Oct. 29, 1946. H. G. WASSERLEIN 2,410,320

SHADED POLE CONSTRUCTION FOR SOLENOIDS

Filed June 28, 1945

FIG. 1.

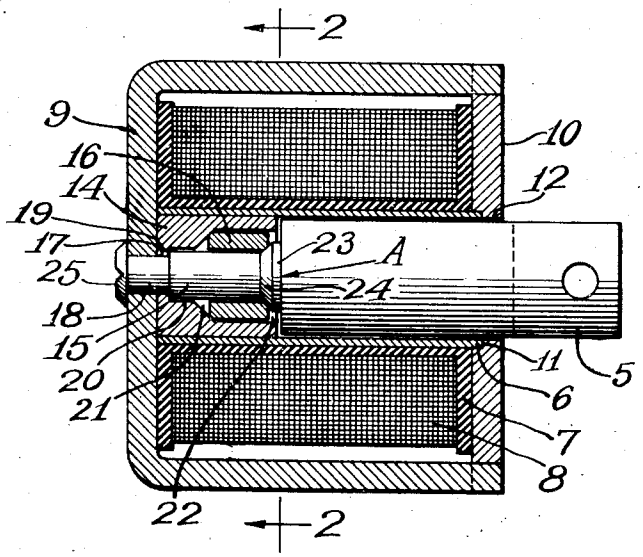
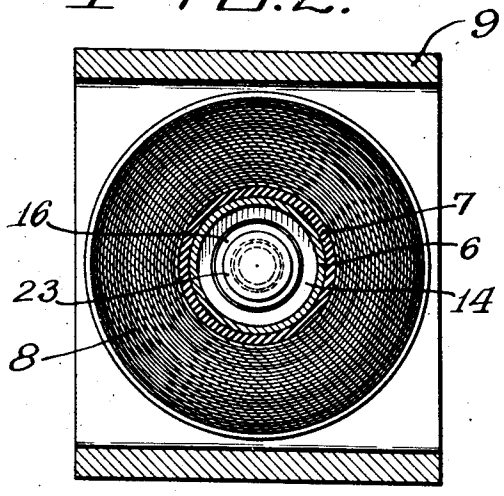


FIG. 2.



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Patented Oct. 29, 1946 2,410,320

UNITED STATES PATENT OFFICE

2,410,320

SHADED POLE CONSTRUCTION FOR SOLENOIDS

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Application June 28, 1945, Serial No. 602,095

5 Claims. (Cl. 175—338)

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The present invention relates to alternating current solenoids. It is the purpose of this invention to provide an improved shaded pole construction for solenoids whereby improved suppression of alternating current hum is obtained without the necessity of special machining.

In the past those designs of shading coil constructions with which I am familiar have required expensive manufacturing practices in order to get a reasonably quiet operation. The designs have been such as to require either milled slots or very close diametrical tolerances where the shading coil engages the plunger stop. In order to obtain a reasonably quiet alternating current solenoid it has been necessary to machine the faces of the plunger stops.

My invention contemplates a novel construction whereby the shading coil is mounted with the plunger stop in such a fashion as to eliminate the expensive procedure above referred to. The novel construction furthermore permanently secures the shading coil tightly so as to eliminate any possibility of vibration while the plunger stop is being secured in the proper position.

The nature and advantages of my invention will appear more fully from the following description and the accompanying drawing wherein a preferred form of the invention is shown. It is to be understood however, that the drawing and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawing:

Figure 1 is a sectional view taken axially through a solenoid embodying my invention, and

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

In the drawing the solenoid plunger is shown at 5. It operates within a brass guide tube 6 which is surrounded by a shell 7 upon which the coil 8 is wound. The frame of the solenoid comprises a strip 9 of iron bent to substantially U-shape and a cross piece 10 closing the open ends of the strip 9. The cross piece 10 is recessed to provide a shoulder 11 for the brass tube 6. The gap between the plunger 5 and the cross piece 10 is illustrated at 12. The clearance at this air gap may be made quite small in order that the reluctance of the gap be held to a minimum.

