

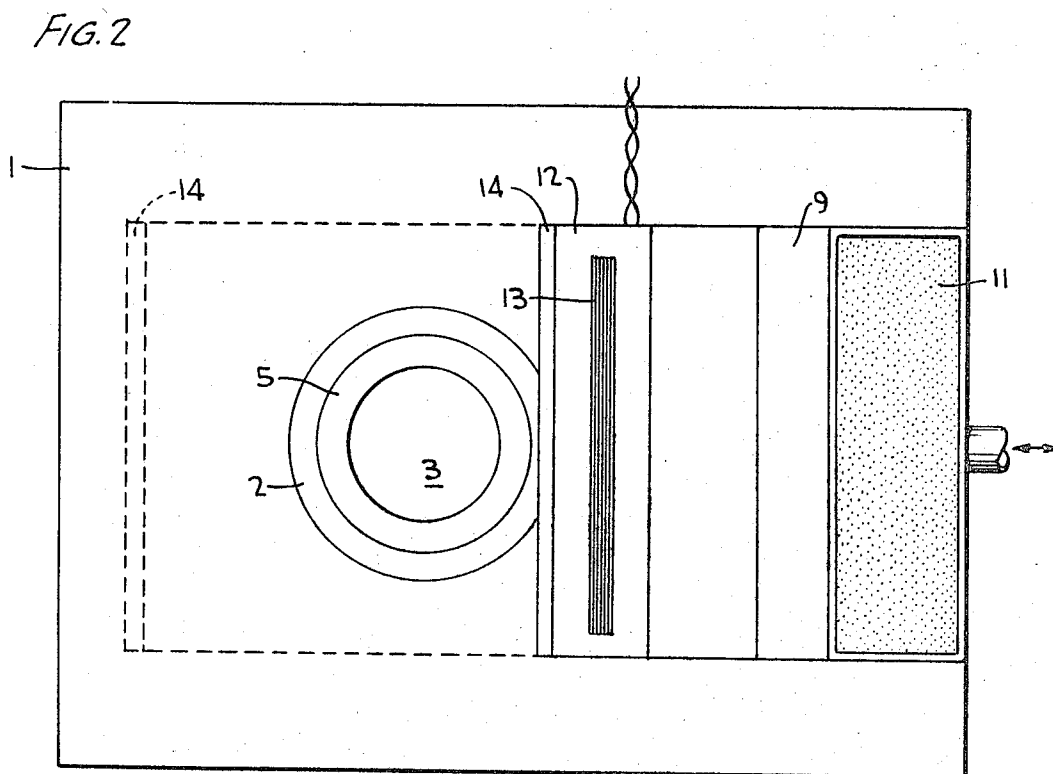
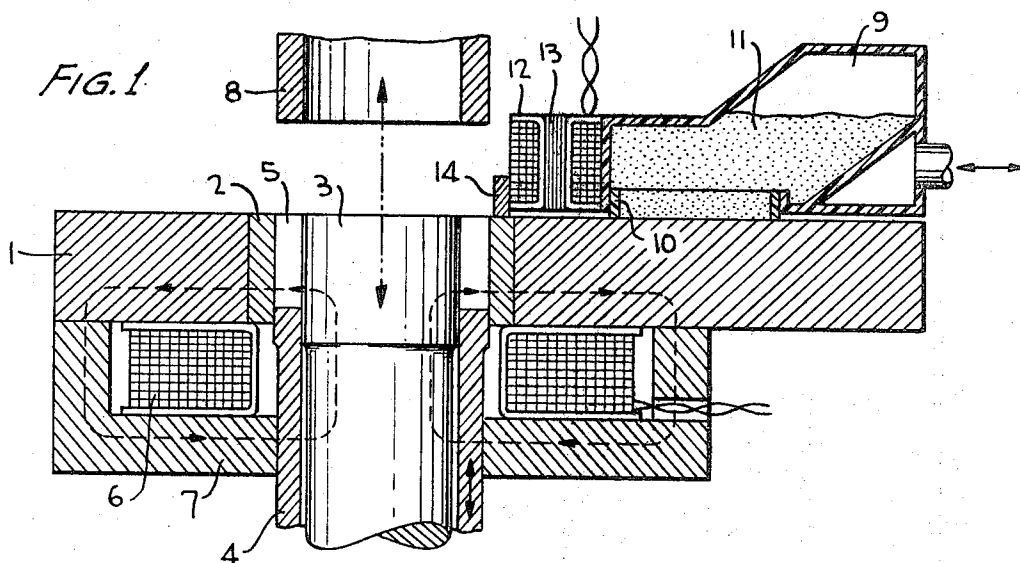
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AUTOMATIC PRESSING TOOL FOR ANISOTROPIC PERMANENT MAGNETS

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AUTOMATIC PRESSING TOOL FOR ANISOTROPIC PERMANENT MAGNETS

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5 Claims

ABSTRACT OF THE DISCLOSURE

An automatic press for making permanent magnets from magnet powder wherein a mold has an opening for receiving the magnet powder, a press ram for pressing the magnet powder and an electromagnetic means for establishing a magnetic field while the magnet powder is being pressed; the magnet powder is fed into the mold opening by means of a filling device carrying a quantity of the magnet powder, and a demagnetizing coil operatively connected to the filling device demagnetizes the adjacent parts of the pressing tool after each stock of the ram.

BACKGROUND OF THE INVENTION

The invention concerns an automatic pressing tool for anisotropic permanent magnets which are produced from a magnet powder which may also include a binder.

