June 8, 1948. D. S. GRANBERRY 2,442,808

MAGNETIZING FIXTURE

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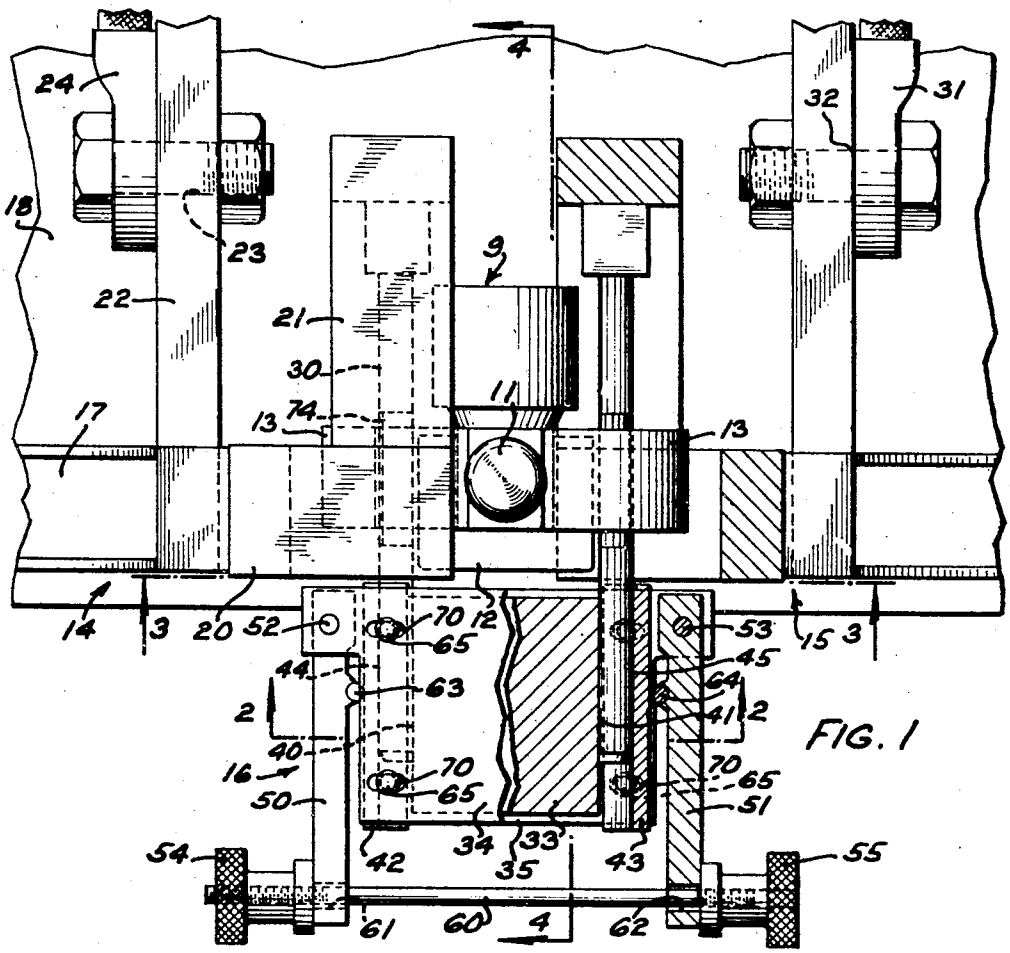


