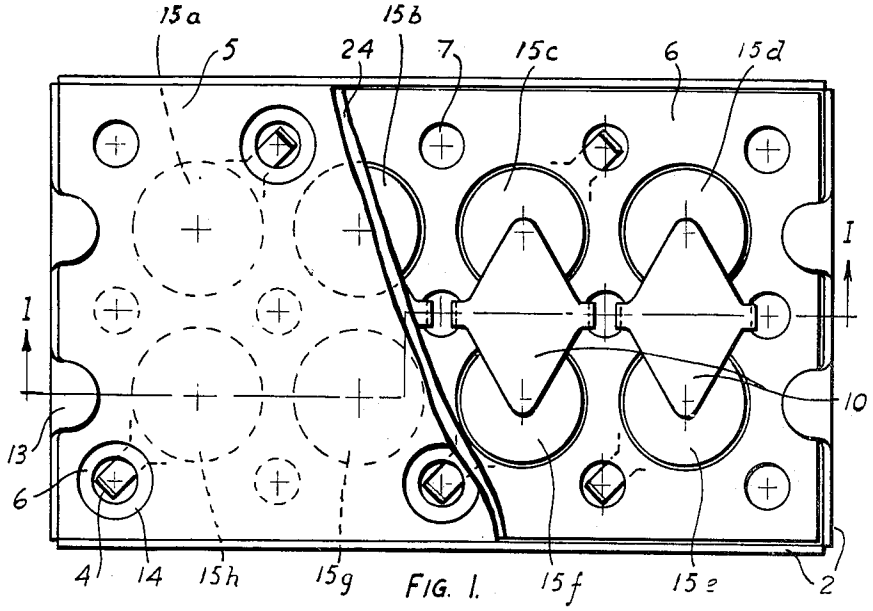


FIG. 1.

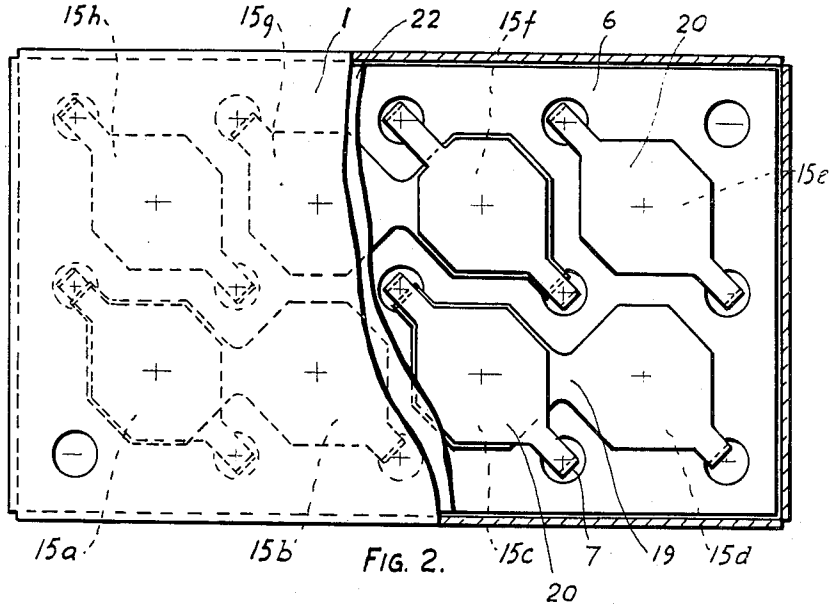


FIG. 2.

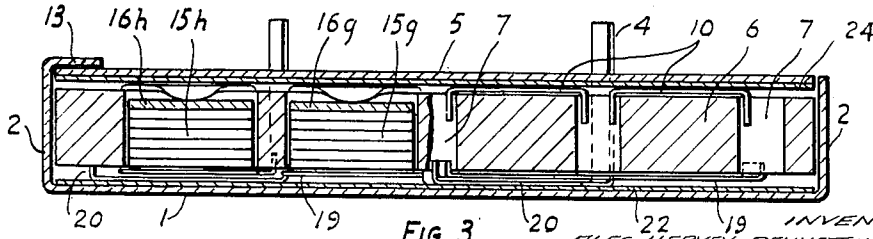


FIG. 3.

