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CHILL IRON ALLOY CASTINGS

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This invention relates to castings and more particularly to chill cast iron alloy castings, having a part of the casting, adapted for wear, made of chilled iron.

Broadly the invention comprehends the production of cast articles formed by casting specific iron alloy analysis compositions against chill plates to form castings having extreme hardness and abrasive wear resistant surfaces in the white chilled portion thereof and gray iron adjacent the chilled portion.

Internal combustion engine valve tappets and like articles having surfaces thereof subject to abrasive wear have been devised and used commercially over a great period of time but have not been of a metallic composition as chilled at the wear surfaces to provide all that might be desired so as to render said articles practically service-free or afford a long life therefor. The invention as herein set forth makes use of a specific iron alloy analysis such that in the use thereof in producing a chilled white iron casting provides a very hard chilled surface having high abrasive wear resistance and which will not spall or fatigue in present day engines in conjunction with present day detergent oils used therein. It is thus the basic object of this invention to provide an article of specific iron alloy analysis at least a portion of which is cast against a chill plate to produce a reasonably inexpensive article capable of having its chilled surface withstand abrasive wear.

The presently devised chilled iron alloy casting is intended primarily for engine valve tappet structures wherein one end or head surface thereof is subject to abrasive wear by reason of engagement of the engine cam against said surface in the actuation of said tappet against spring pressure imposed upon said tappet. In so utilizing an iron alloy of specific analysis together with the chill casting of at least a portion of a specific article therefrom, an article having a chilled surface of very good wear characteristics is achieved. It is conceivable that such an article could take any of various shapes aside from tappets if like surfaces are desired subject to impact or heavy pressure.

The composition so utilized in carrying out this invention, that of a chilled casting of iron, is characterized by its strength, hardness and toughness, properties desired in parts subject to wear and containing the following:

	Percent
Silicon	2.40–3.05
Manganese	.70–1.10
Carbon	3.20–3.65
Molybdenum	.50–1.00
Chromium	.20–1.00
Nickel	1.20–2.00

Phosphorus and sulphur may be present within the ranges usually found in cast iron.

For use in the production of engine valve tappets having a head the surface of which is subjected to abrasive

wear, good results have been obtained with a composition containing approximately the following:

	Percent
Silicon	2.70
Manganese	.80
Carbon	3.50
Molybdenum	.60
Chromium	.70
Nickel	1.60

Impurities of phosphorus and sulphur

Phosphorus and sulphur may be present within the ranges usually found in cast iron.

Such a composition, if chill cast, will produce a white iron having a Rockwell C hardness 55 minimum as compared with ordinary chilled iron.

The present iron alloy composition is not only extremely hard and abrasive wear resistant in the chilled condition but it is strong and tough both in the chilled condition and gray iron condition. Thus this composition is characteristically suitable for chilled castings subjected to heavy pressure or impact, since such castings are less liable to breakage than ordinary chilled iron castings.

In the production of tappet castings according to this invention the iron is first melted in an electric arc furnace and the chill depth adjusted to suit the purpose. Chill depth control is effected by varying the amount of chromium added and by the addition of graphitizers such as carbon and silicon. After melting the iron it is poured into appropriate shaped molds, preferably "green" sand molds at a temperature in excess of about 2500° F. The sand molds as such prior to the pouring of the molten iron thereinto are supported upon chill plates to effect the desired local chilling on the head surface of the tappets. Although green sand molds are preferred it is conceivable that dry sand molds as well as shell molds could likewise be used. Subsequent to the casting of the rough tappets they are machined and ground as required to finish size and condition ready for engine installation.

While this invention has been directed primarily to the production of chilled iron alloy castings for use as engine tappets, it is readily conceivable of use of said castings in the production of articles to be subjected to like impact and heavy pressure use in or out of contact with presently developed and used detergent oils and accordingly, the appended claims are so directed basically to chilled iron alloy castings of specific metallic analysis.

What we claim is:

1. A chilled casting, a portion of which is of chilled white iron and the remainder of which is gray iron, containing silicon 2.40 to 3.05%, manganese .70 to 1.10%, carbon 3.20 to 3.65%, molybdenum .50 to 1.00%, chromium .20 to 1.00%, nickel 1.20 to 2.00% and the balance substantially all iron.

2. A chilled casting according to claim 1 wherein the casting is in the form of an engine tappet, the head of which is subject to detergent oils under impact and heavy loading in operational use, said head being the chilled white iron portion of the casting.

3. A cast engine tappet comprising a body portion and a head portion, said tappet containing by percent, silicon 2.40 to 3.05, manganese .70 to 1.10, carbon 3.20 to 3.65, molybdenum .50 to 1.00, chromium .20 to 1.00, nickel 1.20 to 2.00 and the balance substantially all iron, said head portion being of chilled white iron and said body portion being of gray iron, whereby said head is highly resistant to corrosive fatiguing.

4. A cast engine tappet comprising a body portion and a head portion, said tappet consisting substantially of 3.50% carbon, .80% manganese, 2.70% silicon, 1.60% nickel, .70% chromium, .60% molybdenum and the balance substantially all iron, said head portion being of chilled white iron and said body portion being of gray iron, whereby said head is highly resistant to corrosive fatiguing.

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