FIG. 1

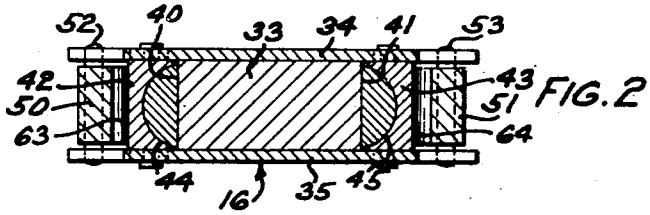


FIG. 2

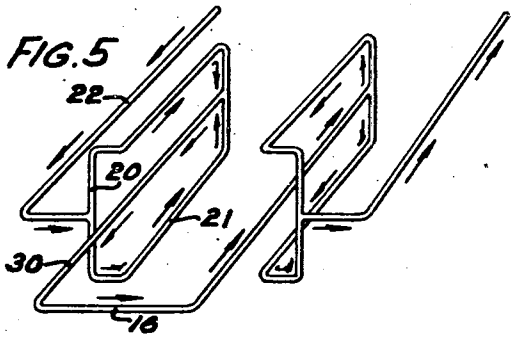


FIG. 5

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FIG. 3

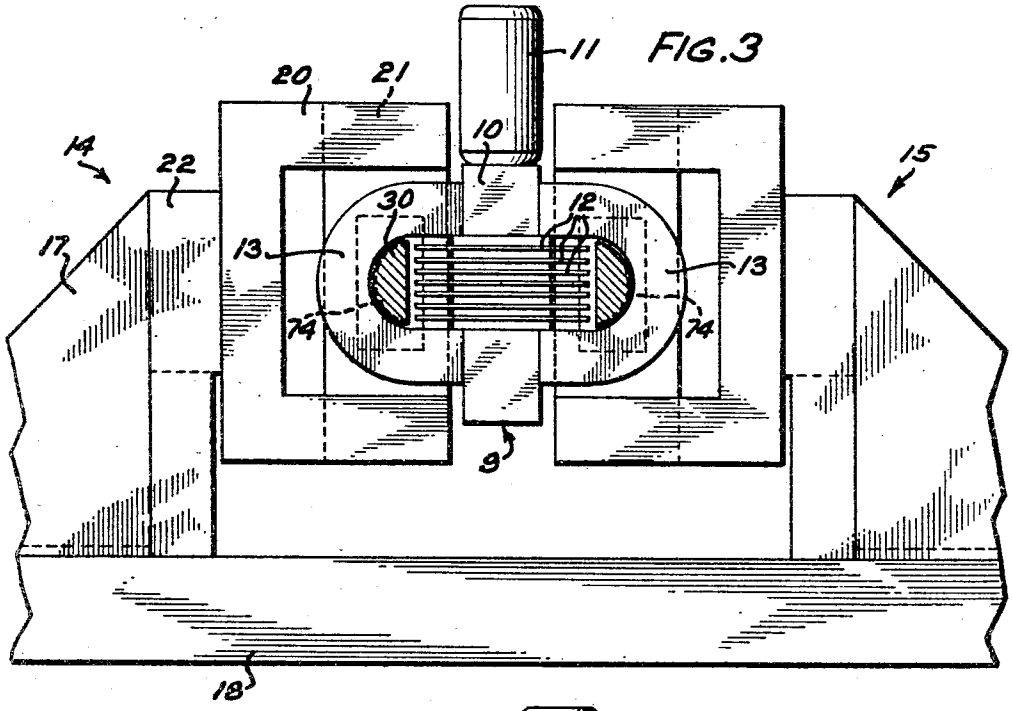
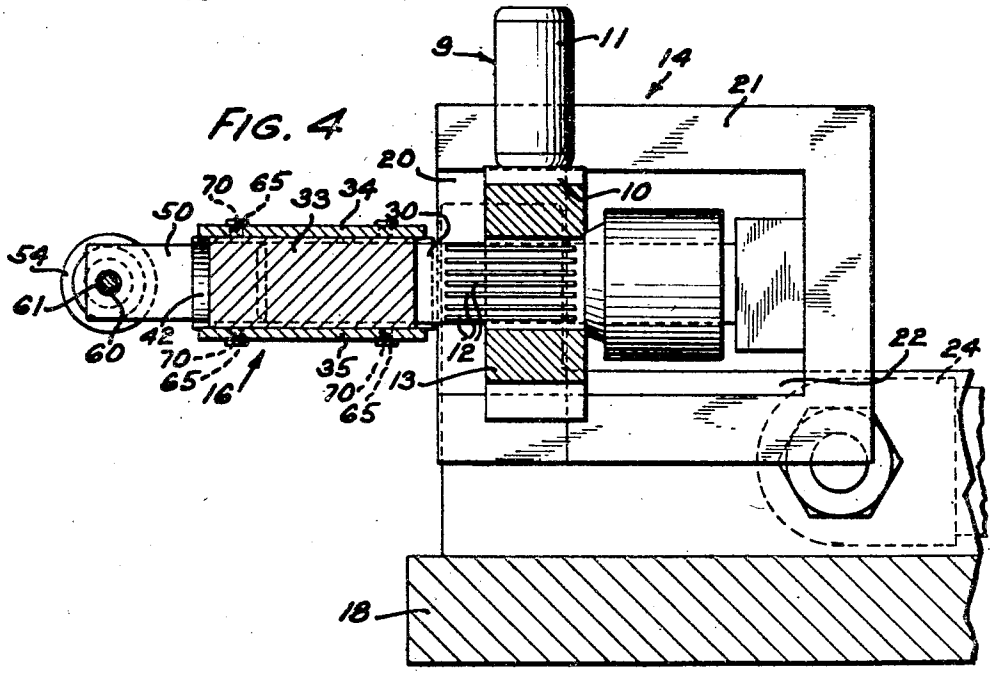