INVENTORS
ALEC HERVEY BENNETT WALKER,
LESLIE JOSEPH LOCKETT,

BY Robert B Larson
ATTORNEY

March 27, 1956 A. H. B. WALKER ET AL 2,740,075

METAL RECTIFIER ASSEMBLIES

Filed June 16, 1954 3 Sheets-Sheet 2

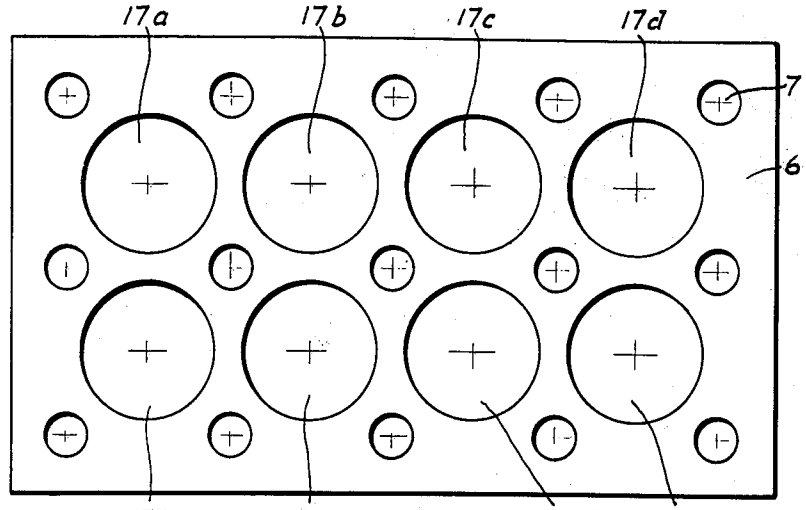


FIG. 4.

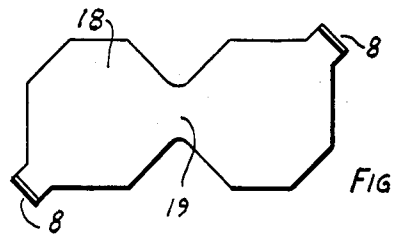


FIG. 5a.

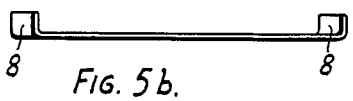


FIG. 5b.

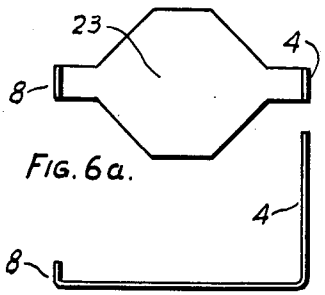


FIG. 6a.

FIG. 6b.

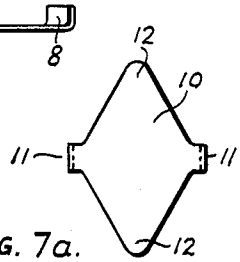


FIG. 7a.



FIG. 7b.

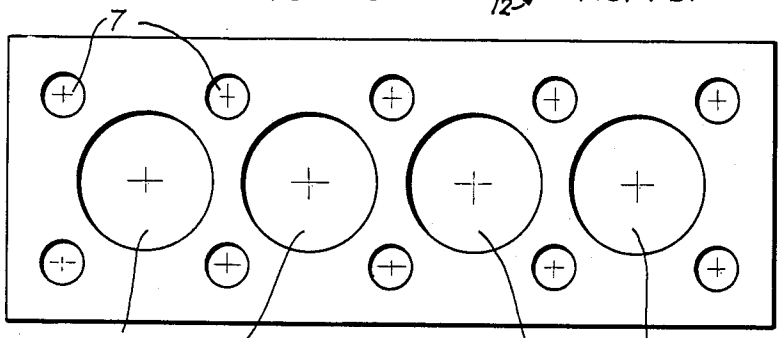


FIG. 8.

