Sept. 12, 1967 G. D. WALE ET AL 3,341,793

ELECTRICAL REACTORS

Filed May 19, 1965

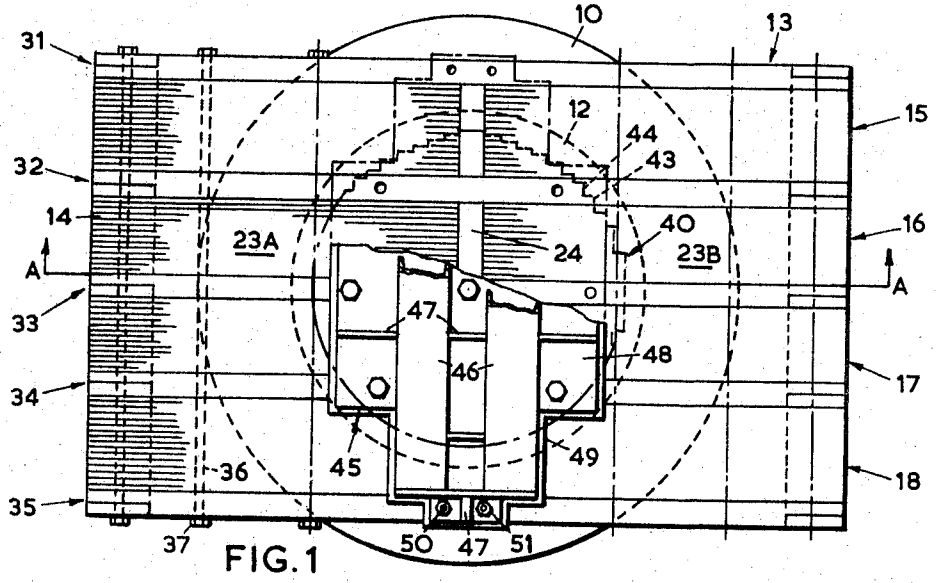



FIG. 1

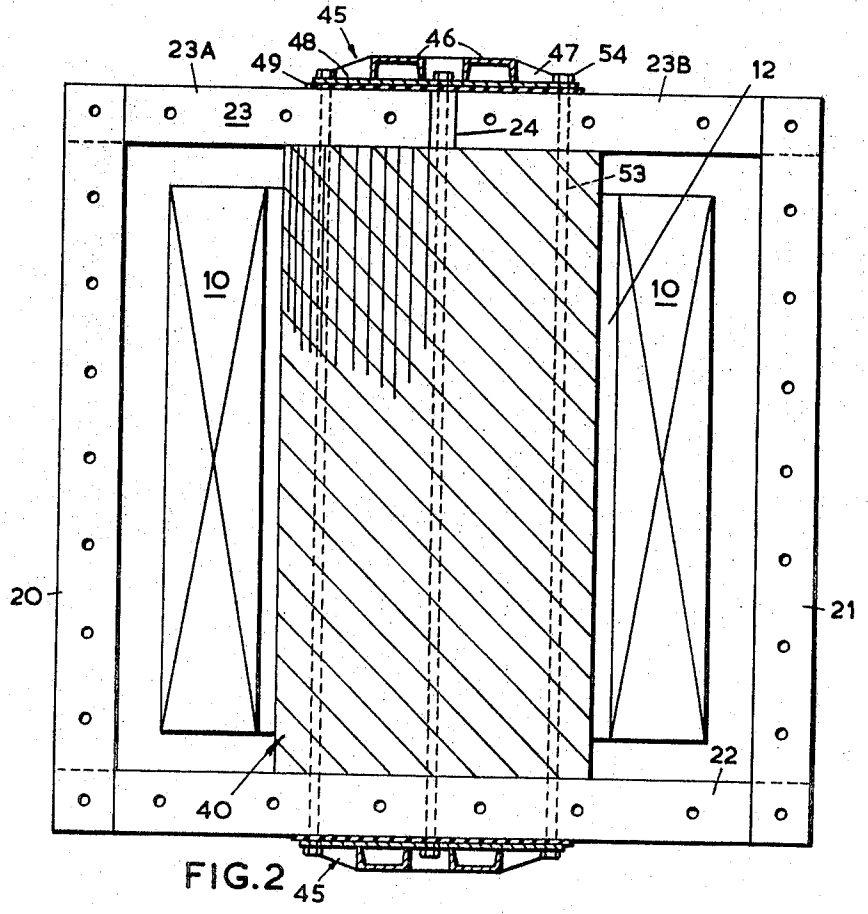



FIG. 2

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# ELECTRICAL REACTORS

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1 Claim. (Cl. 336—84)

This invention relates to electrical reactors.

According to the invention an electrical reactor comprises a generally rectangular laminated magnetic shield having two side members and first and second transverse members arranged to provide a closed magnetic circuit, at least the first transverse member being formed of at least two parts spaced end to end and defining a gap therebetween, a non-magnetic support member formed with two end surfaces and extending between the two transverse members, clamping means for causing the transverse members to abut against the end surfaces of the support member, the said gap being positioned adjacent the associated end of the support member and the clamping means being effective to clamp the support members firmly between the second transverse member and both the said parts of the first transverse member, and an electrical winding disposed about the support member.