In the case of such pressing tools, the prior art arrangements have caused great difficulties with respect to filling the press hole repeatedly with equal quantities of magnet powder. During use of such prior art devices, the parts of the pressing tool surrounding the press hole are magnetized through the magnetic field applied during pressing, causing magnetic poles to develop at the edges; a certain amount of magnet powder will adhere to these edges, forming at times a bridge across the press hole and preventing the equal flowing-in of the magnet powder into the press hole. This phenomenon occurs particularly in the case of pressing tools for thin-walled elements.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to solve the problem associated with prior art devices.

Another object of this invention is to provide an automatic pressing tool with a faultless operation by demagnetization of the pressing tool.

This invention has another object in that a demagnetizing coil is attached to the filling device for an automatic pressing tool for unitary movement and energization with the filling device.

The present invention is summarized in an automatic press for making permanent magnets from magnet powder wherein a magnet-forming mold has aperture means for receiving the magnet powder, ram means for pressing the magnet powder, electromagnetic means associated with the mold and establishing a magnetic field in which the magnet powder is pressed, a filling device carrying the magnet powder is transversely movable for filling the aperture means, and demagnetizing means is carried by the filling means to cause demagnetization of the adjacent parts of the automatic press.

Other objects and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross section of an automatic press em-

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bodying the present invention and with the press rams being partially shown; and

FIG. 2 is a top plan view of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As is illustrated in FIG. 1, the present invention is embodied in an automatic press, parts of which have been omitted for the sake of brevity. The automatic press includes a base plate 1 having a pressing matrix 2 in the form of an annulus or sleeve. The inner surface of the matrix 2 defines the outer wall of a circular aperture 5, the inner wall of which is defined by a fixed middle ram 3; the lower wall of the press hole 5 is defined by the upper surface of a lower press ram 4 which is movable up and down as viewed in FIG. 1. After being filled with magnet powder the press hole 5 is subject to a radial magnetic field created by means of the field coil 6, which magnetic field has a magnetic flux as generally shown in the broken lines of FIG. 1. The magnetic flux is shown as passing through the fixed middle ram 3, the press hole 5, the matrix 2, the base plate 1 and through the ground pot 7 made of soft iron. The pressing process is carried out by means of the upper ram 8 which has the same cylindrical configuration as the press hole 5 and is movable up and down as viewed in FIG. 1. After the pressing process, the pressed article in the form of a permanent magnet annulus is ejected from the base plate 1 by means of the upward movement of the lower ram 4 which reciprocates back to its original position so that the press hole 5 will again be free.

The filling device 9 is slidably mounted on the top of the base plate 1 and reciprocates from the right as viewed in FIG. 1. A seal 10 is disposed adjacent the outlet of the filling device 9 and is in engagement with the top surface of the base plate 1 so that the loose magnetic powder 11 is retained in the filling device until it is aligned with the press hole 5. The trailing edge of the filling device 9 is secured to a reciprocating shaft which affects a reciprocal movement of the filling device by any suitable power means (not shown). The front portion of the filling device carries a demagnetizing coil 12 having a core 13 made of laminated iron. A buffer strip 14 made of felt or sponge rubber is attached to the forward portion of the demagnetizing coil 12 to define the leading edge of the filling device 9 and to push an ejected molded article to the left as viewed in FIG. 1.

During the normal sequence of operation of the automatic pressing tool, a switch (not shown) energizes the demagnetizing coil 12 in response to initial movement of the filling device 9 to the left as viewed in FIG. 1. During its leftward movement, the adjacent portions of the base plate 1 surrounding the pressing hole 5 are subject to an alternating magnetic field of at first rising then declining strength and as a result will be completely demagnetized. As is illustrated in FIG. 2, the filling device 9 traverses the base plate 1 to an extreme position as indicated by the dashed lines for the buffer strip 14. During such leftward movement, the press hole 5 is completely filled with the magnet powder 11 which is permitted to drop freely into such hole and fill it evenly. The filling device 9 is thereafter returned to its original position as shown in FIG. 1 after which the upper ram 8 moves downwardly to compress the powder into press hole 5. During such downward movement, the electromagnetic coil 6 is energized by a suitable switch (not shown) creating the radial magnetic field which affects alignment of the particles in the magnetic powder as it is being pressed by the upper ram 8.

After the permanent magnet is formed, the ram 8 is retracted upwardly and the lower ram 4 moves upwardly

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(as is viewed in FIG. 1) to affect the permanent magnet from the matrix 2. The above arrangement has the particular advantage in that the demagnetizing device does not have to be changed during the replacement of different pressing matrixes in the primary mold. Accordingly, all parts of the pressing tool are demagnetized, which are transversed by the iron coil 13 during the movement of the filling device 9.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In an automatic press for making permanent magnets from magnet powder, the combination comprising a magnet-forming mold having aperture means for receiving magnet powder, ram means for pressing the magnet powder, electromagnetic means associated with said mold and establishing a magnetic field in which the magnet powder is pressed, filling means transversely movable to said aperture means and carrying a quantity of magnet powder for supplying said aperture means, and demagnetizing means carried by said filling means and demagnetizing adjacent parts of the automatic press.
2. The invention as recited in claim 1 wherein said demagnetizing means comprises an A.C. coil energized

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in response to transverse movement of said filling means.

3. The invention as recited in claim 2 wherein said A.C. coil is mounted on a front portion of said filling means.

4. The invention as recited in claim 3 wherein said filling means includes an opening for supplying magnet powder to said aperture means and a seal for said opening engaging a surface of said mold.

5. The invention as recited in claim 4 wherein said filling means includes a buffer strip on its leading edge to remove articles ejected from said aperture means.

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