What is claimed is:

1. A flux cored wire for gas shielded arc welding, the flux being filled into a steel outer sheath, wherein

the flux contains acid-soluble Mg,

a content of the acid-soluble Mg in a first flux component having a particle diameter of 75 μm or less in the flux is set at 0.1 to 5% by mass relative to the total mass of the first flux component,

a content of the acid-soluble Mg in a second flux component having a particle diameter of more than 75 μm and 106 μm or less in the flux is set at 0.1 to 7% by mass relative to the total mass of the second flux component, and

a content of the acid-soluble Mg in a third flux component having a particle diameter of more than 106 μm in the flux is set at 1 to 15% by mass relative to the total mass of the third flux component.

2. The flux cored wire for gas shielded arc welding according to claim 1, wherein a flux filling ratio is in a range of 10 to 25% by mass relative to the total mass of the wire.

3. The flux cored wire for gas shielded arc welding according to claim 1 or 2, wherein the acid-soluble Mg is contained in a content of 0.05 to 1.0% by mass relative to the total mass

of the wire.

4. The flux cored wire for gas shielded arc welding according to claim 1 or 2, comprising, relative to the total mass of the wire:

1 to 10% by mass of at least one of Ti and Ti compound(s) in total in terms of Ti;

0.5 to 2% by mass of at least one of Si and Si compound(s) in total in terms of Si;

1.0 to 3.0% by mass of Mn; and

0.02 to 0.15% by mass of C, wherein

a P content is restricted to 0.030% by mass or less, and

a S content is restricted to 0.030% by mass or less.

5. The flux cored wire for gas shielded arc welding according to claim 1 or 2, further comprising, relative to the total mass of the wire:

0.05 to 0.5% by mass of at least one of Na compound(s), K compound(s) and Li compound(s) in total in terms of Na, K and Li, respectively; and

0.05 to 0.3% by mass of F compound(s) in terms of F.

6. The flux cored wire for gas shielded arc welding according to claim 1 or 2, further comprising, relative to the total mass of the wire:

0.5% by mass or less of at least one of Zr and Zr compound(s) in total in terms of Zr.

7. The flux cored wire for gas shielded arc welding according to claim 1 or 2, further comprising, relative to the total mass of the wire:

0.05 to 1.0% by mass of at least one of Mg and Mg compound(s) in total in terms of Mg.

8. The flux cored wire for gas shielded arc welding according to claim 1 or 2, further comprising, relative to the total mass of the wire:

0.005 to 0.050% by mass of at least one of Bi and Bi compound(s) in total in terms of Bi.

9. The flux cored wire for gas shielded arc welding according to claim 1 or 2, further comprising, relative to the total mass of the wire, at least one selected from the group consisting of:

Cu: 0.5% by mass or less;

Ni: 3.0% by mass or less;

Cr: 0.5% by mass or less;

Mo: 0.5% by mass or less;

Nb: 0.2% by mass or less;

V: 0.2% by mass or less;

at least one of B and B compound(s): 0.0001 to 0.0100% by mass in total in terms of B; and

rare earth metal(s)(REM(s)): 0.01 to 0.5% by mass.

10. The flux cored wire for gas shielded arc welding according to claim 1 or 2, wherein

a Fe content is 77% to 94% by mass, relative to the total mass of the wire.