The principal feature of my invention lies in the combination of a novel plunger stop 14 and its core 15 with a shading coil 16. The stop 14 is set in the bottom of the frame 9. It is provided with a bore that comprises a small portion 17 through which the shank 18 of the core extends. A

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shoulder 19 is provided adjacent the portion 17 of the bore. This shoulder serves as a stop for the large portion of the core 15. The bore is enlarged as indicated at 20 to receive the large portion of the core somewhat loosely. The bore then is flared outwardly as indicated at 21 to provide a larger chamber 22 in which the shading coil 16 is placed. The core 15 has a head 23 thereon which is beveled as shown at 24. In assembly of the parts the core 15 is pressed into the part 14 and the copper ring 16 is deformed by being wedged between the tapered surfaces 21 and 24 until the shoulder on the core reaches the shoulder 17 of the plunger stop. Then the core is staked to the frame by spreading the head as indicated at 25.

This construction is particularly advantageous from a production standpoint. The plunger stop and the core are of such design that they may be turned out on a screw machine with comparatively loose tolerances and completely finished as they are cut off without any necessity for secondary finishing operations. The copper shading coil may be simply a cut off portion of a copper tube. No particular attention may be paid to smoothing any rough edges or corners of this ring. The parts are so dimensioned that when they are loosely assembled the lower end of the core 15 separates from the shoulder 19 in the shell of the plunger stop at a distance of about .040 inch. The head 23 of the core may have a slight burr at the center referred to by the letter A when it is cut off the bar in the screw machine. It is not necessary to finish the surfaces of the head 23 by a secondary operation because this slight burr is swedged down by a hardened punch in the assembly operation.

I have found that a better pull of the solenoid and better suppression of A. C. hum is obtained if the core head 23 projects slightly beyond the shell so that it is the head which engages the plunger rather than the shell. However, reversal of this condition works almost as well.

Having thus fully described my invention, I claim:

1. In a solenoid a frame, a plunger, a guide sleeve for said plunger and a plunger stop secured to the frame comprising a shell having a seat therein, a core having a shoulder engaging said seat, the shell having an enlarged bore, with a tapered wall adjacent the shoulder, the core having a head thereon with a tapered surface opposite the tapered wall, and a shading ring wedged between said tapered surface and said tapered wall.

2. A solenoid comprising a frame, a plunger, said frame having an aperture in one wall to receive the plunger and a plunger stop against the opposite wall, a sleeve guide in the frame for the plunger, a coil around said sleeve, said stop comprising a shell resting against said opposite wall, said shell having a tapered inner wall facing toward the plunger, a core extending through the shell and clamping it to the frame, a head on the core having an enlarged head facing the plunger, and a shading ring wedged between the tapered surface and the head.

3. A solenoid comprising a frame, a plunger, said frame having an aperture in one wall to receive the plunger and a plunger stop against the opposite wall, a sleeve guide in the frame for the plunger, a coil around said sleeve, said stop comprising a shell resting against said opposite wall, said shell having a tapered inner wall facing toward the plunger, a core extending through the shell and clamping it to the frame, a head on the core having an enlarged head facing the plunger, and a shading ring wedged between the tapered surface and the head, the first named walls of the frame having a recess centering the guide sleeve around the aperture.

4. A solenoid comprising a frame, a plunger, said frame having an aperture in one wall to receive the plunger and a plunger stop against

the opposite wall, a sleeve guide in the frame for the plunger, a coil around said sleeve, said stop comprising a shell resting against said opposite wall, said shell having a tapered inner wall facing toward the plunger, a core extending through the shell and clamping it to the frame, a head on the core having an enlarged head facing the plunger, and a shading ring wedged between the tapered surface and the head, the first named walls of the frame having a recess centering the guide sleeve around the aperture, and the shell serving to center the other end of said sleeve.

5. A solenoid comprising a frame, a plunger, said frame having an aperture in one wall to receive the plunger and a plunger stop against the opposite wall, a sleeve guide in the frame for the plunger, a coil around said sleeve, said stop comprising a shell resting against said opposite wall, said shell having a tapered inner wall facing toward the plunger, a core extending through the shell and clamping it to the frame, a head on the core having an enlarged head facing the plunger, and a shading ring wedged between the tapered surface and the head, said head on the core extending beyond the shell toward the plunger whereby to receive the blow of the plunger when it is attracted.

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