INVENTORS
ALEC HERVEY BENNETT WALKER,
LESLIE JOSEPH LOCKETT,

BY Robert B Pearson

ATTORNEY

March 27, 1956 A. H. B. WALKER ET AL 2,740,075

METAL RECTIFIER ASSEMBLIES

Filed June 16, 1954 3 Sheets-Sheet 3

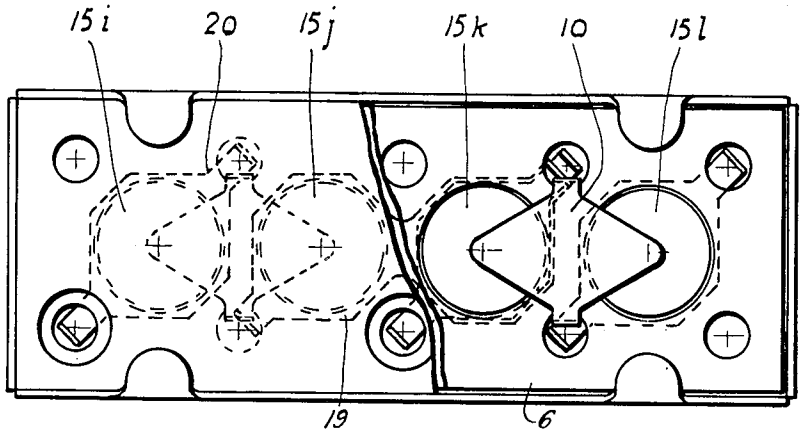


FIG. 9.

INVENTORS
ALEC HERVEY BENNETT WALKER,
LESLIE JOSEPH LOCKETT,

BY Robert B Pearson

ATTORNEY

United States Patent Office

2,740,075

Patented Mar. 27, 1956

2,740,075

METAL RECTIFIER ASSEMBLIES

Alec H. B. Walker and Leslie J. Lockett, King's Cross, London, England, assignors to Westinghouse Brake & Signal Company Limited, London, England

Application June 16, 1954, Serial No. 437,130

Claims priority, application Great Britain June 30, 1953

3 Claims. (Cl. 317—234)

This invention relates to metal rectifier assemblies of the kind in which stacks of rectifier elements are housed in holes formed in a block of insulating material, the whole being provided with a metal casing and the arrangement being such that the stacks are in good thermal contact with the metal casing, through which the heat generated during the operation of the rectifier assembly may be dissipated. It is to be understood that the term "good thermal contact" as used herein implies good heat transferable relationship and is not limited to actual metal to metal contact.

It is an object of the invention to provide a rectifier assembly of the above kind in which the majority of the component parts are of standard designs regardless of the desired internal circuit connections required in the complete assembly, thereby simplifying the actual process of assembly and keeping down the cost of the tools required to produce those parts.

According to the invention, a metal rectifier assembly of the kind described comprises a metal casing having a base and a closure plate; a block of insulating material in said casing and having extending therethrough a first series of parallel rows of equally spaced holes and a second series of rows of equally spaced holes parallel therewith, the holes being symmetrically arranged with the rows of the second series interposed between the rows of said first series and between the rows of said first series and the edges of said block; a stack of rectifier elements in each of the holes of said first series; springs holding at least one end of each of said stacks in good thermal contact with said casing; connecting links making electrical contact between pairs of adjacent stacks and having symmetrically disposed projections engaging with holes of said second series for correctly positioning said connecting links; a first thin sheet of insulating material between said block and the base of said casing and a second thin sheet of insulating material between said block and said closure plate, said sheets electrically insulating said connecting links and said stacks from said casing; and connector tags making electrical contact with selected ones of said stacks and projecting out of said casing and insulated therefrom and each having at least one projection engaging with holes of said second series; the assembly being such that the closure of the casing compresses said springs, thereby providing good electrical contact between said stacks, said connector links and said connector tags and good thermal contact between said stacks and said spring and said casing.

The invention is illustrated by way of example in the drawings accompanying the specification of which:

Figure 1 is a plan view of an eight stack rectifier assembly embodying the invention, part of the closure plate being shown broken away to disclose certain of the component parts;

Figure 2 is an inverse plan view of the assembly of Figure 1 part of the base of the casing being shown broken away to disclose other component parts;

Figure 3 is a cross section of the assembly taken along the section line I—I in Figure 1;

Figure 4 is a plan view of the body in which the stacks are housed;

Figure 5*a* and 5*b* show details of one form of connector link;

Figures 6*a* and 6*b* show details of one form of a connector tag;

Figures 7*a* and 7*b* show details of one form of spring;

Figure 8 is a plan view of the body of one form of four stack assembly; and

Figure 9 is a plan view of the four stack assembly, part of the closure plate being shown broken away to disclose the arrangement of one of the springs.

Referring to the drawings, a block 6 of insulating material is contained in a metal casing composed of a base 1 having up-turned sides 2 and a closure plate 5, the whole forming a box-like structure and the closure member being secured in position by the turning over of projecting ears 13 formed in the upturned sides 2 at each end of the casing.

