April 10, 1951 W. A. RAY 2,548,239

CORE STRUCTURE FOR ELECTROMAGNETS

Filed May 5, 1947

Fig. 1

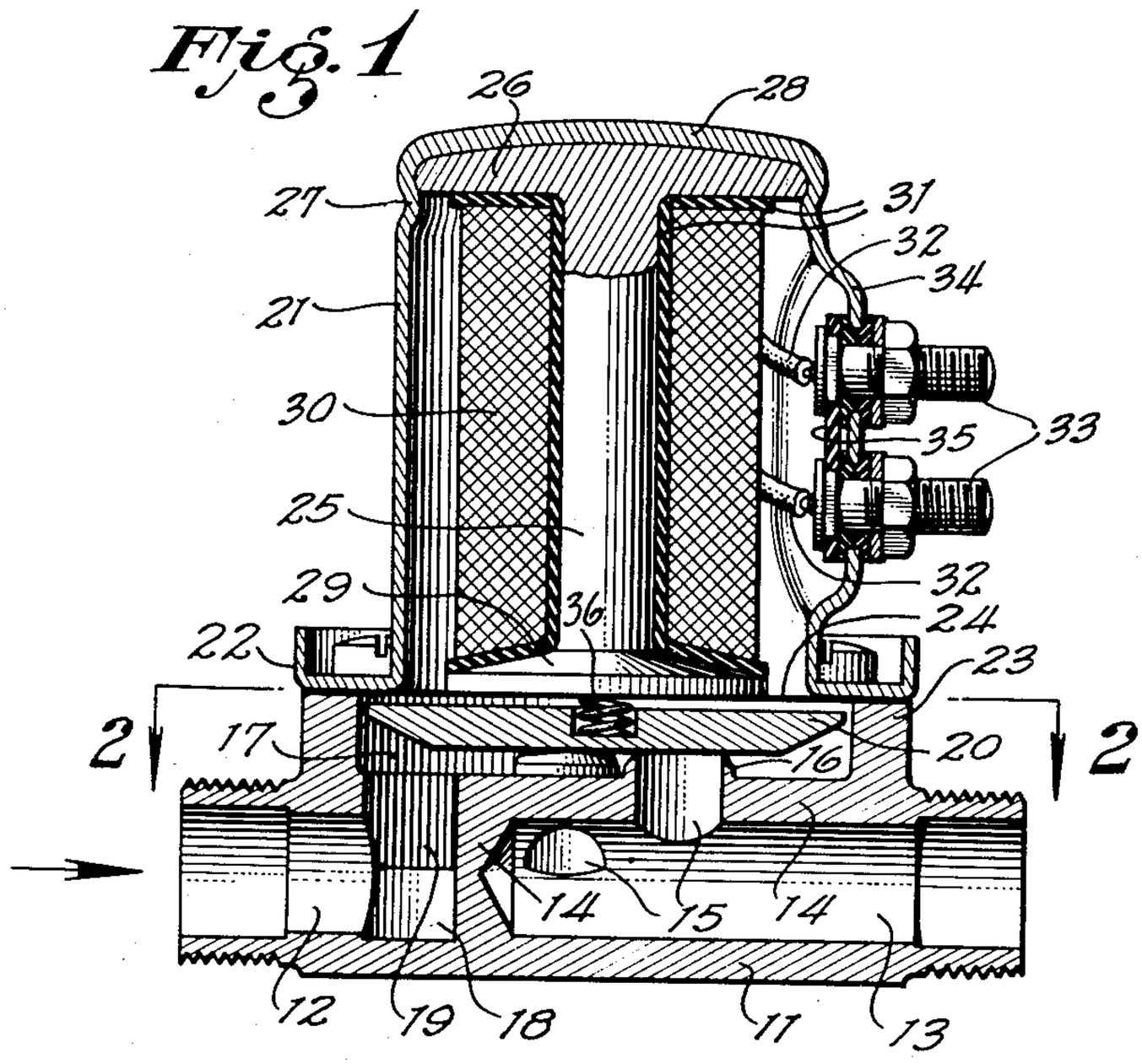
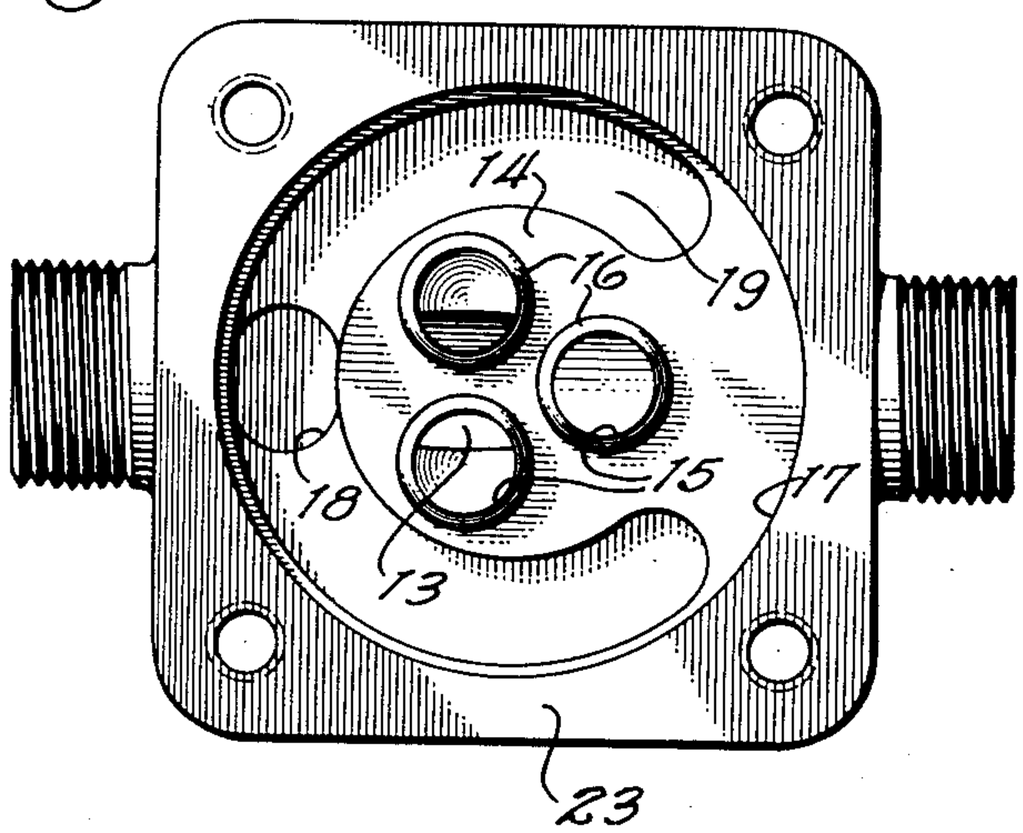


