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STEEL DIE BLOCK

Pierre François Marie Aubert, Paris, France, assignor to The Nitralloy Corporation, a corporation of Delaware

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For the making of steel die blocks to be used in the shaping of objects by a series of stamping or pressing operations, two kinds of steel alloys have in general been employed; carbon steel with high carbon content for the making of small and medium sized die blocks and chromium-nickel steel alloys of varying composition to make larger die blocks. The die blocks made from the known alloys are useful for a certain number of die-shaping operations, which number generally can not be exceeded. My invention relates to die blocks which can be used for a great many more operations than the old ones, before their usefulness is lost. The object is attained by making the die blocks out of a steel alloy susceptible to nitriding, and then nitriding the same at least on the working surfaces. The invention includes, in addition to die blocks, other articles which in their normal use are subjected to high pressures and shocks on their working surfaces.

As illustrative of the invention, a die block may for example be made in the following manner. First a suitable blank is formed out of a suitable chromium-aluminum steel alloy,—for example, an alloy with 0.4% carbon, 1.7% chromium, 1.1% aluminum, 0.45% nickel and 0.2% molybdenum. The blank is then heated and the working surface is formed. The die block thus produced is then heated to 875° C. and quenched in oil and then tempered by drawing to about 500° C. In order to prevent scaling of the working surfaces of the die, they are packed with charcoal and covered with a steel plate. At the end of the above treatment the die block showed a hardness of about 330 according to the Brinell scale, which hardness as will be readily understood will not be affected, except for the surfaces actually nitrided, by the subsequent nitriding treatment. As a consequence the core hardness of the finished nitrided die block will be around the value obtained in the tempering treatment. After the above treatment every trace of scale, which could prevent nitriding, was very carefully removed with emery cloth and the die block was then nitrided for about 100 hours at a temperature of 500° C.

With a die block prepared as above, about 6000 operations were performed, after which the die block had the appearance of an unused one, and showed no trace of wear; while die blocks previously made from carbon steel, after 3000 operations would be useless because of excessive wearing away. The fact that die blocks made according to the invention possess such extraordinary durability during use is probably explained by the fact that the very hard nitrided outer layer is supported by the deeper underlying core portions, which have as above indicated a very considerable hardness and hence great resistance to penetration by the harder nitrided case when the latter is subjected to impacts.

While I have referred throughout only to die blocks, it is obvious that any mechanical element which in use is subjected to repeated and severe mechanical shock, can be so made. Forging hammers, or the forging faces thereof, and similar impact elements are representative examples, other than die blocks falling within the present invention.

I claim:

1. An article which in its normal use is subjected to high pressures or shocks; said article being made of an alloy comprising, in addition to iron, the following elements in substantially the proportions noted; 0.4% carbon, 1.1% aluminum, 1.7% chromium, 0.45% nickel, and 0.2% molybdenum, and having a nitride hardened working surface and a heat treated core portion, said core portion having a hardness of about 330 or more Brinell.

2. A steel die block of the class described, made of an alloy comprising, in addition to iron, the following elements in substantially the proportions noted; 0.4% carbon, 1.1% aluminum, 1.7% chromium, 0.45% nickel, and 0.2% molybdenum, said block having a nitride hardened working surface and a core hardened by heat treatment.

3. An article which in its normal use is subjected to high pressures or shocks; said article consisting of a steel alloy containing approximately 1.1% of aluminum and approximately 1.7% of chromium, together with smaller proportions of nickel and molybdenum, and having a nitride hardened surface and a heat treated core portion, said core portion having a hardness of about 330 or more Brinell.

PIERRE FRANÇOIS MARIE AUBERT.