The block 6 is a rectangular block composed of any suitable insulating material such as, for example, that sold under the registered trademark "Perspex" and has extending therethrough a first series of holes and a second series of holes of smaller diameter than those of the first series.

In the eight stack rectifier assembly shown in Figures 1 to 4 inclusive, the holes of the first series are arranged in two parallel rows, the first row comprising four equally spaced holes 17*a*–17*d*, the second row comprising four similarly spaced holes 17*e*–17*h* symmetrically disposed in respect to the holes of the first row, the two rows being spaced apart by a distance equal to that between the adjacent holes in each row.

The holes of the second series are, on the other hand, arranged in three parallel rows each of five equally spaced and symmetrically placed holes 7 with the spacing between the rows equal to that between the adjacent holes in each row and equal to that between the two rows of the first series, the arrangement being such that the centre row of holes 7 is interposed between the two rows of the first series, and two outer rows of holes 7 lie between the rows of the first series and the edges of the block 6.

Stacks of rectifier elements 15*a*–15*h* for instance of the well known copper oxide or selenium type are housed in the holes 17*a*–17*h* with the upper surfaces of the stacks in contact with metallic bearing plates 16*a*–16*h* respectively. Inter-connections between the lower surface of each of the adjacent stacks 15*a* and 15*b*, 15*c* and 15*d*, 15*f* and 15*g* are provided by three connecting links 19 of suitably thin electrically conducting material, each link comprising two enlarged parts 18 against which the lower surfaces of the adjacent stacks abut when the assembly is completed, and two small lips 8 which extend upwardly into two of the holes 7 in the centre and outer rows of the second series respectively to maintain the connecting link in position against lateral movement.

Means for connecting the lower surfaces of the stacks 15*a*, 15*c*, 15*e*, 15*f* and 15*h* to an external circuit are provided by five connector tags 20 of suitably thin electrically conducting material, each tag comprising a single enlarged part 23 against which the lower surface of the stack or one of the enlarged parts 18 of a connecting link abuts when the assembly is completed, and a small lip 8 and a projecting member 4 which are arranged to fit into two of the holes 7 in the centre and outer rows of the second series respectively, the projecting members 4 being arranged to extend upwardly through the holes 7 of the outer row in which they fit and though co-incident holes 14 formed in the closure plate 5 of sufficient diameter to prevent electrical contact therebetween when the assembly is completed.

To prevent unwarranted electrical connections between either the connecting links 19 of connector tags 20 and the base 1 of the casing, a sheet 22 of insulating material is interposed therebetween of length and width corresponding to the internal dimensions of the casing,

the thicknesses of the sheet and the material of which it is composed being such as to allow the efficient conduction therethrough to the casing of heat developed by the elements under working conditions.

Four springs **10** are provided both to ensure a good contact pressure between the elements in the stacks and between the lower surfaces of the stacks, and the associated connecting links **19** and/or connector tags **20**, and also to interconnect electrically the upper surfaces of the pairs of stacks **15***a*—**15***h*, **15***b*—**15***g*, **15***c*—**15***f*, **15***d*—**15***e*. The springs **10** each comprise a single arcuate leaf the two ends **12** of which are arranged to act on the bearing plates **16** of a pair of stacks, and two downwardly projecting lips **11** which are arranged to fit into adjacent holes **7** of the centre row of the second series in order to maintain the spring in position against lateral movement, the lengths of the downwardly extending lips **11** of each spring being such as not to make contact with the upwardly extending lips **8** of the connecting links, or connector tags which occupy the same hole **7**. Furthermore the distance apart of the two lips **11** of each spring **10** is such as to fit in the holes **7** of the centre row of the second series without making contact with the lips **11** of the adjacent springs **10** which occupy the same holes **7**.

The centre of each spring is arranged to act against the closure plate **5** when this plate is secured in position by the projecting ears **13**, and to prevent unwanted electrical connections between the springs **10** and the closure plate when the latter is so secured, a sheet **24** of insulating material having dimensions similar to those of the sheet **22** is interposed therebetween, the sheet **24** having holes formed therein corresponding in position to the holes **14** in the closure plate in order to receive the projecting members **4**.

