June 4, 1929. D. G. ACKERLY 1,715,691

UNIDIRECTIONAL CURRENT CARRYING DEVICE

Filed Feb. 11, 1925

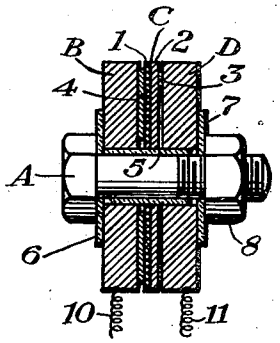



Fig. 2.

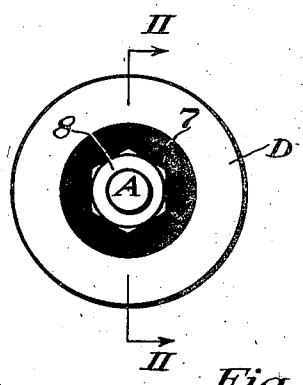



Fig. 1.

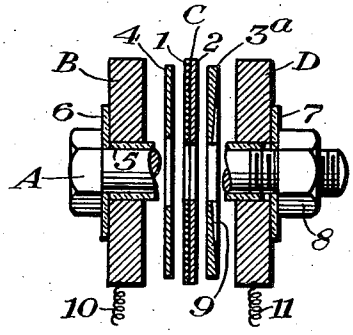



Fig. 3.

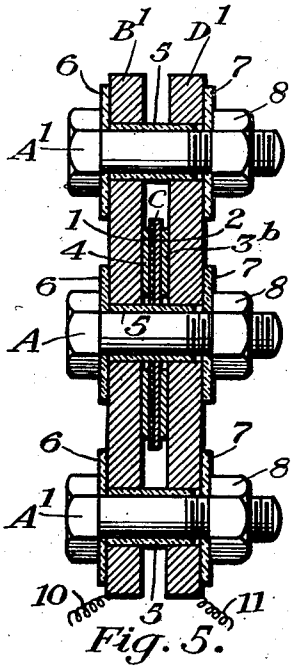



Fig. 5.

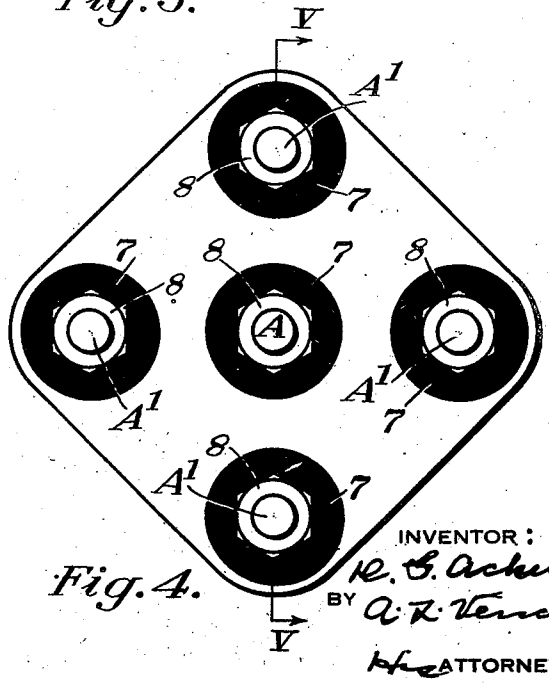



Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## UNIDIRECTIONAL CURRENT-CARRYING DEVICE.

Application filed February 11, 1925. Serial No. 8,594.

My invention relates to uni-directional current carrying devices.

I will describe several forms of uni-directional current carrying devices embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is a view showing, in front elevation, one form of uni-directional current carrying device embodying my invention. Fig. 2 is a sectional view along the line II—II of Fig. 1. Fig. 3 is an exploded sectional view illustrating a modified form of the device shown in Figs. 1 and 2 and also embodying my invention. Fig. 4 is a view, showing in front elevation, another modification of the device shown in the preceding views and also embodying my invention. Fig. 5 is a sectional view along the line V—V of Fig. 4.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1 and 2, the device comprises a disk C having asymmetric current carrying characterics, that is, a disk which offers greater resistance to current flowing through the disk in one direction than to current flowing through the disk in the other direction. One form of disk possessing this characteristic comprises a sheet 2 of metal with a layer 1 of a compound of the metal formed directly thereon. For example the sheet 2 may be copper and the layer 1 cuprous oxide, or the sheet 2 may be iron and the layer 1 be iron oxide.

