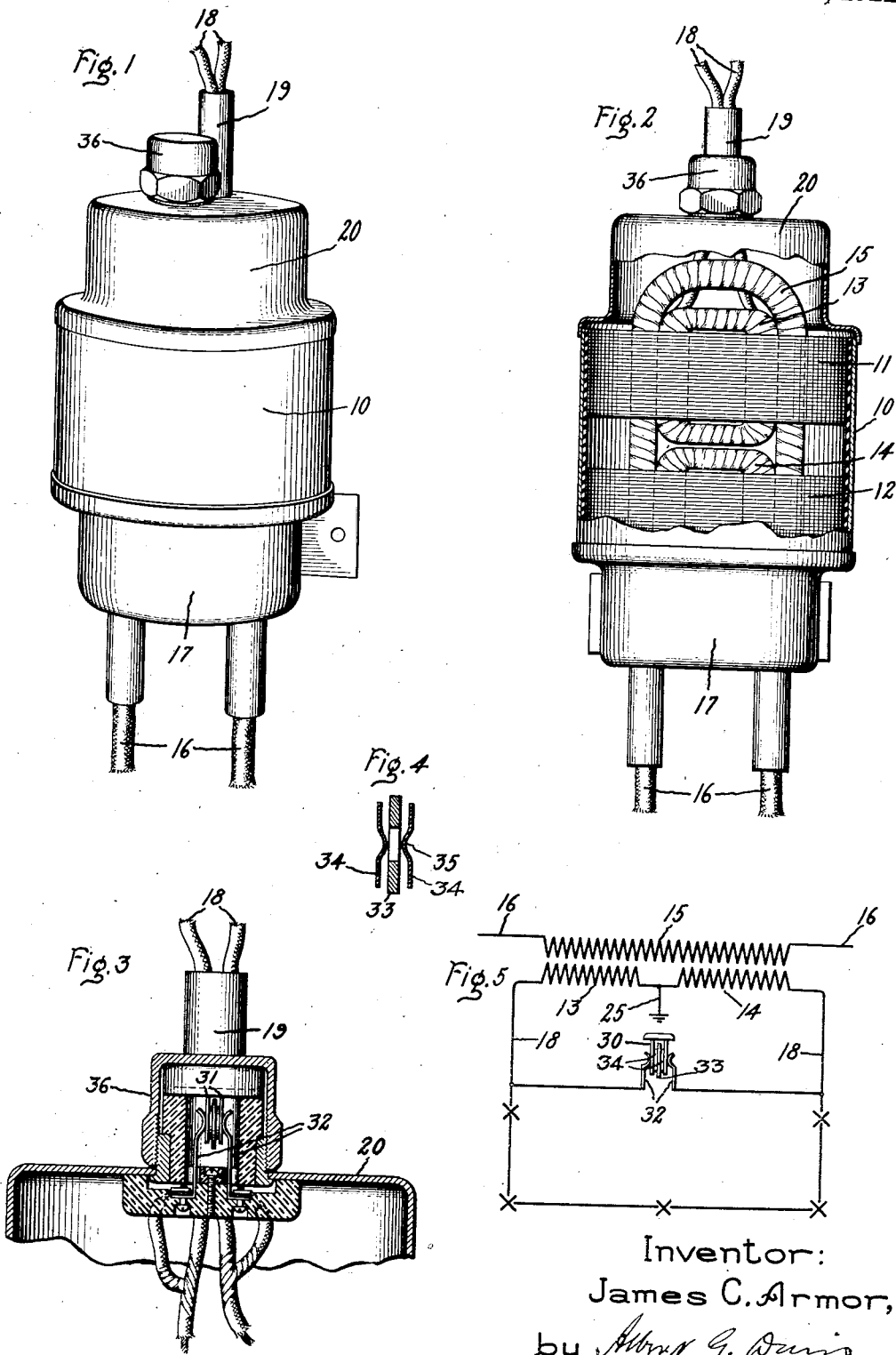


J. C. ARMOR,  
 TRANSFORMER.  
 APPLICATION FILED APR. 2, 1920.

1,402,037.

Patented Jan. 3, 1922.



Inventor:  
 James C. Armor,  
 by *Albert G. Davis*  
 His Attorney

# UNITED STATES PATENT OFFICE.

JAMES C. ARMOR, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## TRANSFORMER.

1,402,037.

Specification of Letters Patent.

Patented Jan. 3, 1922.

Application filed April 3, 1920. Serial No. 370,786.

*To all whom it may concern:*

Be it known that I, JAMES C. ARMOR, a citizen of the United States, residing at Knoxville, Pittsburgh, county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Transformers, of which the following is a specification.

My invention relates to transformers and the like and has for its object an improved and economical arrangement of parts.

More specifically my invention relates to transformers supplying a series load such as are used for series lighting circuits and provides a safe and economical transformer for such use.

In circuits supplying electrical energy to series loads it is desirable to fix the potential of some point of the circuit in order to prevent the accumulation of electrostatic charges on the line and to limit the voltage to ground to substantially one-half the secondary voltage. Accordingly, it has been the prior practice to ground the neutral point of the transformer supplying the load. There is objection to this practice, however, for if the external circuit should become grounded at any point, the half of the secondary transformer winding nearest the grounded external point would be short circuited with consequent damage. To avoid this contingency, two separate transformers in series are to some extent used, which adds to the expense of the installation.

