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FIELD OF THE INVENTION

The present invention concerns a steel for cold forming and offers excellent
5 resistance to wear by abrasion.

This steel is obtained by the fusion and refining of a steel and is characterised in
that the alloy has the following weighted composition :

	Preferred bracket	Wide bracket
	Carbon 1 - 1.20 %	0.80 - 1.50%
10	Manganese 0.30 - 0.50%	< 1%
	Silicon 0.80 - 1%	< 1%
	Phosphorus $\leq$ 0.020%	$\leq$ 0.030%
	Sulphur $\leq$ 0.005%	$\leq$ 0.005%
	Chromium 8 - 8.50%	6.25 - 9%
15	Nickel < 0.30	< 0.50%
	Molybdenum 2 - 2.30%	1.80 - 3%
	Aluminum < 200ppm	< 0.15%
	Vanadium 0.20 - 0.40%	0.20 - 0.40%
	Niobium 0.60 - 0.90%	0.60 - 1.5%
20	Nitrogen < 130 ppm	< 150 ppm
	Oxygen < 30 ppm	< 50 ppm
	Titanium or	
	Zirconium 500-1000 ppm	500-1500 ppm

25 The complement being iron plus the impurities characteristic of producing the metal.

This steel is worked off via electric fusion followed by refining in a heating
ladle, degassing under vacuum and undergoing a remelting process.

In this steel, the carbon and niobium form niobium carbide and the titanium or
zirconium favour the obtaining of idiomorphous niobium carbide. The stoichiometric
30 relation for forming niobium carbide is about 1% of niobium for 0.12% of carbon. The

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excess carbon is balanced by the chromium, molybdenum and vanadium content of the steel.

The steel of the invention has a hardness of more than 60 Hrc. It exhibits a combination of qualities : resistance to abrasive wear, machinability and a toughness
5 never previously obtained.

Toughness is determined via a measurement according to the Charpy test. A 7x10x55mm reference test piece is treated at 1050°C, is stopped in oil, followed by an annealing of two hours at 560°C. For a hardness in excess of or equal to 60 Hrc, it exhibits a rupture energy equal to or more than 40 Joules.

10 The cold forming steel of the invention improves resistance to wear which covers three forms :

- abrasive wear, clearly improved,
- wear by scaling, clearly improved, by virtue of the excellent toughness of the steel
- wear via adherence, also clearly improved.

15 The present invention is not merely limited to the embodiment described and shown, but covers all possible variants.

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**WHAT IS CLAIMED IS :**

1. Steel for cold forming and obtained via the fusion and refining of an alloy,
- 5 characterised in that the alloy has the following weighted composition :
- | | |
|--------------|--------------|
| Carbon | 0.80 - 1.50% |
| Manganese | < 1% |
| Silicon | < 1% |
| Phosphorus | ≤ 0.030% |
| 10 Sulphur | ≤ 0.005% |
| Chromium | 6.25 - 9% |
| Nickel | < 0.50% |
| Molybdenum | 1.80 - 3% |
| Aluminum | < 0.15% |
| 15 Vanadium | 0.20 - 0.40% |
| Niobium | 0.60 - 1.5% |
| Nitrogen | < 150 ppm |
| Oxygen | < 50 ppm |
| Titanium or | |
| 20 Zirconium | 500-1500 ppm |

the complement being iron plus the impurities characteristic of producing the metal.

2. Steel according to claim 1, characterised in that the alloy has the following weighted composition :
- | | |
|-------------|--------------|
| 25 Carbon | 1 - 1.20 % |
| Manganese | 0.30 - 0.50% |
| Silicon | 0.80 - 1% |
| Phosphorus | ≤ 0.020% |
| Sulphur | ≤ 0.005% |
| 30 Chromium | 8 - 8.50% |



	Nickel	< 0.30
	Molybdenum	2 - 2.30%
	Aluminum	< 200ppm
	Vanadium	0.20 - 0.40%
5	Niobium	0.60 - 0.90%
	Nitrogen	< 130 ppm
	Oxygen	< 30 ppm
	Titanium or	
	Zirconium	500-1000 ppm

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the complement being iron plus the impurities characteristic of producing the metal.