Materials of Conferences

PROGRESSIVE METHOD OF CUTTING STAINLESS AND HEATPROOF STEELS AND ALLOYS

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Stainless and heatproof steels and alloy (steels of austensite class) find more and more application in modern machine-building industry. Machine and constructions' parts made of these materials are characterized by durability and high service performance.

The steels of austensite class refer to hard-to-treat ones; their characteristic is the formation of cyclic chips, the increased wear of the instrument and the machined part surface coating low quality.

For the solution of the abovementioned problem it is offered to use the method of cutting with advanced plastic deformation. At the plastic materials machining process the intensive plastic deformation precedes the separation of the cut-down layer material from the blank part, i.e. the principle cutting work part is spent on the plastic deformation of the metal taken off. The essence of the cutting with advanced plastic deformation of the cut-down layer material consists in combining two processes – the preliminary plastic deformation and cutting itself. Thereat by the moment of the cutting instrument action on the cut-down material layer a part of the work spent on plastic deformations in the process of chip formation at usual cutting action is already performed by a supplementary rolling device making the depth and cold work degree necessary for the maximal efficiency of the following process.

It provides the cutting force, temperature, specific work decrease, process cyclicity, that results in the instrument's durability and processing capacity increase. The chip making process if treated with cutting the preliminary cold-worked layer cut down results in surface roughness decrease, some chip shrinkage reduction and friction conditions change.

The work was submitted to international scientific conference «Manufacturing Technology» (Italy - Rome, Florence, September, 9-16, 2008, came to the editorial office on 14.07.2008.

THYRISTOR INVERTERS WITH AN IDLE LIMITER FOR TRANSFORMER LOADS

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Electroarc welding sets of an inverter type, i.e. welders in which a welding transformer is operated from the inverter with frequency till 100 kHz, are widely used [1]. Inverters in such welders may be realized as the single-ended circuit as well as the push-pull circuit. Single-ended inverters use the core of the welding transformer slightly worse than push-pull inverters. But push-pull bridge inverters form the supply voltage asymmetry of the welder transformer. When frequency increases this asymmetry increase too and result in the saturation of the transformer core that minimize advantages of bridge (push-pull circuit) inverters to single-ended inverter. The asymmetry is eliminated in push-pull circuits if condensers are used in the power circuit. Specifically, the asymmetry is lacked in the half-bridge inverter shown in [2]. The deficiency of such inverter is poor utilization of capacitor capacity. Utilization of the condenser is better fourfold, but a surge voltage is possible in the diagonal of the bridge load at the quiescent condition and light loads.

The general deficiency of half-bridge inverters as well as bridge inverters is the need to use gate-turn-off (GTO) keys, i.e. transistors or GTO thyristors. Transistors constraint a power range of welders, and GTO thyristors have the more complicated control system, and main, have large losses and lesser permissible switching frequency in comparison with ordinary (SCR) thyristors.

Inverters using ordinary (SCR) thyristors with coercive commutation by means of condensers ("C"-commutation) or of a combination of condensers and inductor ("L-C"-commutation) are known too. But coercive commutation complicates the power circuit of the inverter. A "classic" thyristor inverter using gate-turn-off thyristors or ordinary thyristors with coercive commutation is described in [3]. The circuit provides for the series condenser turn on with the primary winding of the transformer welder that may result in voltage surges in the condenser and the primary winding at the quiescent condition and light loads. Gate-turn-off thyristors are much expensive than ordinary thyristors and it losses are greater. The control system of it is more complex too. Frequency behaviors of gate-turn-off thyristors are worse than of ordinary thyristors too. Therefore such decision may used only for comparatively low frequencies that increase integrally the mass and gabarit characteristics of the device.

Decisions described in [4] permit to optimize the device. Specifically, gate-turn-off thyristors of the inverter are substitute for ordinary (SCR) thyristors; the inverse diode bridge is excluded from the thyristor inverter circuit, and a standard control circuit has in addition a current sensor, a resistance transducer of the "welding die - welding surface" gap, a delay cell, an AND element, a gate-tape diode and four keys. After primary winding current of the transformer welder was dropped the delay cell provided the interval was required to restore locking properties of the conducting current diagonal thyristor pair. If the welding electrode don't contact with a welding surface at the same time then current was missed in the circuit of the resistance transducer and enable pulses were don't given from the control system to thyristors driving points of the inverter. I.e. the quiescent condition is excluded. Only after the electrode touch with a welding surface enable pulses were begun to give to driving points of thyristors. Those decisions permit to eliminate voltage surges at the circuit of the inverter load diagonal, to increase the frequency, to decrease losses of the inverter, to substitute gate-turn-off thyristors for ordinary thyristors, to exclude the inverse diode bridge from the power circuit.

In conclusion should note that the device was considered with the load in the form of a transformer welder. Though the proposed device is available for other electro technical transformer loads in which the quiescent condition isn't operating condition and may be excluded.

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The work was submitted to international scientific conference «Priorities for Science, Technology and Innovation», Egypt (Sharm el-Sheikh), November, 20-27, 2008, came to the editorial office on 28.05.2008.

PROBLEMS AND PROSPECTS OF NATURAL STONE DEVELOPMENT

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Stone is one of solid minerals involved by the human into the development and further use at the dawn of its existence.

For the Russian Federation and the countries of the Commonwealth of Independent States the tendency of cap stone production small volumes is indicative. First of all, it is connected with the prevailing architectural tradition, which doesn't suppose natural stone construction work large volumes, in our country and also with the undergrade raw material being handled and then used. The low level of rock mining operating enterprises' equipment with state-of-the-art technologies, mining methods and technologies' imperfection, lack of finished products permanent sale markets, and also the insufficient level of geological exploration of reserves, transport and personnel problems are evident; specific negative trends consisting in the presence of stone processors, the production capacity of which far exceed the possibilities of their raw material resources base, being typical of some regions of the Russian Federation (Ural). It stimulates the production maintenance on account of procurement and subsequent processing of the foreign stone, increases the product cost and reduces the population employment. As a result of this, in the Russian Federation, not more than 1-2 kg of cap stone per caput a year are mined (the analogous factor for the Hellenic Republic makes about 50 kg of cap stone a year, 2007).

In spite of the presence of a great amount of disadvantages, the main consequence of which are useful minerals heavy tolls at the procurement, blasting technologies and cap stone breaking-out are widely used all over the world. Together with this the saw methods of monolith recovery find application. Cap stone breaking-out wedge methods used independently or in combination with other known methods are kept on being used at a great amount of cap stone open casts all over the world.

Despite of high labour intensity the drilling-and-wedge method is wide-spread as it doesn't need expensive equipment, specifies the lowest requirements to mining and geological conditions of development and provides the required quality of the procured units.

In the middle of the eighties of the last century N.G. Kyu offered the method of oriented rock failure using putty substances. This method cardinally differs from the one of hydraulic rock failure on the root principles of fracture, means of operating and areas of application, though it borrows some elements from it (the destruction through a shot hole, the possibility of static and dynamic fracture load application). The first experiments on brittle materials failure using putty substances were carried out under laboratory conditions in terms of a unit of organic glass and plasticine blown in into the crack being formed in the static mode [1].

The method of directed rock fracture using putty substances got further development in 2000-2002, when H.G. Kyu offered and tested the dynamic variant of rock failure by the mentioned method. Under his leadership the first well resulted brittle artificial materials impact fracture experiments under laboratory conditions were carried out. After that, the first full-scale experiments on the directed dynamic fracture of a granite unit by hand method were carried out on the "Green Hill" experimental polygon of the Mining Engineering Institute of the Siberian Branch of the Russian Academy of Sciences under the leadership of N.G. Kyu [2].

The possibility of crack evolution process control was proved in the course of the further carrying out of the experiments on brittle environment fracture with putties. The essence of the method consists in the fact that a shot hole is drilled in the brittle material and it is filled with putty. At the static fracture a sealer (granular material, for example) is laid over the putty. A wedge equipped with hard alloy metal inserts, which form linear antipodal furrows on the shot hole