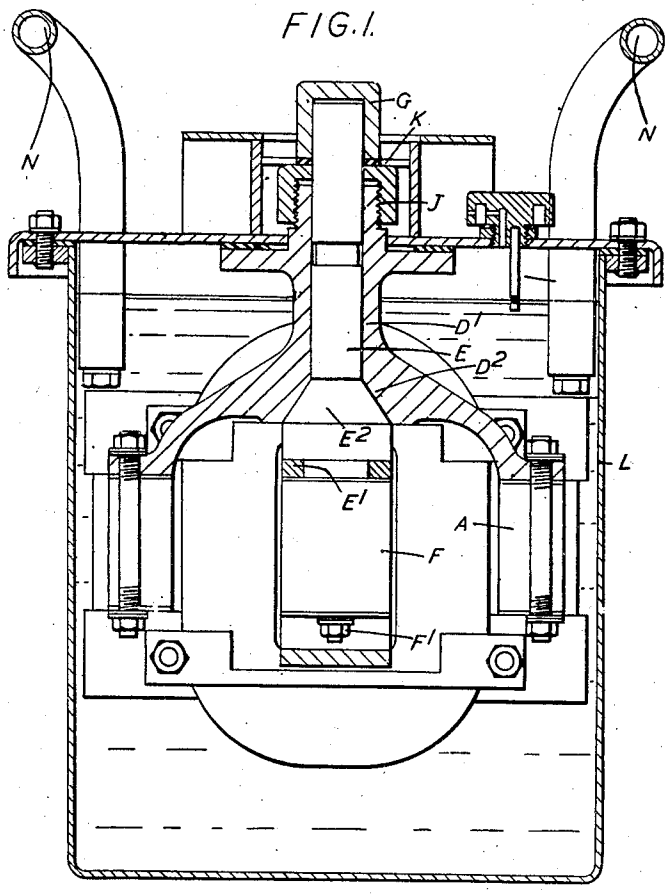
June 25, 1946. J. W. BAYLES ET AL 2,402,721

VARIABLE IMPEDANCE CHOKE

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FIG. 1.



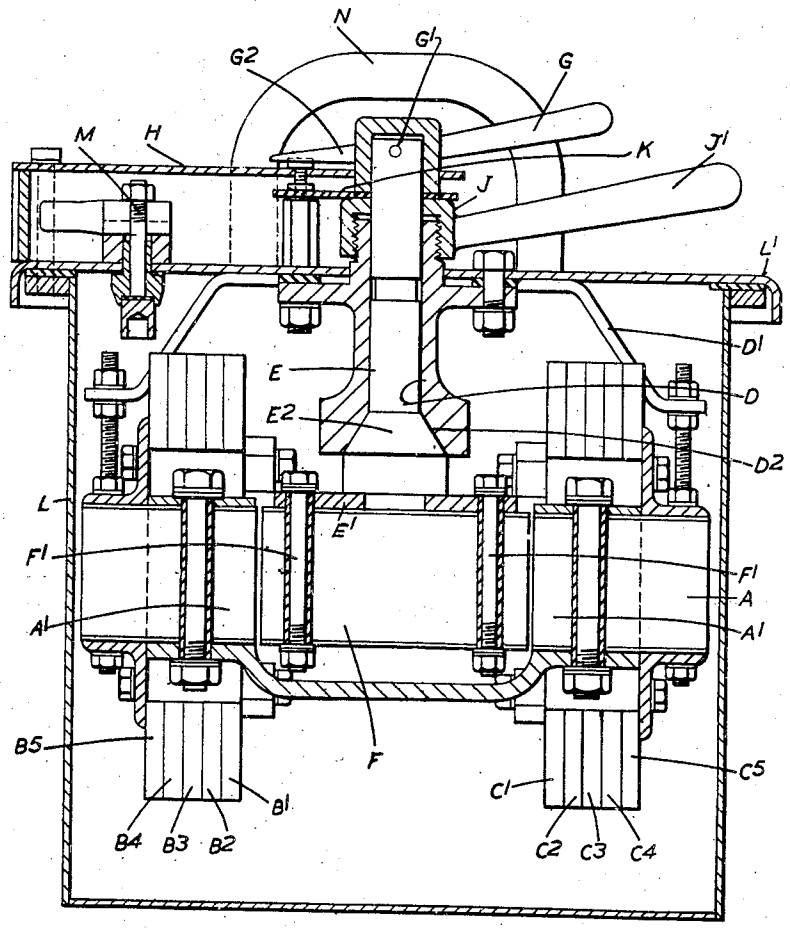
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VARIABLE IMPEDANCE CHOKE

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FIG. 2.



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VARIABLE IMPEDANCE CHOKE

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FIG. 3.