By my invention, I am enabled to use a single transformer in which a novel arrangement of the windings is employed that is safe against short circuits and involves considerably less material of construction than two transformers.

For a more complete understanding of my invention, reference should be had to the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 shows a perspective view of a transformer constructed in accordance with my invention; Fig. 2 is a view mainly in section showing details of the transformer shown in Fig. 1; Figs. 3 and 4 are fragmentary views showing other details; and Fig. 5 is an explanatory diagram.

Referring now to the drawings and to Fig. 2 in particular, 10 denotes a casing, here shown as cylindrical, in which two shell type

cores 11 and 12 are secured in spaced relation in the upper and lower portions thereof respectively. Each of these cores carries a low voltage or secondary winding, here shown at 13 and 14. These windings are connected in series and are designed to supply electrical energy to the series load. The two cores are magnetized by a single primary winding, shown at 15, which is passed through the windows of the two cores as though they were sections of a single core.

The primary leads are shown at 16 protruding from suitable bushings in the lower cap 17 of the casing 10. The secondary leads 18 are similarly shown protruding from a bushing 19 in the upper cap 20.

The series connection between the windings 13 and 14 provides a convenient point at which to make a ground connection for the secondary winding as indicated at 25 in Fig. 5. The grounded neutral thus provided for the secondary windings is without the shortcomings of the practices of the prior art, since the provision of separate cores prevents either section 13 or 14 of the secondary from being traversed by abnormal currents of substantially twice normal value should a ground occur at some point on the external circuit. The short circuited current in either winding can only rise to that value at which the ampere turns for that half are in balance, which value is very little different from the normal full load value of the current.

I have shown at 30 the short circuiting or cut out switch for the secondary which is normally employed when serving a series load. This switch is preferably made in the form of a plug and is conveniently mounted on the upper cap 20 of the transformer housing. This plug as shown, consists of a pair of prongs 31 normally insulated apart and adapted to be inserted between a pair of spring contact fingers 32 mounted on the cap 20 and conductively connected across the secondary circuit, as shown in Figs. 3 and 5. When the plug is removed these contact fingers 32 engage so as to short circuit the whole secondary winding and cut out the load. The insulation which insulates prongs 31 apart, according to the form of my invention here shown, is arranged to perform a protective or safety function for the transformer in addition to its insulating function. Accordingly the insulation be-

tween prongs 31 comprises a perforated plaque 33 of insulating material whose dielectric strength is more than sufficient to withstand normal voltage across the secondary winding, but where perforated is not sufficient to withstand abnormal voltages. At each side of this plaque 33, there is a conducting element 34 preferably as shown in Figs. 3, 4 and 5 which has a pressed-out protuberance 35 proportioned in such size as to control the discharge voltage of the gap thus formed across the perforation, and thereby permit the secondary voltage harmlessly to discharge itself when it has risen to a predetermined excessive value. This discharge causes the indented portions 35 of the conducting elements 34 to become fused together so as to permit the switch to perform its function of short circuiting the secondary circuit of the transformer. Upon removal of this fused plug, the engagement of the springs 32 maintains this short circuit across the transformer secondary until the insertion of a new plug so that the load circuit is protected at all times. Each of the conducting elements 34 is shown in Fig. 4 separated a short distance from the plaque 33 to indicate the construction more clearly. The cut out plug 30 so arranged is conveniently housed in a screw cap 36 secured on the housing of the transformer as shown.

The plug 30, while preferably made to discharge a safety function, is not necessary to the practice of the other features of my invention here disclosed where two separate cores are used, but may be used independently, and is claimed separately in my divisional application Serial No. 478,151, filed June 16, 1921.

Having now described an embodiment of my invention which is at present the best means known to me for carrying the same into effect, I would have it understood that this is merely illustrative and that I do not mean to be limited thereby to the precise details shown, nor restricted in the choice of

recognized equivalents except as defined in my claims hereunto annexed.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In transformers and the like, the combination with a plurality of cores having independent magnetic circuits, of an individual secondary winding on each core, a single primary winding arranged to magnetize all of said cores, said secondary windings being connected in series to supply a series load and provided with a ground connection through such series connection.

2. In transformers and the like, the combination with a plurality of cores having independent magnetic circuits, of an individual secondary winding on each core, a single primary winding arranged to magnetize all of said cores, and a single casing supporting said cores, said secondary windings being connected in series to supply a series load and provided with a ground connection at a point on such series connection.

3. In transformers and the like, the combination with a casing having a shell type core in each of its upper and lower portions, of a secondary winding on each core and one primary winding threading the windows of both cores, a series connection between said secondary windings, and a ground connection leading therefrom from said series connection.

4. In transformers and the like, the combination with a casing having a shell type core in each of its upper and lower portions, of a secondary winding on each core and one primary winding threading the windows of both cores, a grounded series connection between said secondary windings, and a short circuiting switch for said secondary windings on said casing arranged to discharge voltages of a predetermined value there- through when in open circuited position.

In witness whereof, I have hereunto set my hand this 25th day of March, 1920.

JAMES C. ARMOR: