

propensity to enlarge the size of magnet blocks to be cutoff machined, indicating an increased depth of cut. When a magnet block has an increased height, the effective diameter of the cutoff abrasive blade, that is, the distance from the rotating shaft or spacer to the outer periphery of the blade (corresponding to the maximum height of the cutoff abrasive blade available for cutting) must be increased. Such larger diameter cutoff abrasive blades are more liable to deformation, especially axial runout. As a result, a rare earth magnet block is cut into pieces of degraded shape and dimensional accuracy. The prior art uses thicker cutoff abrasive blades to avoid the deformation. Thicker cutoff abrasive blades, however, are inconvenient in that more material is removed by cutting. Then the number of magnet pieces cut out of a magnet block of the same size is reduced as compared with thin cutoff abrasive blades. Under the economy where the price of rare earth metals increases, a reduction in the number of magnet pieces is reflected by the manufacture cost of rare earth magnet products.

Citation List

Patent Document 1: JP-A 10-175172
 Patent Document 2: JP-A 07-171765
 Patent Document 3: JP-A 05-92420
 Patent Document 4: JP-A 2010-110850
 Patent Document 5: JP-A 2010-110851
 Patent Document 6: JP-A 2010-110966

DISCLOSURE OF INVENTION

~~An object~~Embodiments of the invention ~~is seek~~ to provide a method for cutoff machining a rare earth magnet block having a substantial height into a multiplicity of pieces at a high accuracy, using a multiplicity of thin cutoff abrasive blades having a reduced effective diameter.

Embodiments of ~~The the~~ invention ~~is are~~ directed to provide a method for multiple cutoff machining a rare earth magnet block using a multiple blade assembly including a plurality of cutoff abrasive blades coaxially mounted on a rotating shaft at axially

spaced apart positions, each said blade including a core in the form of a thin disk or thin doughnut disk and a peripheral cutting part on an outer peripheral rim of the core. The cutoff abrasive blades are rotated to cutoff machine the magnet block into a multiplicity of pieces. The inventor has found that the object is achievable by starting the machining operation from the upper surface of the magnet block downward, interrupting the machining operation before the magnet block is divided into pieces, turning the magnet block upside down, placing the magnet block such that the cutoff grooves formed before and after the upside-down turning may be vertically aligned with each other, and restarting the machining operation from the upper surface of the upside-down magnet block downward to form cutoff grooves in the magnet block until the cutoff grooves formed before and after the upside-down turning merge with each other, thereby cutting the magnet block into pieces. Only the addition of the simple step of turning the magnet block upside down ensures that a rare earth magnet block having a substantial height is cutoff machined into a multiplicity of pieces at a high accuracy and productivity, using a multiplicity of thin cutoff abrasive blades having a reduced effective diameter.

Accordingly ~~to an aspect of the invention, there is~~ provides provided a method for multiple cutoff machining a sintered rare earth magnet block using a multiple blade assembly ~~including~~ comprising a plurality of cutoff abrasive blades coaxially mounted on a rotating shaft at axially spaced apart positions, each said blade ~~including comprising~~ a core in the form of a thin disk or thin doughnut disk and a peripheral cutting part on an outer peripheral rim of the core, the method ~~including comprising~~ the step of rotating the cutoff abrasive blades to cutoff machine the magnet block into pieces. The method further ~~includes comprising~~ the steps of starting the machining operation from the upper surface of the magnet block downward to form cutoff grooves in the magnet block, interrupting the machining operation before the magnet block is cut into pieces, turning the magnet block upside down,

the connection between upper and lower side cutoff grooves. In one embodiment, the side surface of the magnet block which is not subject to the machining operation is a reference plane, the magnet block is turned upside down such that the reference planes
5 may be aligned with each other before and after the upside-down turning. In an alternative embodiment, a jig for securing the magnet block in place is disposed such that a side surface of the jig is parallel to the cutting plane of the magnet block, the side surface is a reference plane, and the jig is turned upside down
10 such that the reference planes may be aligned with each other before and after the upside-down turning. In these embodiments, the step at the connection between upper and lower side cutoff grooves is minimized.

When a rare earth magnet block is cut into pieces by
15 machining from both upper and lower directions, the effective diameter of the cutoff abrasive blades can be reduced to less than the height of the rare earth magnet block, and even to about half of the height of the rare earth magnet block. Then the space that must be defined around the magnet block for allowing the cutoff
20 abrasive blades to move may be reduced. Then the size of the cutoff machining system may be reduced. In a further embodiment wherein the jig is designed to secure the magnet block by clamping at the opposite sides of the magnet block surface subject to machining, the length of slits which are formed in the jig to
25 allow for entry of the cutoff abrasive blades may be reduced. From this aspect, the jig and hence the cutoff machining system can be reduced in size.

ADVANTAGEOUS EFFECT OF INVENTION

30 Using a multiplicity of thin cutoff abrasive blades having a reduced effective diameter, a rare earth magnet block having a substantial height can be cut into a multiplicity of pieces at a high accuracy. The method according to embodiments of the invention ~~is~~ can be of great worth in the industry.