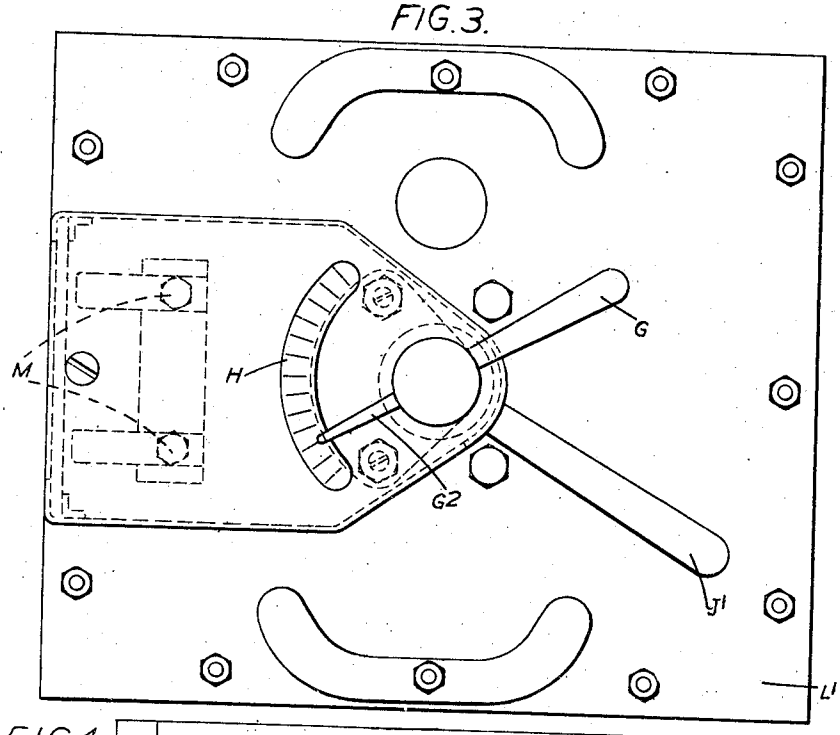
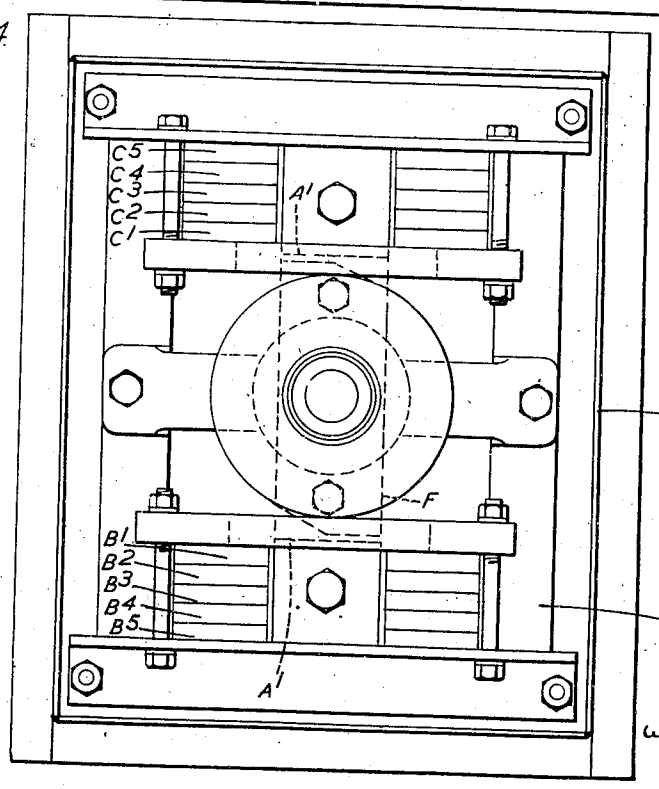


FIG. 4.



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UNITED STATES PATENT OFFICE

2,402,721

VARIABLE IMPEDANCE CHOKE

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Application February 14, 1944, Serial No. 522,312.
In Great Britain March 1, 1943

2 Claims. (Cl. 171—242)

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This invention relates to variable impedance chokes, for example for use as welding regulators.

According to the present invention a variable impedance choke comprises an armature mounted to turn about an axis to vary the reluctance of the magnetic circuit of which it forms a part, and clamping means arranged to clamp the armature against movement or vibration in any direction.

Preferably the armature is provided with a handle arranged so that the length of air gap in the circuit is varied from a maximum to a minimum by turning the handle through a fraction of a revolution.

The armature may have formed on or attached to it a part with a tapered surface engaging a complementary tapered surface of a fixed part, the clamping means serving to force the tapered surfaces axially into wedging engagement. Preferably the tapered surfaces and wedging means are arranged so that outward movement of the armature spindle produces a clamping action whereas inward movement, as by tapping the end of the spindle, frees the tapered surfaces. A spring may be provided tending to urge the tapered surfaces apart.