FIG. 4



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Patented June 8, 1948 2,442,808

UNITED STATES PATENT OFFICE

2,442,808

MAGNETIZING FIXTURE

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Application August 27, 1946, Serial No. 693,288

9 Claims. (Cl. 175—21)

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This invention relates to a magnetizing fixture and more particularly to current carrying holding fixtures for magnetizing permanent magnet structures.

In the manufacture of certain types of magnetron tubes, the tubes and the magnets therefor are assembled together before the magnets are magnetized. After they are assembled the magnets are disposed within the magnetic field of a current carrying conductor in order to fully magnetize the magnet. Because of the configuration of the assembled tubes and the size of conductors necessary to carry the tremendous magnetizing current it has been difficult to mount the assembled tubes on the magnetizing coil and demount them after magnetization with the rapidity desired for mass production.

It is an object of this invention to provide a new and efficient magnetizing fixture having among its features contact surfaces of relatively large area to reduce resistance to the magnetizing current.

Another feature of the invention is the provision of a structure on which the assembled magnetron tubes can be mounted and demounted with facility.

In accordance with one embodiment of this invention, a magnetizing fixture is provided with two brackets spaced apart and secured to a bench, to each of which brackets is attached a split coil assembly made of relatively heavy conducting bars. The center legs of the two split coil assemblies extend some distance from the coil and are adapted to fit the apertures formed between the inside curved surfaces of the magnets and the sides of the anode of the magnetron tube to which they are attached. After the magnetron tube assembly has been mounted on the fixture, the ends of the center legs of the coils are connected together by a yoke with a central contact member providing large contact surfaces for engaging the center legs which are urged toward the central contact member by pressure pads under the pressure of thumb screw actuated levers.

A complete understanding of this invention will be had from the following detailed description taken in conjunction with the accompanying drawings, in which

Fig. 1 is a plan view of a preferred embodiment of the invention with some parts broken away and in section. This view shows a magnetron assembly mounted in the fixture and the shorting yoke clamped on the center legs of the coils;

Fig. 2 is a cross sectional view mainly of the shorting yoke taken on the line 2—2 of Fig. 1 in the direction of the arrows;

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Fig. 3 is a sectonal view taken along the line 3—3 of Fig. 1 in the direction of the arrows showing the brackets and most of the split coil assembly in elevation;

Fig. 4 is a transverse sectional view of the apparatus taken on the line 4—4 of Fig. 1 in the direction of the arrows, and

Fig. 5 is a diagrammatic representation of the coils and the shorting yoke showing the path of the magnetizing current.

One form of magnetron tube 9 which may have its magnets magnetized in the structure shown as illustrative of one embodiment of the invention comprises a central body portion 10 from which there extends a glass envelope 11 and on which there are formed heat dissipating fins 12—12. A pair of horseshoe type permanent magnets 13—13 are secured to the body portion 10 in position to partially surround the fins 12—12. The other structural features and characteristics of the tube are not pertinent to the present invention.

As will be seen from the drawings, the apparatus comprises three main sections, two split coil sections 14 and 15 and a shorting yoke 16. Sections 14 and 15 are similarly constructed, each being the mirror image of the other, and only one of these sections (section 14) will be described in detail herein.

