United States Patent [19]

Stöeber

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[54] **STRIKING TOOL**

[75] Inventor: **Hans Stöeber,** Sonthofen, Germany

[73] Assignee: **Hans Stöeber,** Sonthofen, Germany

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[21] Appl. No.: **458,311**

[30] **Foreign Application Priority Data**

Apr. 7, 1973 Germany 2317692

[52] **U.S. Cl.** **241/197**

[51] **Int. Cl.²** **B02C 13/28**

[58] **Field of Search** 241/195, 197, 275, 300

[56] **References Cited**

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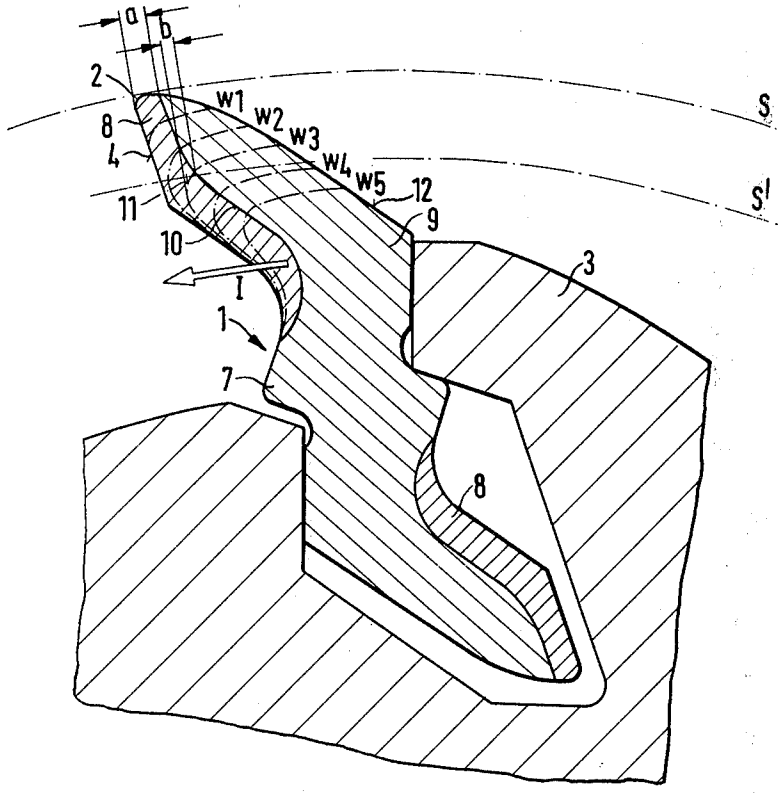
Primary Examiner—Granville Y. Custer, Jr.

Attorney, Agent, or Firm—Silverman & Cass, Ltd.

[57] **ABSTRACT**

A striking tool for crushing stonelike material, the tool having a double layer, one layer forming the working side and being prone to wear and the other layer forming the rear side being of a material having resistance to bending.

3 Claims, 2 Drawing Figures



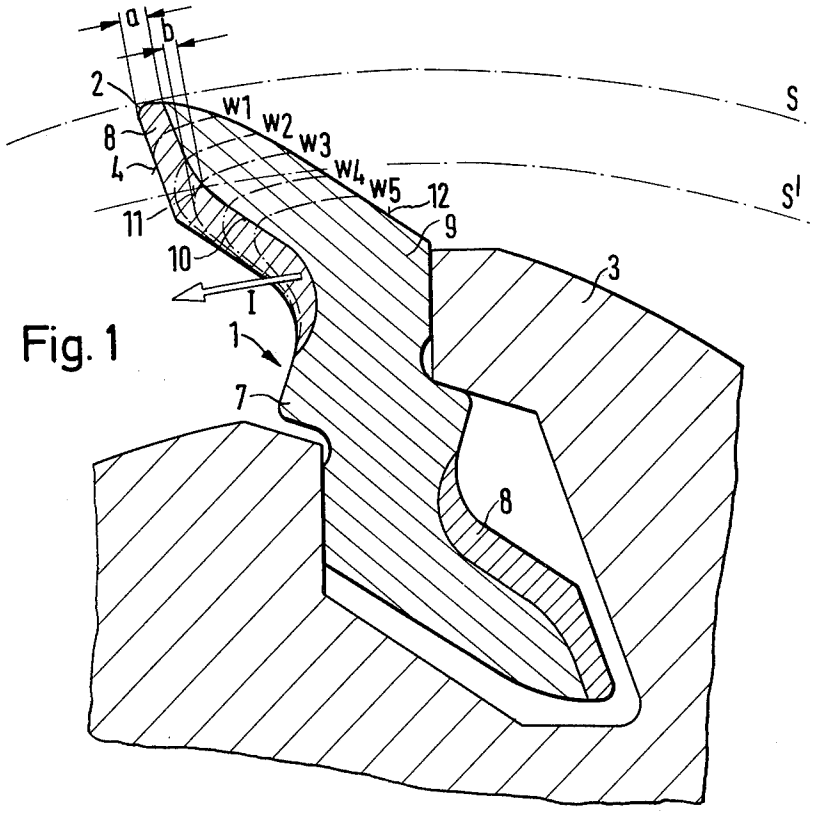


Fig. 1

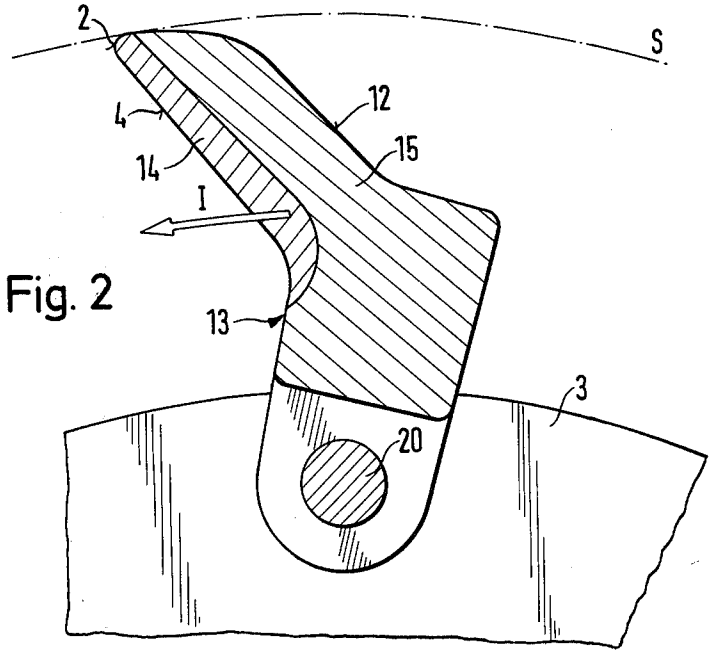


Fig. 2

STRIKING TOOL

BACKGROUND OF THE INVENTION

1. Field of the invention

This invention relates generally to striking tools, and more particularly, to an impact-hammer crusher arranged on a rotor positioned on horizontally or vertically disposed bearings for crushing stonelike materials having a working side limited in its upper area by a striking edge.

2. Description of the Prior Art

Striking tools of the type with which this invention is concerned are known generally in the art. The mode of operation of the prior art provides for the striking tools rotating with high peripheral velocity—crush stones coming in the circle described by the outermost edge of the striking tool principally through shearing—and throw the pieces against stationary breaking elements.

The special feature of this crushing involves the fact that, with newly installed striking tools, a generally desirable high proportion of finely-grained components is produced, whereby in addition the crushed individual grain exhibits a compact form. These positive properties, however, are lost, in the case of the hitherto customary striking tools, with increasing wearing-out of the striking tool, in a constantly increasing degree, and the quality of the crushed material correspondingly constantly decreases. Thus, through the wear of the striking tools, the crushed material is qualitatively reduced. In this connection, in the wearing out of striking tools, one should basically differentiate between striking wear and friction wear.

Striking wear occurs predominantly, directly at the front edge of the breaking tool, the striking edge. Pure striking wear exists however only in the case of new tools, and is, thus, limited in time. In a new striking tool, the striking edge is situated on the largest radius with regard to the rotor axis, i.e., the striking edge alone determines the striking circle diameter. Thus, a new striking tool shows only striking wear. Such striking wear is, however, limited to a short period, as with progressing wear of the striking edge, friction wear occurs on the outside of the tool in addition to striking wear.

During this short period, the quality of the breaking material is optimal, since the energy residing in the rotor, is fully available for shearing an individual stone, and for hurling away the part of a stone which has penetrated into the striking circle.

Striking wear has the effect of rounding the striking edge, whereby additionally, friction wear occurs in the zone lying behind the striking edge, the so-called outer surface. This friction wear uses up in an increasing manner the outer surface and deforms the tool so as to rise steeply toward the rear, opposite the direction of rotation. This deformation of the tool so as to rise steeply toward the rear, which results in the creation of an oblique outer surface, prevents a predominant portion of the stones falling through a chute from reaching the actual striking edge as a result of the greater peripheral velocity of the striking tool vis a vis the velocity of the falling stones.

The pure shearing and striking effect is thus lost since the stones slide on the oblique outer surface of the worn tool whereby the stone is not acted upon by the striking edge. The stones thereby lose energy as a consequence of frictional engagement with the oblique

surface are thrown off with a lesser tangential velocity as compared with the velocity of the rotor. Hence, there no longer occurs a pronounced shearing and striking effect. This results in, a significant reduction in quality, with regard to fineness of the crushed material, and the form of the individual particle.

The present invention has the object of constructing a striking tool of the type previously mentioned, in such a fashion that the reduction in quality of the breaking material with increasing wearing out of the striking tool is largely avoided.

This problem is solved according to the invention in that the striking tool is designed to have a double layer, in which one layer is constructed as a working side, comprising a material prone to wear and the other layer as a rear side of a material having resistance to bending. This gives the advantage that the working side, in spite of increasing wear, preserves a sharp striking edge and remains continuously capable of functioning. On the other hand, the unavoidable friction wear deforms the outer surface whereby the outer surface barely projects beyond the circle described by the striking edge.