In the four stack rectifier assembly shown in Figure 9 the body **6**, Figure 8, is similar to half that of the eight stack rectifier assembly shown in Figure 4, the first series of holes comprising only a single row of four equally spaced holes **17***i*–**17***l*, and the second series comprising two parallel rows each of five equally spaced and symmetrically disposed holes **7** between those of the first series and the opposite edges of the block, the spacing between the rows being equal to the distance between the adjacent first series.

Stacks of rectifier elements **15***i*–**15***l* are housed in the holes **17***i*–**17***l* respectively the lower surfaces of the stacks **15***i*, **15***k* and **15***l* are each in contact with a connector tag **20**, the lower surfaces of the stacks **15***j* and **15***k* are connected together by a connecting link **19**, and the upper surfaces of the stacks **15***i* and **15***j* and **15***k* and **15***l* are connected together by means of a pair of springs **10** respectively.

No details as to the sense of the rectifier elements in the stacks have been given since it is evident that numerous modifications may be made to the arrangements above described by way of example in order to meet particular requirements of the assembly or conditions of operations; for instance due to the symmetry of the holes in the block it is evident that in the eight stack rectifier assembly the springs **10** can be arranged to interconnect the upper surfaces of adjacent stacks in the same row as shown in Figure 9 or the connecting links **19** can be arranged to interconnect the lower surfaces of each pair of stacks in adjacent rows.

Furthermore additional connector tags **20** may be used where required and any of the holes **7** not in use may form a bore through which a bolt may be passed for the purpose of mounting the assembly on a chassis or frame, the only modification to the assembly in the first case being the cutting of additional co-incident holes in the closure plate **5** and the sheet **24**, and in the second case the cutting of additional co-incident holes in the closure plate **5**, the sheet **24**, the sheet **22** and the base **1** of the casing.

It is also evident that although the holes **17***a*—**17***h* and **17***i*–**17***l* of the first series in the block **6** are shown in Figures 4 and 8 respectively to be circular, these holes may equally well be shaped otherwise to accommodate correspondingly shaped rectifier elements.

Having thus described our invention what we claim is:

1. A metal rectifier assembly of the kind described, comprising a metal casing having a base and a closure plate; a block of insulating material in said casing and having extending therethrough a first series of parallel rows of equally spaced holes and a second series of rows of equally spaced holes parallel therewith, the holes being symmetrically arranged with the rows of the second series interposed between the rows of said first series and between the rows of said first series and the edges of said block; a stack of rectifier elements in each of the holes of said first series; springs holding at least one end of each of said stacks in good thermal contact with said casing; said springs functioning as connecting links making electrical contact between pairs of adjacent stacks and having symmetrically disposed projections engaging with holes of said second series for correctly positioning said connecting links; a first thin sheet of insulating material between said block and the base of said casing and a second thin sheet of insulating material between said block and said closure plate, said sheets electrically insulating said connecting links and said stacks from said casing; and connector tags making electrical contact with selected ones of said stacks and projecting out of said casing and insulated therefrom and each having at least one projection engaging with holes of said second series; the assembly being such that the closure of the casing compresses said springs, thereby providing good electrical contact between said stacks, said connector links and said connector tags and good thermal contact between said stacks and said springs and said casing.

2. A metal rectifier assembly as claimed in claim 1, in which the assembly is mounted on a support by means of a bolt or bolts passing through one or more holes of said second series.

3. A metal rectifier assembly of the kind described, comprising a metal casing having a base and a closure plate; a block of insulating material in said casing, said block having extending through it a first and a second series of holes, the holes of said first series being arranged in a row, the holes of said second series being arranged in two rows which are parallel to and arranged one on each side of said first series, the spacing of the holes in each row being the same and the holes in one row being equally spaced from the nearest hole in an adjacent row; a stack of rectifier elements in each of the holes of said first series; springs holding at least one end of each of said stacks in good thermal contact with said casing; said springs functioning as connecting links making electrical contact between pairs of adjacent stacks and having symmetrically disposed projections engaging with holes of said second series for correctly positioning said connecting links; a first thin sheet of insulating material between said block and the base of said casing and a second thin sheet of insulating material between said block and said closure plate, said sheets electrically insulating said connecting links and said stacks from said casing; and connector tags making electrical contact with selected ones of said stacks and projecting out of said casing and insulated therefrom and each having at least one projection engaging with holes of said second series; the assembly being such that the closure of the casing compresses said springs, thereby providing good electrical contact between said stacks, said connector links and said connector tags and good thermal contact between said stacks and said springs and said casing.

No references cited.