The split coil section 14 is supported on a bracket 17 which is secured in any suitable manner to a bench 18. The bracket 17 carries an L-shaped side member which serves to support the body of the split coil section and also serves as a conductor for conducting current to the coil section. The L-shaped side member, as well as the remaining portions of the coil section 14, is made up of relatively heavy copper stock in order to carry the current necessary for magnetization, which may be of the order of 30,000 amperes. The copper parts may be silver plated to promote better electrical contact between all abutting and connecting surfaces.

The parts which go to make up the split coil section 14 comprise a pair of U-shaped members 20 and 21 suitably connected together, for example, by brazing one to the other, in such manner that they are disposed at right angles one to another with the U-shaped member 21 having its base at the rear of the fixture and the U-shaped member 20 being secured to an L-shaped side member 22 in such manner that the area of contact between the side member 22 and the

U-shaped member 20 will be approximately at the middle of the base of the U-shaped member, whereby the proper distribution of magnetizing current may be effected. At its rear end the L-shaped side member 22 is provided with a suitable aperture 23 whereby a current cable terminal 24 may be clamped in good electrical conducting relation to the member 22. Mounted on the base of the U-shaped member 21 and extending between the legs thereof is a center leg 30 which is secured to the inside surface of the base of the U-shaped member 21, preferably by brazing it thereto. Thus the two U-shaped members 20 and 21 and the center leg 30 form a split coil wherein the proportions of a horseshoe magnet of the type to be magnetized will easily fit between the center legs and the inner surfaces of the outside turns of the coil, thus forming a single turn around each leg of the horseshoe magnet.

The coil section 15 is secured to the bench a suitable distance away from the section 14 to accommodate the particular magnetron tube assembly, the magnets 13 of which are to be magnetized. Another current lead 31 is connected to the coil section 15 at 32. The two current leads 24 and 31 connect the apparatus to a source of magnetizing current, not shown, which may be of the half-cycle type.

It will be apparent that unless there be some connection between the two coil sections 14 and 15, the path of current between the two leads 24 and 31 will be incomplete. To complete the circuit after a magnetron tube assembly is slipped into place over the center legs 30 of the coils the legs are bridged by a shorting yoke 16 which is slidably positioned on the center legs. The yoke 16 comprises a center block 33 to opposite faces of which two plates 34 and 35 are secured. The faces 40 and 41 of the block 33 are extensive in area in order to make a good low resistance electrical connection between the block and the center legs 30. Low resistance between these connections is further ensured by pressure applied from both sides through a pair of slidable pressure pads 42 and 43 which have concave surfaces to engage the half-round sides 44 and 45 of the center legs 30. The pressure pads 42 and 43 are urged toward the center block 33 by the clamping action of a pair of levers 50 and 51 pivoted at 52 and 53 between the plates 34 and 35 and drawn together by the manipulation of a pair of thumb nuts 54 and 55 screwed on the threaded ends of a rod 60 which is slidably positioned in apertures 61 and 62 formed in the free ends of the levers 50 and 51, respectively. A pair of rounded projections 63 and 64 formed on the levers 50 and 51, respectively, provide slidable engagement with the pressure pads 42 and 43 to equalize and transmit the force of the levers to the contact surfaces. The pressure pads 42 and 43 are provided with guide pins 65 which are slidably disposed in slots 70.

In the operation of the apparatus, a magnetron tube assembly 9 is positioned on the fixture so that the magnets 13—13 of the magnetron assembly are disposed around the center legs 30 of the coils and within the turn area of the coils after which the center legs are connected by sliding the shorting yoke 16 between them and applying pressure to the joints between the center block 33 and the center legs 30 by tightening the thumb nuts 54 and 55. A suitable current is then sent through the coils thereby magnetizing the magnets after which the assembly may be removed. Due to the relatively low voltages involved, insulation is not a great problem and a thin coat of insulation 74 around the section of the legs 30 where the magnetron is disposed when being magnetized will prevent any harmful short-circuits between the magnetron assembly and the coils. It will be apparent that the structure of the apparatus is conducive to rapid mounting, magnetizing, and demounting of magnetron assemblies.