In devices of this type, the resistance offered by the disk to currents flowing from the oxide to the metal is considerably less than the resistance offered to currents flowing in the opposite direction.

I have discovered that devices of the type described give best results when the disk C is subjected to comparatively high pressure, and I have further discovered that for best results the high pressure applied to the disk C should be uniformly distributed over the disk.

In order to subject the disk to such uniformly distributed high pressure, the device may be constructed as follows.

The disk C is provided with a centrally located hole to accommodate the shank of a bolt A. The shank of this bolt is provided with a sleeve 5 of insulating material. Carried also by bolt A, and located one on each side of disk C are two contact plates B and D of rigid material such as steel. Interposed between the oxide coating 1 of disk C and one contact plate B is a malleable washer 4, which I prefer to make of several plies of lead foil or tin foil. This washer covers substantially the entire face of disk C. The threaded end of bolt A is provided with a nut 8 adapted to clamp the two plates B and D together adjacent their centers, and to thereby apply high pressure to the disk. Washers 6 and 7 of insulating material are placed under the head of bolt A and nut 8, respectively. Electrical connections may be made to the device through wires 10 and 11 attached to plates B and D, respectively.

With the device constructed as thus far described, when nut 8 is turned up to exert high pressure on the disk, the natural resiliency of plates B and D, causes the outer edges of these plates to spring slightly apart, thereby resulting in a considerably smaller pressure upon disk C adjacent its periphery than adjacent its center.

To overcome this condition I provide, between disk C and plate D, a shim 3 of annular form and comprising a single thickness of lead foil or tin foil. This shim is located in concentric relation with respect to bolt A and is of such size that the shim is spaced a considerable distance from the bolt in a radial direction as best seen in Fig. 2.

It will therefore be plain that when nut 8 is drawn up, pressure is at first applied to the disk only through shim 3, adjacent the edge of the disk. As the pressure exerted adjacent the center of plates B and D is increased, the edges of the plates are sprung slightly apart, thereby permitting plate D to bear against disk C adjacent the center of the disk. The parts are so proportioned that when the desired pressure is applied to disk C, the outward springing of disks B and D is compensated for by the shim 3, so that the pressure is then evenly distributed over the entire area of the disk.

In the modification shown in Fig. 3, the parts are the same as in Figs. 1 and 2, except that shim 3 is replaced by a pressure washer $3^a$ having a concave face 9 adjacent plate D. The parts are so proportioned that when the nut 8 is drawn up to exert the op-

timum pressure upon disk C, the resiliency of the plates B and D is exactly compensated for by the concave washer $3^a$, and the pressure on disk C is therefore evenly distributed.

In the form shown in Figs. 4 and 5, a flat washer $3^b$ similar to washer 4 is interposed between plate D′ and disk C. The edges of plates B′ and D′ are extended beyond the limits of the disk C, and the tendency of these plates to spring apart when nut 8 is drawn up on bolt A, is overcome by clamping together the overhanging edges of the contact plates B′ and D′ by means of bolts A′. With this arrangement of apparatus the plates B and D are maintained in parallel relation, and the pressure exerted upon disk C is evenly distributed. The bolts A′ are each provided with washers 6 and 7 and a sleeve 5 of insulating material similar to those provided on bolt A.

Although I have herein shown and described only a few forms of uni-directional current carrying devices embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A uni-directional current carrying device comprising a disk having asymmetric current carrying characteristics, a contact plate, a bolt passing through said plate and disk, a nut threaded on said bolt for clamping said plate and disk together under comparatively high pressure, and a shim interposed between said plate and said disk for uniformly distributing the pressure exerted by said nut.

2. In combination, a bolt, a disk on said bolt and having asymmetric current carrying characteristics which vary in response to the pressure applied to the disk, a flat plate on said bolt, a pressure washer having a concave surface interposed between said plate and said disk, and a nut threaded on said bolt to clamp said washer against said disk whereby the disk is subjected to a uniformly distributed pressure.

In testimony whereof I affix my signature.

DONALD G. ACKERLY.