In one form of regulator hitherto employed the impedance is varied by providing a tapping switch and a number of tappings on the winding. In this type of regulator the impedance is of course varied in steps and not continuously and the arrangement is relatively complicated. In another form a portion of the core is mounted so as to be movable by means of a screw adjusting device. It is however generally necessary to turn the operating handle through a large number of revolutions to vary the impedance from a minimum to a maximum or vice versa, and in addition the movable part of the core is liable to vibration and noise. An object of the present invention is to eliminate these disadvantages of both customary forms of construction.

One specific embodiment of the invention will be described with reference to the accompanying drawings in which

Figures 1 to 4 are respectively front and side elevations and a plan and underplan of a variable choke embodying the invention.

The main portion of the core A is of generally rectangular shape with two pole pieces or projections A^1 extending towards one another from the middles of two of its sides. The choke windings are wound on these projections, an arrangement which tends to minimise heating of the surrounding casing due to leakage flux.

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In order to deal with large currents such as are required for welding, a number of windings B^1, B^2, B^3, B^4, B^5, C^1, C^2, C^3, C^4 and C^5 are connected in parallel to share the current. In order that the current may be shared efficiently the coils connected in parallel should link the same amount of flux but this is difficult to ensure since leakage flux will generally link the coils furthest from the pole tips but not those nearest to them. Thus in accordance with a feature of the invention the coils are connected in series in pairs and the pairs are connected in parallel, and the coil B^1 nearest the pole tip on one side is paired with the coil C^5 furthest from the pole tip on the other side and so on the pairs being B^2 and C^4, B^3 and C^3, B^4 and C^2 and B^5 and C^1. In this way a much closer approximation to balance between the coils is secured. The core is bolted to a brass guide D which affords a bearing D^1 for a stout armature shaft E. The armature F consists of a pack of laminations of elongated rectangular form bolted with insulated bolts F^1 to each other and to a stout plate E^1 which is welded to the end of the armature shaft. The portion of the armature shaft close to the armature is of larger diameter than the remainder and between the two portions is a conical surface E^2 which fits a cooperating conical surface D^2 in the brass guide. At its opposite end the armature shaft projects through the top plate of the casing and carries an operating handle G secured to it by a pin G^1 and having a pointer G^2 to indicate its position. This preferably cooperates with a scale H reading directly in amperes. By means of this operating handle the armature and its shaft can be turned in the air gap between the two pole pieces. The upper part of the brass guide is screwthreaded and on it is screwed a lock nut J having a locking handle J^1 secured to it. This lock nut is interposed between the operating handle and the top of the brass guide so that when the locking handle is turned to screw the lock nut upwardly it pushes upwards on the operating handle and therefore clamps the conical surfaces afforded by the armature shaft and guide firmly into clamping engagement. All working clearances are taken up and the armature is locked against movement or vibration in any direction.

A spring (not shown) may be provided, if desired, to urge the conical surfaces apart to free the clamping action when the clamping handle is slackened off, but if the conical surfaces should for any reason jam in engagement the arrangement is such that a tap on the end of the spin-

dle will free them. To prevent movement of the locking handle from turning the operating handle, a washer K is interposed between them which has extensions clamped by bolts to prevent it from rotating.

The armature is of generally rectangular elongated form having two corners chamfered off to enable it to turn in the air gap without fouling the pole pieces. When the length of the armature is in line with the pole pieces the air gap is reduced to a minimum whereas when it is turned transversely the air gap is a maximum. The armature may be provided with a winding, not shown, for example one or more short circuited turns, to enable the same magnetic circuit to cover different current ranges, or to produce a more convenient variation of impedance with movement of the handle.

The whole assembly is mounted in a casing L to the top plate L^1 of which the brass guide is bolted. The casing may be filled with oil, air or a suitable plastic and is provided with terminals M for external connection and handles N for convenience of lifting.

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

1. A variable impedance choke, comprising a magnetic circuit including a fixed core and an armature mounted for rotation relative to said core to vary the reluctance of said circuit, fixed supporting means for said core, said supporting means having a portion provided with a conical surface, a shaft secured to and supporting said armature for rotation, said shaft extending through said supporting means and having a conical surface for engaging the conical surface of said supporting means, and means for moving said shaft axially to cause a wedging action between said conical surfaces for locking said armature.

2. A variable impedance choke, comprising a magnetic circuit including a fixed core and an armature mounted for rotation relative to said core to vary the reluctance of said circuit, fixed supporting means for said core, said supporting means having a portion provided with a conical surface, a shaft secured to and supporting said armature for rotation, said shaft extending through said supporting means and having a conical surface for engaging the conical surface of said supporting means, and means for moving said shaft axially to cause a wedging action between said conical surfaces for locking said armature; said last means comprising a nut surrounding said shaft and having threaded engagement with said fixed supporting means, thrust-transmitting means acting between said nut and said shaft, and an operating handle for said nut.

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ALEXANDER THORNTON ROBERTSON.