As illustrated by the arrows in Fig. 5 the flow of magnetizing current from the current source is through the side member 22 to the base of the U-shaped member 20 where it splits into two paths through the legs of member 20 to the legs of U-shaped member 21 to the base of member 21 and then out through center leg 30 of split coil section 14 and shorting yoke 16 to the split coil section 15 where it traverses an identical path in a reverse direction.

What is claimed is:

1. A magnetizing apparatus comprising a coil having two opposed branches with a center leg common to said branches, a second coil similar to said first coil and spaced apart therefrom, both of said coils being disposed so that magnets to be magnetized may be mounted within said branches upon said center legs, and removable means to electrically connect said center legs together comprising a yoke, a contact member, and means for applying pressure between said center legs and said contact member.

2. A magnetizing apparatus comprising a coil having two opposed branches with a center leg common to both said branches, a second coil having two opposed branches with a center leg common to both said branches, both of said coils being spaced apart to accommodate two magnets to be magnetized within said branches and around said center legs, and removable means to electrically connect said center legs to each other comprising a yoke, a contact member for engaging said center legs, a pair of levers for urging said center legs toward said contact member, and a pressure pad between said levers and said center legs.

3. A magnetizing apparatus comprising a coil having two opposed branches with a center leg common to both said branches, a second coil having two opposed branches with a center leg common to both said branches, both of said coils being spaced apart to accommodate magnets to be magnetized within said branches and around said center legs, removable means to electrically connect said center legs to each other comprising a yoke, a contact member for engaging said center legs, a pair of levers for urging said center legs toward said contact member and a pressure pad between each lever and said center legs, means for applying force to said levers, and means to lock said levers in any desired stressed position.

4. A magnetizing apparatus comprising a coil having a current conducting arm extending in one direction, a second current conducting arm extending in another direction, a leg intermediate to said arms, and removable means to make an electrical connection to said leg comprising a contact member for engaging said leg, a lever, and an associated pressure pad between said leg and said lever for urging said leg toward said contact member and into intimate engagement therewith.

5. A magnetizing apparatus comprising a coil having a branch in one direction, a second branch in another direction and a leg common to said

branches, removable means to make an electrical connection to said leg comprising a contact member for engaging said center leg, a lever, a pressure pad disposed between said lever and said center leg, means for applying force to said lever thereby urging said center leg into intimate engagement with said contact member, and means for maintaining said lever in a stressed position.

6. A magnetizing apparatus comprising a split coil having two opposing branches, one side of one branch and one side of the other branch being merged together to form a common member, means to make an electrical connection to said common member comprising a contact member, a pressure pad engaging said common member, and a lever for applying pressure to said pressure pad to urge said common member into intimate contact with said contact member.

7. A magnetizing apparatus comprising a split coil having two opposing branches, one side of one branch and one side of the other branch being merged together to form a common member, means to make an electrical connection to said common member comprising a contact member, a pressure pad engaging said common member, and a lever for applying pressure to said pressure pad to urge said common member into intimate contact with said contact member, and means secured to said lever for equalizing said pressure.

8. In a magnetizing fixture a set of two U-shaped coil forming members disposed at right angles one to the other, a current conducting lead connected to the base of one of said U-shaped members at its outer surface, a current conducting leg projecting from the base of the other U-shaped member at its inner surface, a second

set of U-shaped members similar to said first set, a second current conducting leg projecting from the second set of U-shaped members in a similar manner to the first leg, and a yoke for connecting the legs to form two sets of split coils.

9. In a magnetizing fixture a set of two U-shaped coil forming members disposed at right angles one to the other, a current conducting lead connected to the base of one of said U-shaped members at its outer surface, a current conducting leg projecting from the base of the other U-shaped member at its inner surface, a second set of U-shaped members similar to said first set, a second current conducting leg projecting from the second set of U-shaped members in a similar manner to the first leg, and a yoke for connecting the legs to form two sets of split coils comprising a contact member, a pair of pressure pads engaging said legs, a pair of levers for applying pressure to said pressure pads to urge said legs into intimate contact with said contact member, and means secured to said levers for equalizing said pressure.

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