chromium alloys tend to exhibit metastable FCC structures at room temperature, up to the TT. On the other hand, the transformation occurs easily under the action of mechanical stress, by the aforementioned process, up to the TT.

The prior art of greatest relevance to this invention is United States. Patent No. 5,002,731 (Mar. 26, 1991), the inventors being Paul Crook, Aziz I. Asphahani, and Steven J. Matthews. The commercial embodiment of this patent is known as ULTIMET® alloy. United States Patent No. 5,002,731 discloses a cobalt-based alloy containing significant quantities of chromium, nickel, iron, molybdenum, tungsten, silicon, manganese, carbon, and nitrogen. The patent discloses an unanticipated benefit of carbon (augmented by the presence of nitrogen at a similar level) in the alloy with regard to both cavitation erosion resistance and corrosion resistance. Furthermore, the patent reveals that the influence of nickel on cavitation erosion, at least, was not powerful over the content range 5.3 to 9.8 wt.%. The experimental, wrought materials used in the discoveries of Crook et al. were made by vacuum induction melting, electro-slag re-melting, hot forging and hot rolling (to sheets and plates), and by subsequent solution annealing. Interestingly, a maximum nitrogen content of 0.12 wt.% was claimed due to the fact that a higher level of 0.19 wt.% caused cracking problems during wrought processing.

SUMMARY

In one aspect of the disclosure, there is provided a cobalt-based alloy resistant to high speed/self-coupled sliding wear consisting essentially of 0.83 wt.% nickel, 0.125 wt.% nitrogen, 26.85 wt.% chromium, 4.58 wt.% molybdenum, 2.33 wt.% tungsten, 2.97 wt.% iron, 0.84 wt.% manganese, 0.27 wt.% silicon, 0.065 wt.% carbon, and 0.11 wt.% aluminum, and the balance cobalt plus impurities wherein the alloy has a coefficient of friction between 0.2 and 0.3 at a load of 20N when tested using a pin-on disk method of ASTM Standard G99.

In another aspect of the disclosure, there is provided a cobalt-based alloy resistant to high speed/self-coupled sliding wear consisting essentially of:

0.4546 to 1.2054 wt.% nickel,
0.101 to 0.149 wt.% nitrogen,
25.31 to 28.39 wt.% chromium,
4.04 to 5.12 wt.% molybdenum,
1.79 to 2.87 wt.% tungsten,
1.93 to 4.01 wt.% iron,
0.586 to 1.094 wt.% manganese,
0.03 to 0.51 wt.% silicon,
0.041 to 0.089 wt.% carbon, and
0.0346 to 0.1854 wt.% aluminum, and
the balance cobalt plus impurities;

wherein the alloy has a coefficient of friction between 0.2 and 0.3 at a load of 20N when tested using a pin-on disk method of ASTM Standard G99.

We have discovered that a wrought, low-nickel derivative of the commercial example of the alloy disclosed in United States Patent No. 5,002,731 possesses extraordinary resistance to high speed sliding wear, when self-coupled, relative to the original material and to a material with an intermediate nickel content. The influence of nickel is non-linear, and therefore counter to the current theories of cobalt-based alloy metallurgy and tribology (i.e. science of wear). This extraordinary property was achieved at a nickel content of approximately 0.83 wt.% and a

We claim:

1. A cobalt-based alloy resistant to high speed/self-coupled sliding wear consisting essentially of 0.83 wt.% nickel, 0.125 wt.% nitrogen, 26.85 wt.% chromium, 4.58 wt.% molybdenum, 2.33 wt.% tungsten, 2.97 wt.% iron, 0.84 wt.% manganese, 0.27 wt.% silicon, 0.065 wt.% carbon, and 0.11 wt.% aluminum, and the balance cobalt plus impurities wherein the alloy has a coefficient of friction between 0.2 and 0.3 at a load of 20N when tested using a pin-on disk method of ASTM Standard G99.

2. The alloy of claim 1 wherein the alloy is in a form selected from the group consisting of plates, sheets, bars, tubes, wires, billets, castings, weldments, weld overlays, and powder products.

3. A cobalt-based alloy resistant to high speed/self-coupled sliding wear consisting essentially of:

0.4546 to 1.2054 wt.% nickel,

0.101 to 0.149 wt.% nitrogen,

25.31 to 28.39 wt.% chromium,

4.04 to 5.12 wt.% molybdenum,

1.79 to 2.87 wt.% tungsten,

1.93 to 4.01 wt.% iron,

0.586 to 1.094 wt.% manganese,

0.03 to 0.51 wt.% silicon,

0.041 to 0.089 wt.% carbon, and

0.0346 to 0.1854 wt.% aluminum, and

the balance cobalt plus impurities;

wherein the alloy has a coefficient of friction between 0.2 and 0.3 at a load of 20N when tested using a pin-on disk method of ASTM Standard G99.

4. The alloy of claim 3 wherein the alloy is in a form selected from the group consisting of plates, sheets, bars, tubes, wires, billets, castings, weldments, weld overlays, and powder products.