In order that the invention may be more clearly understood a reactor in accordance with the invention will now be described, by way of example, with reference to the accompanying drawing, in which:

FIG. 1 is a part-sectional plan view of the reactor, and,

FIG. 2 is a cross-sectional side elevation of the reactor on the line A—A of FIG. 1.

In the drawing the reactor is shown as having a cylindrical winding **10** which has a central aperture **12**, and the winding is disposed within a shell-type magnetic shield generally indicated at **13**. The shield is made up of magnetic laminations as indicated at **14** in FIG. 1, and these laminations are disposed in four similar spaced assemblies of top, bottom, and two side magnetic members as seen in the drawing.

Each such assembly is arranged in the form of a hollow rectangular structure, and the four assemblies together also form a hollow rectangular structure.

One such assembly, shown generally at **16**, comprises side magnetic members **20** and **21**, bottom magnetic member **22**, and top magnetic member **23**, the latter member comprising two portions **23A** and **23B** separated by a gap **24** which may include insulation if desired. The other three rectangular assemblies generally denoted by reference numerals **15**, **17** and **18**, are similar to the assembly **16** and each have a gap **24** between the two portions of their top member.

The four similar rectangular magnetic assemblies **15** to **18** are spaced apart from one another by rectangular electrically insulating spacers generally indicated at **32**, **33** and **34**, each spacer comprising four spacer members which have tongued ends and which are preferably made of wood.

Adjacent each major face of the reactor shield is disdosed one of two steel clamping frames as shown at **31** and **35**.

The whole shield comprising the four magnetic assemblies, the spacers and the clamping frames are bolted together by a number of bolts and nuts as for example shown at **36** and **37** in FIG. 1. The shield or any part thereof may of course be bonded or banded together by any method known for the construction of laminated magnetic assemblies.



Disposed within the central aperture of the winding **10** is a stiffening and support member shown generally at **40** and composed of electrically insulating non-magnetic material. This support member is built up of a number of layers of such material, as shown, for example, at **43** and **44** of FIG. 1.

The two ends of the member **40** do not extend over sufficient of the inner faces of the top members to provide a sufficient support for the top members of the rectangular assemblies **15** and **18**. To increase the support plate structures **45** are provided at the top and bottom of the reactor shield. These are each shown in the drawing to comprise a metal assembly of inverted channel sections **46** and stiffening pieces **47** welded to a flat metal plate **48**. To provide insulation between the plate structures **45** and the laminations **14** against which they lie, sheets of electrical insulation **49** are provided which overlap the plates **48** all around their perimeters.

The top plate structure **45** is attached to the top of the frames **31** and **35** by bolts **50** and nuts **51**. In a similar manner the bottom plate structure **45** is attached to the bottom of the frames **31** and **35**.

The plate structures **45** are further secured to the shield by bolts and nuts as shown for example at **53** and **54** in the drawing. The bolts **53** extend through the member **40** and therefore also serve to clamp the top and bottom members of the hollow rectangular structure against the member **40**. The bolts are electrically insulating and preferably comprise glass fibre resin impregnated rods having metal fittings at either end to provide sufficient strength of the screw threads which engage the nuts **54**.

The stiffening and support member **40** may be of any suitable insulating and non-magnetic material but is preferably of densified wood. Its prime object is to provide stiffening and support between the top and bottom members and so to reduce any elastic deflection thereof due to the alternating magnetic forces set up in the shield. These forces have twice the frequency of the alternating current in the winding and attract the top and bottom magnetic members of the magnetic shield inwardly together. By reducing movement of the shield the noise emitted by the reactor is decreased.

The two-part arrangement of the top magnetic members also ensures that the stiffening and support member **40** can always be firmly clamped between the top and bottom members as this two-part arrangement allows for minor variation in the dimensions of the members. If desired the magnetic shield may be further sub-divided with gaps such as **24** provided in the bottom members and additionally or alternatively with gaps provided in the side members. If desirable more than one gap may be provided in each magnetic member of the shield, such gaps for the top and bottom members being preferably within those parts of the shield which lie wholly or partly against the ends of the stiffening and support member **40**.

Further, the provision of the member **40** and the two-part arrangement of the top and bottom magnetic members with the gaps **24** enables the reactor parts to be proportioned so that they are less likely to be excited to resonance by the magnetic forces set up in the shield so that the possibility of the shield resonating under operating conditions, with resultant increased noise emission, is reduced.

It is not essential that the top and bottom magnetic members be clamped against the stiffening and support member **40** by bolts as shown, any other suitable means may be used.

If desired the reactor may be arranged with the wind-

ing and stiffening and support member horizontal. For this arrangement the magnetic members described in the specification as "top" and "bottom" become "side" members, and members described as "side" members become "top" or "bottom" members.

What we claim as our invention and desire to secure by Letters Patent is:

An electrical reactor comprising a generally rectangular laminated magnetic shield having two side members and first and second transverse members arranged to provide a closed magnetic circuit, at least the first transverse member being formed of at least two parts spaced end to end and defining a gap therebetween, a non-magnetic support member formed with two end surfaces and extending between the two transverse members, clamping means for causing the transverse members to abut against the end surfaces of the support member, the said gap being positioned adjacent the associated end of the support member and the clamping means being effective to clamp the support member firmly between the second transverse member and both the said parts of the first transverse member, and an electrical winding disposed about the support member.




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