Jan. 8, 1946. T. ISEKI 2,392,592

PROCESS OF MANUFACTURING BUILT-UP PERMANENT MAGNETS

Filed Dec. 12, 1940

Fig. 1

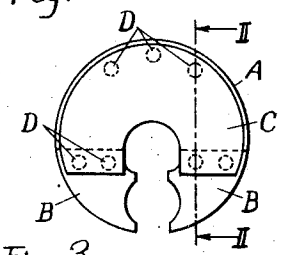


Fig. 2

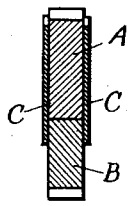


Fig. 3

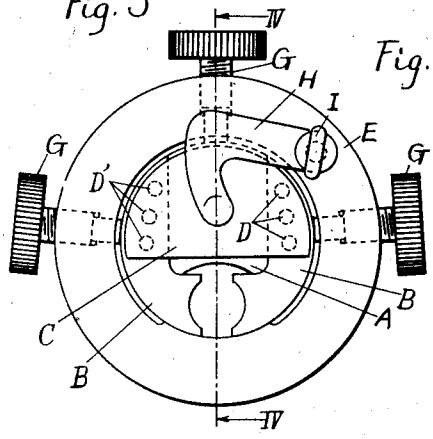
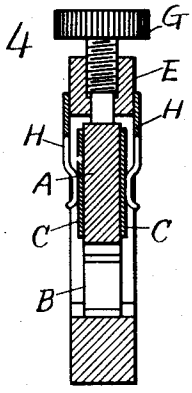


Fig. 4



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PROCESS OF MANUFACTURING BUILT-UP PERMANENT MAGNETS

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Application December 12, 1940, Serial No. 369,882
In Japan December 29, 1939

2 Claims. (Cl. 29—155.59)

This invention relates to improvements in the process of manufacturing a built-up permanent magnet which consists of a piece of magnet and two pieces of soft iron attached to said magnet with one end of each soft iron piece acting as the magnetic pole, and more particularly to the method of building up a permanent magnet, wherein a magnet piece and two soft iron pieces are put together by an intervention of thin non-magnetic metallic plates which are attached to both sides of the magnet and soft iron pieces by electrical spot-welding method, and the tight and close contact of the magnet and soft iron pieces is made by the contraction of the heat-expanded metallic plates.

Hitherto, the elements of the built-up permanent magnet has been put together by means of screws, solder or riveting, but these methods involve such difficulties as drilling and tapping in the soft iron and non-magnetic metallic plates leaving unavoidable and allowable clearance between the contacting surfaces of the magnet and soft iron pieces, thereby causing a considerable magnetic loss. Moreover, these processes are expensive and clumsy because it is not an easy task to get a proper fit of the magnet into the space formed by the soft iron pieces and the covering metallic plates.

The present invention successfully does away with these difficulties, and perfect contact between the magnet and soft iron pieces can be readily and economically attained.

Fig. 1 is a side elevation showing one form of a built-up permanent magnet according to the present invention;

Fig. 2 is a sectional view taken on the line II—II of Fig. 1;

Fig. 3 is a side elevation of another form of the invention showing in addition, means for holding the parts of the magnet in position for permanent attachment to one another, and

Fig. 4 is a sectional view, partly in elevation, taken on the line IV—IV of Fig. 3.

As shown in Figs. 1 and 2 a built-up permanent magnet made according to the present invention, wherein two soft iron pieces B with one end of each as the pole are put together with the permanent magnet piece A by an intervention of two pieces of thin non-magnetic metallic plates C placed so as to cover both sides of the magnet and the soft iron pieces.

To build up the permanent magnet according to this invention, the magnet piece A and the soft iron pieces B are tightly put together in facial contact, and non-magnetic metallic plates C are placed on both sides of the magnet and the soft iron pieces so as to bridge them over. Then the non-magnetic plates alone are heated for a few seconds, and the prearranged elements are electrically spot-welded at the points indicated in the drawing by small dotted circles D. When the non-magnetic metallic plates are cooled, the magnet and the soft iron pieces come to very tight and close contact with each other due to the contraction of the metallic plates. It is necessary that the contacting surfaces of the magnet and the soft iron pieces previously be finally finished to insure close contact.

In the example of Figs. 3 and 4 soft iron pieces B are placed on both ends of the permanent magnet A so that the permanent magnet is held between the soft iron pieces.

E is a frame of the device made of a metallic circular ring. G are set screws radially provided on the frame of the device the inner ends of the screws being extended into the inside of the frame.

A spring arm H is pivoted on each surface of the frame. This spring arm can be swung by means of a knob I, and when it is swung outwardly its free end rides on the surface of the frame.

To practise this invention, the elements, that is, permanent magnet A, soft iron pieces B and covering plates C are inserted in the frame of the device as illustrated in the Figures 3 and 4, and the permanent magnet and the soft iron pieces are put together tightly by means of the set screws and the non-magnetic metallic plates C are properly held on the surface of the magnet and soft iron pieces in such a way as to bridge over the contacting lines of the pieces by means of the spring arm H.

When the necessary prearrangements are completed, one end of the covering plates on both sides is spot-welded to one of the soft iron pieces at the points marked D'. Then the covering plates are heated by a gas burner, for example, for a few seconds, and the other end of the covering plates while still hot are spot-welded to the other soft iron piece at the points marked D.

In the illustrated instance in Figs. 3 and 4 the magnet A and the non-magnetic metallic plates C are not welded together, because the soft iron pieces hold the magnet so tightly due to the contraction of the plates that the welding becomes unnecessary, but the direct welding to the magnet may be used wherever such method is deemed desirable, depending upon the sizes and shapes of the built-up magnet.

The built-up permanent magnet manufactured

by this new process contains no screws, neither is it riveted nor soldered. This is a new product as a built-up permanent magnet per se.

What I claim is:

1. A manufacturing process of a built-up permanent magnet wherein a soft iron piece is attached in facial contact to opposite poles of a permanent magnet piece, and non-magnetic plates are placed to cover opposite sides of said permanent magnet and soft iron pieces, and said plates are spot welded to one of the pieces at one side of a facial contact and heated and while hot, welded to another of said pieces at the opposite side of said facial contact so that tight facial contact is attained by the contraction of the metal plates.

2. A manufacturing process of a permanent magnet wherein two soft iron pieces are attached in facial contact to a permanent magnet piece at opposite poles, the faces of contact being approximately parallel, non-magnetic plates are placed on opposite sides of said permanent magnet and soft iron pieces and said plates are spot welded to one of said soft iron pieces and heated and while hot, spot welded to the other of said soft iron pieces so that the permanent magnet piece is firmly held between the soft iron pieces on contraction of the metal plates.

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