In a further embodiment of the invention, the materials of both layers can be formed as a composite material.

Furthermore, the striking edge, with continuous wearing out of the striking tool, can exhibit a somewhat equal distance from the line of separation, between the two layers, whereby, in a simple manner, the preservation of a sharp striking edge is assured.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a lateral view of a striking tool according to the invention, with rotor in cross section;

FIG. 2 shows another embodiment of a striking tool with rotor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The striking tool represented in FIg. 1 is arranged in a rotor **3**, wherein the rotor 3 is moved in the direction of arrow I.

The striking tool **1** has a working side **4**, and a rear side **12**. The working side 4 is bounded at the upper zone by a striking edge **2**.

The striking tool **1** comprises the two layers **8** and **9**, in which the layer **8** constitutes the working side **4**, while the layer **9** represents the rear side **12**.

The layer **8** of the working side **4** comprises a material highly capable of resistance to wear, but of low resistance to bending, while the layer **9** comprises a material which has a high resistance to bending, but low resistance to wear. By way of example, layer **8** could be composed of chilled cast iron such as a cast steel of 3% C and 15–20% Cr.; layer **9** could be composed of tough weldable steel or cast steel. The two layers could be secured together as a lamination, by casting for example. Other compositions or means of securement of the two layers are possible.

The front layer **8** comprising wear-resistant material, which constitutes the working side **4**, is embedded in the layer **9** of the rear side **12**. The contour of the working side exhibits no deviation as compared with the contour of conventional striking tools.

The contour of the border surface or interface **10** between the wear resistant but low bending resistant material of the layer **8**, and the bending resistant but low wear resistant material of the layer **9** is chosen such

that with increasing wearing out w_1, w_2.. of the wear resistant layer, a comparatively sharp edge **11** remains, as the striking tool is worn back from the striking circle S to the striking circle S'.

The layer **9** is, on the other hand, so worn out through friction wear, that its outer surface w_2, w_3, etc. does not project, or only slightly projects, over the circle described through the striking edge **11.**

The thickness *a* of the wear resistant layer **8,** somewhat increases inwardly, such that the distance *b* of the striking edge **11** remains substantially proportional to the layer **9.** The distance of the striking edge **11** from the interface **10** thus remains generally constant as measured along the striking circle.

The rear side **12** of the striking tool **1** is contoured such that the layer **9** exhibits consistent rigidity with respect to the striking and bending load, but presents a minimum of an oblique outward friction surface so as to minimize frictional drag between the tool and stones to be crushed.

In the lower zone **7** of the striking tool **1,** the layer **9** completely surrounds the front layer **8** of the working side **4.**

In FIG. **2,** another embodiment **13** of a striking tool is represented, which is constructed as a striking hammer pivotally suspended in the rotor **3,** through a hinge **20.** This striking tool or the striking hammer **13** moves together with the rotor in the direction of arrow I. The striking tool is likewise made of composite material having a front layer **14,** being wear resistant, which forms the working side **4** with the striking edge **2.** This wear resistant layer **14** is embedded in a supporting layer **15,** of low wear resistance, but of high resistance to bending, which layer constitutes the rear side **12** of the striking tool. Again, through this combination is assured that also with increasing wearing out of the working side, a sharp striking edge is constantly present.

Both striking tools represented in the embodiments explained in the foregoing, are constructed in such a fashion that the working side **4** and the rear side **12,** define a body having a small striking surface, and equal resistance to bending at every point of the cross section, and at every stage of wear. Through this, a finger-like cross section ensues, which assures that a striking tool functioning efficiently is present even with increasing wear.

What is to be secured by Letters Patent of the United States is:

1. A striking tool for an impact and hammer crusher, the tool adapted to be mounted on a rotor supported in a bearing and operable to rotate the tool at high velocity into engagement with stones along a striking circle for crushing same, the tool comprising an impact head formed of a composite material comprising at least a pair of layers of material having an intimately bonded interface, one layer providing a working side of wear-resistant material having a striking edge, the other layer formed of a material resistant to bending and having a low wear resistance, and wherein the upper surface of said other layer substantially recedes relative to the striking edge of the working side at an acute angle relative to a plane tangential to the striking edge and generally normal to the striking circle.

2. The tool as claimed in claim **1** in which the working side and said other side define a body wherein resistance to bending in every point of its cross section remains generally constant in every stage of wear.

3. The tool as claimed in claim **1** in which the thickness of the wear-resistant material providing the striking edge remains a generally equal distance from the interface between the two layers, as determined by planes generally normally intersecting the striking circle, with progressive wear of the striking tool.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,929,296

DATED : December 30, 1975

INVENTOR(S) : HANS STOEBER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page, block [75], change the inventor's name from "Stöeber" to --Stoeber-- and in block [73], change the Assignee from "Hans Stöeber, Sonthofen" to --BHS-Bayerische Berg-, Hütten- und Salzwerke Aktiengesellschaft, Munich,--.

Signed and Sealed this

fourth Day of *May 1976*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks