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2,864,963

MAGNETIC SHIELD

Filed June 24, 1957

FIG.1.

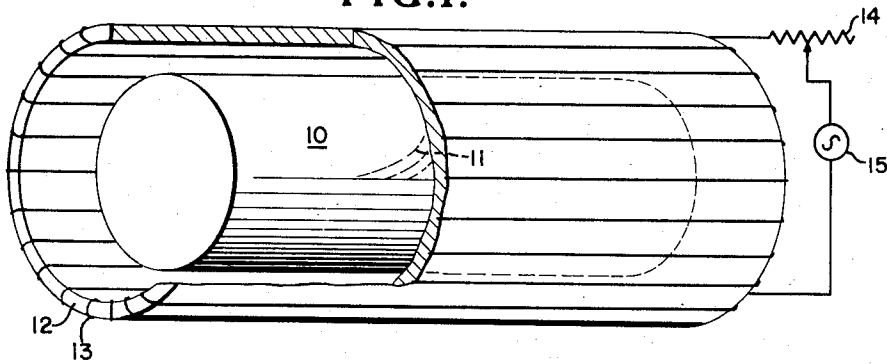


FIG.2.

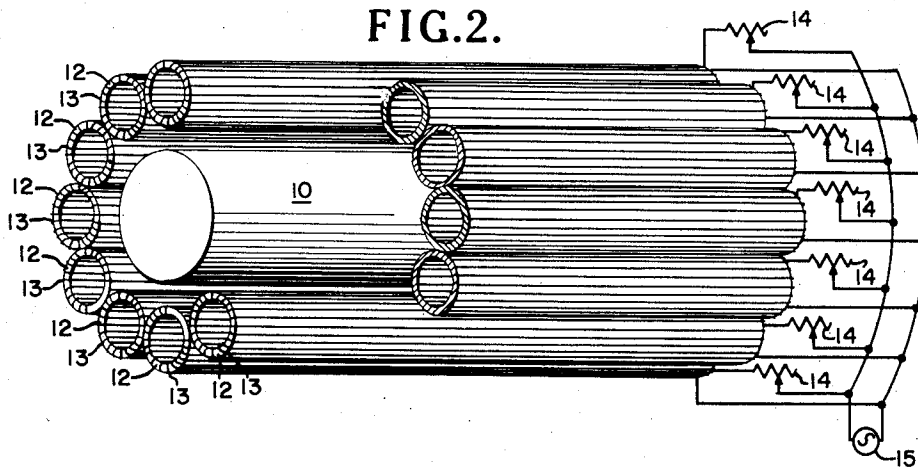
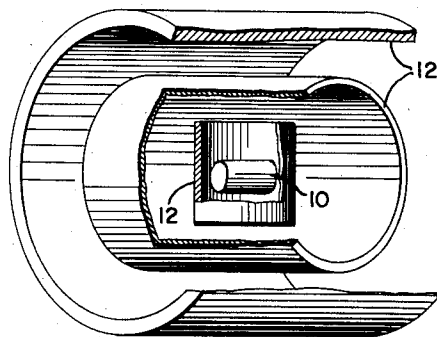


FIG.3.



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MAGNETIC SHIELD

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4 Claims. (Cl. 307—91)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a magnetic shield for limiting the stray magnetic fields associated with electrical and magnetic devices. More specifically, the present invention relates to a magnetic shield wherein high efficiency of operation is achieved by operating the shield in a region of high permeability for the material of which it is made. It is found that some ferromagnetic material, such as silicon iron, increases in permeability in the presence of properly applied magnetic fields. The permeability of such materials is found to be rather low initially and to pass through a maximum as the material approaches saturation in the presence of an applied magnetic field. It has also been found that when the applied magnetic field is alternating in nature the shielding material becomes more efficient as a magnetic shield.

The present invention has as one of its advantages resulting from its higher efficiency operation that a high degree of shielding may be obtained with a relatively small increase in weight of the device as a result of applying the shield of the present invention thereto. Since the presence of stray magnetic fields may be highly undesirable in some applications of electrical devices and since total weight becomes a problem when such applications are applied to aircraft, the usefulness of the present invention becomes obvious.

Accordingly, it is an object of the present invention to provide a new and improved magnetic shield for limiting stray magnetic fields associated with electrical apparatus.

It is another object of the present invention to provide a relatively light weight magnetic shield of high efficiency.

It is another object of the present invention to provide a magnetic shield which is operated in the region of high permeability of the material of which the shield is made.

Other objects and advantages of the invention will become more fully apparent from the following description of the annexed drawings, which illustrate a preferred embodiment of this invention, and wherein:

Fig. 1 is a diagrammatic view of the present invention applied to an electrical device; and

Fig. 2 is a modification of the shield of Fig. 1 in which the shield is made up of a plurality of tubular members.

Fig. 3 is a diagrammatic showing of the present invention as employed to substantially eliminate stray magnetic fields from an electrical device.

Referring now to the drawing, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 an electrical device 10, which may be for example, an electric motor or the like, and which has radial stray magnetic fields 11. Surrounding the device 10 there is a tubular shield member 12 constructed of a ferromagnetic material, such as silicon steel. On this cylindrical member 12, there is wound toroidally a winding 13. The winding is

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connected through a regulating device 14 to a source of alternating current 15.

By adjusting the regulating device 14 a current level may be selected which produces a maximum permeability for the particular ferromagnetic material employed in the shield 12, that is to say, the material of the magnetic shield may be biased to its maximum permeability. In such an arrangement the maximum shielding properties are obtained with a minimum expenditure of material in the shielding and consequently with a minimum increase in the weight of the device due to the shielding. It will be noted that whereas in the preferred embodiment described the shield member is referred to as being tubular, it should be understood that the tubular shape is not essential to the operation of the shield and that any suitable shaped member on which a toroidal winding may be made would be suitable for some applications.

A second embodiment of the present invention consists of mounting a plurality of tubular members coaxially about a device to be shielded with each of the tubular members having its own toroidal winding. The toroidal windings in each case being connected to a source of alternating current. This is illustrated in Fig. 2. A third modification of the present invention is illustrated in Fig. 3 wherein a plurality of tubular members 12 are mounted with their axes mutually perpendicular. This configuration of Fig. 3 shows the devices of the invention arranged to provide substantially complete shielding for an electrical device with a minimum expenditure of material in the shield itself, the wiring of which is similar to that of Fig. 1 and is not shown in detail in this figure.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A magnetic shield comprising at least one tubular member composed of a ferromagnetic material, a toroidal winding on each of said tubular members, and means connected to energize said winding with an alternating current, means connected between said winding and said means to energize said winding for adjusting the said current level to produce maximum permeability.

2. A magnetic shield for a direct current dynamo-electric device comprising a tubular member of a ferromagnetic material for surrounding said device in coaxial alignment therewith, and means for biasing said tubular member into a region of high permeability, said means including an alternating current source.

3. A magnetic shield as claimed in claim 2 in which said means is a toroidal winding on said tubular member, and connected to said source of alternating current to produce an alternating magnetic field in said tubular member, including means for regulating said current to the level to produce maximum permeability.

4. A magnetic shield for a device comprising a plurality of tubular members composed of a ferromagnetic material, said members being mounted concentric to said device and with their axes mutually perpendicular, a toroidal winding on each of the tubular members, a source of alternating current, and means connecting said source to said windings, said last-named means including means for regulating said alternating current to produce maximum permeability in said shield.

References Cited in the file of this patent

UNITED STATES PATENTS

2,650,350	Heath	Aug. 25, 1953
2,768,179	Arnold et al.	Nov. 19, 1957