Fig. 2



INVENTOR,
WILLIAM A. RAY

BY John H. Rouse,
ATTORNEY

Patented Apr. 10, 1951

2,548,239

UNITED STATES PATENT OFFICE

2,548,239

CORE STRUCTURE FOR ELECTROMAGNETS

William A. Ray, North Hollywood, Calif., assignor to General Controls Co., Glendale, Calif., a corporation of California

Application May 5, 1947, Serial No. 745,951

9 Claims. (Cl. 175—21)

1

This invention relates to electromagnets, and more particularly to improvements in core structures therefor.

An object of the invention is to provide—in a core structure of the type which comprises a cup-shaped shell and a rod-like core member centrally disposed in the shell and extending from the end wall thereof—means for substantially eliminating any air-gap at the junction of the core member and the shell; this object being accomplished by providing the core member with an integral head which is so enlarged that it is substantially coextensive with the end wall of the shell, and whose surface is shaped to conform exactly to the cooperating surface of the shell end-wall.

Another object is to provide simple but effective means for securing the core-member head in intimate engagement with the shell end-wall.

Another object is to form the core member so that it constitutes a bobbin for the energizing coil.

For full understanding of the invention, and further appreciation of its features and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a sectional view of an electromagnetically operated fluid control valve embodying this invention; and

Figure 2 is a plan of the valve casing shown in Fig. 1, with the armature-closure **20** removed.

Indicated in the drawing by the numeral **11** is a valve casing having an inlet **12** and an outlet **13** separated by a partition **14** having in its horizontal portion three concentrically-arranged ports **15**; the material of the partition being raised around each of the ports to form valve seats **16**. Communication between the inlet **12** and the chamber **17** above the partition is afforded by a vertical opening **18** which leads to a generally-semicircular trough **19** below the chamber and extending around a major portion of the upper part of the partition to permit more uniform distribution of fluid to the several ports. Normally resting on the seats **16** is a disk-like closure **20**.

The closure **20** is of magnetic material so that it also serves as an armature attractable by an electromagnet mounted on the top of the valve casing. This electromagnet comprises a generally-cylindrical cup-shaped shell **21**, formed of magnetic sheet material, which is secured by its flanged bottom portion **22** to the raised side-wall **23** of the valve casing; a thin diaphragm **24**,

2

of material such as 0.005-inch-thick copper, being interposed between these parts to shield the interior of the shell from the fluid in the valve casing, as well as to serve as a non-magnetic separator for the armature.

