Patented Aug. 29, 1939 2,171,081

UNITED STATES PATENT OFFICE

2,171,081

METALLIC ABRASIVE

John F. Ervin, Ann Arbor, Mich.

No Drawing. Original application May 10, 1937, Serial No. 141,804. Divided and this application December 19, 1938, Serial No. 246,758

1 Claim. (Cl. 51—280)

This invention relates to metal abrasives, and more particularly to improved alloy compositions which are especially adapted for use as abrasives. This application is a division of prior application Serial No. 141,804, filed May 10, 1937, which latter application is a continuation in part of earlier application Serial No. 100,386, filed September 11, 1936.

As is known, discrete metal particles have been employed in the industries as abrasive cleaning and cutting material.

The peculiarly rigorous conditions to which such material is subjected during use impose difficultly attainable criteria upon these products. For example, for some uses, as for cutting steels by impelling metallic particles at tremendous velocities from centrifugal machines, a high degree of hardness is desirable. For this use it has been suggested to use tungsten carbide particles. While such material is exceptionally hard, it is nevertheless very expensive. Furthermore, it is short-lived. Such a product is relatively brittle and under the terrific impact, involved in its use, it rapidly breaks down to an undesirable powdery form.

Similarly, other factors come into play. Thus, a suitable material for metal cleaning and/or cutting should present a high impact resistance as well as a high crushing strength. The correlation of these several and physical characteristics to produce a material having the optimum desirable characteristics is difficult to achieve. It is also to be observed that due to the nature of the use of this material, great quantities are used and consequently the price factor is a further limitation.

It has been discovered that a very effective blasting material of this general type may be produced by utilizing a ferrous base and advantageously modifying its characteristics to render it efficacious for the purpose by the simple expedient of incorporating relatively minor amounts of alloying compounds.

Considered more specifically, it has been found that minor additions of chromium and molybdenum or vanadium to typical high carbon iron alloys produces most effective metallic blast material.

These alloying components advantageously and markedly modify the impact resistance and crushing strength of the base alloy and thus give a product possessing these desirable characteristics. An important factor is the marked modification of the material by the addition of relatively minor, and hence inexpensive, amounts of the alloying ingredients.

As explained in prior application Serial No. 100,386, it was found that additions of proportioned amounts of chromium and vanadium to iron greatly increases the impact resistance. Similarly, as explained in that application, it was ascertained that the addition of properly proportioned amounts of molybdenum and nickel markedly improved the crushing strength of iron, thus rendering the resulting alloy particularly effective as an abrasive material.

As a result of further experimentation, it has now been found that improved abrasive material of this type can be produced when utilizing few alloying constituents. It has been found, for example, that for this particular use, molybdenum and vanadium have a relative action, and either may be used, together with the chromium to confer on the ferrous base alloy the desirable characteristics of high impact resistance and crushing strength.

The invention will be more readily comprehended from a consideration of typical computations.

A very effective abrasive material may be made by utilizing as a base material an iron-carbon alloy. To this may be added, as for example in the ladle, predetermined quantities of chromium and other components to produce an alloy having the following composition:

	Per cent
C	3.0
Mn	0.5
Si	1.5
S	0.1
P	0.4
Cr	1.0
Mo	0.2

Fe—remainder.

It will be appreciated, of course, that this alloy is a representative one, that is to say, the percentage of the beneficial alloying ingredients stated above are not critical. Thus, the chromium content may be varied from approximately 0.75% *to* 3% or more and the molybdenum addition correspondingly varied. In the improved alloys, the molybdenum is utilized in the approximate ratio of 1 part of molybdenum to 5 parts of chromium.

The crushing strength of the abrasive can markedly be improved by incorporating small amounts of nickel in the alloy.

When nickel is utilized, the amount of chromium may be somewhat reduced. A typical example of a nickel containing alloy producible under the invention is:

	Per cent
C	3.0
Mn	0.5
Si	1.5
S	0.1
P	0.4
Cr	0.1–1.5
Ni	0.1–3.0
Mo	0.1–0.6

Fe—remainder.

It will be understood that the carbon content may be varied over a wide range; the three per cent compositions being given merely as indicating a relatively high carbon ferrous base alloy. The percentages of the manganese, silicon, sulphur and phosphorus similarly are susceptible of wide variation.

While improved compositions have been described, it is to be understood that these are merely given as examples to explain the underlying principles of the invention, and not limiting the scope of the invention to these specific compositions.

I claim:

An abrasive material characterized by a high crushing strength and impact resistance comprising a high carbon ferrous base alloy containing substantially 3% carbon; substantially 0.5% of manganese; substantially 1.5% of silicon; substantially 0.1% of sulphur; substantially 0.4% of phosphorus; from substantially 0.25% to 3.0% of chromium; from substantially 0.1 to 0.6% of molybdenum, the balance of the composition being iron.

JOHN F. ERVIN.