Centrally disposed within the shell **21** is an elongated round core-member **25** having at its inner or top end an integrally-formed disk-like head **26** around whose rim the material of the side wall of the shell is deformed or rolled, as indicated at **27**, to secure the head in intimate engagement with the inner surface of the end wall **28** of the shell. The top surface of the head **26** is preferably formed as a segment of a sphere of large radius to ensure uniform engagement of their cooperating surfaces when the shell end-wall is stretched over the head by the rolling operation, so that the possibility of there being an air-gap between these surfaces is substantially eliminated.

At the bottom of the core member **25**, and preferably integral therewith, is a disk-like pole piece **29** whose undersurface or pole-face is in the plane of the mouth of the shell; the diameter of the rim of the pole piece being sufficiently smaller than the inner diameter of the shell that a suitable working-gap for the electromagnet is formed adjacent the mouth of the shell. The head **26** and pole piece **29** constitute the core member a bobbin on which an energizing coil **30** is wound, with insulating material **31** therebetween. The leads **32** of the coil are connected to terminal posts **33** insulatingly mounted in openings through a protruded side-portion **34** of the shell; a strap **35**, of insulating material and having square openings cooperating with squared portions of the posts, being provided to prevent rotation of the posts when connections with an external circuit for the electromagnet are made or removed.

Before assembling the core member and coil in the shell, the coil leads are soldered to the terminal posts which are then mounted in place, the leads being relatively long for this purpose. The shell is then placed in a fixture and, with the core member held firmly in position, the side wall of the shell is rolled tightly around the rim of the core-member head so that the end wall of the shell is stretched into intimate engagement with the top surface of the head. If necessary, the pole faces of the shell and the core member are brought into accurate alignment by grinding.

The armature-closure **20** is normally held in sealing engagement with the valve seats **16** by the force of a bias spring **36** compressed between

the armature and the pole piece 29. When the electromagnet is energized by passage of current through its coil, the armature-closure is attracted into engagement with the pole faces of the electromagnet so that the valve ports 15 are uncovered.

The specific embodiment of my invention herein shown and described is susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. A core structure for an electromagnet, comprising: a cup-shaped shell of magnetic sheet material having side walls and an end wall integral therewith; an elongated core member centrally disposed within said shell and in such spaced relation to said side walls of the shell as to define therewith a space for an energizing coil; said core member having an integral enlargement at its inner end forming a relatively thin head substantially coextensive with, and shaped to conform to, the inner surface of said end wall of the shell; and means for securing said head in intimate engagement with said surface.

2. A core structure as defined in claim 1, and wherein said means for securing said head to said end wall of the shell comprises a reentrant portion of the side wall of the shell in engagement with the rim of the head.

3. A core structure as defined in claim 1, and wherein the conforming surfaces of said head and of said end wall of the shell are respectively convex and concave.

4. A core structure for an electromagnet, comprising: a generally-cylindrical cup-shaped shell of magnetic sheet material having a side wall and an end wall integral therewith; an elongated round core member centrally disposed within said shell and of such diameter as to define with said side wall of the shell a relatively-large annular space for an energizing coil; said core member having an integral enlargement at its inner end forming a disk-like head whose diameter is substantially equal to the inner diameter of the shell, the outer surface of said head being shaped to conform to the inner surface of said end wall of the shell; and means for securing said head in intimate engagement with said end wall.

5. A core structure as defined in claim 4, and

wherein said means for securing said head to said end wall of the shell comprises a reentrant portion of the side wall of the shell in engagement with the rim of the head.

6. A core structure as defined in claim 4, and wherein said outer surface of said head forms a segment of a sphere of large radius.

7. A core structure for an electromagnet, comprising: a generally-cylindrical cup-shaped shell of magnetic sheet material having a side wall and an end wall integral therewith; an elongated round core member centrally disposed within said shell and of such diameter as to define with said side wall of the shell a relatively-large annular space for an energizing coil; said core member having an integral enlargement at its inner end forming a disk-like head whose diameter is substantially equal to the inner diameter of the shell, the outer surface of said head being shaped to conform to the inner surface of said end wall of the shell; and means for securing said head in intimate engagement with said end wall; the other end of said core member being enlarged to provide a disk-like pole piece whose face is in the plane of the mouth of the shell, said head and said pole piece constituting the core member a bobbin for said coil.

8. A core structure as defined in claim 7, and wherein said means for securing said head to said end wall of the shell comprises a reentrant portion of the side wall of the shell in engagement with the rim of the head.

9. A core structure as defined in claim 7, and wherein said outer surface of said head forms a segment of a sphere of large radius.

WILLIAM A. RAY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,654,642	Geissinger	Jan. 3, 1928
1,965,053	Powers	July 3, 1934
2,155,358	Cyr	Apr. 18, 1939
2,353,835	Lane et al.	July 18, 1944
2,411,778	De Wilde	Nov. 26, 1946
2,422,260	Ray	June 17, 1947
2,465,036	Ray	Mar. 22, 1949
2,479,398	Parsons	Aug. 16, 1949