United States Patent [19]

Schmidt

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[54] **INNER LINING CONSTRUCTION FOR IMPACT CRUSHERS**

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Sept. 15, 1972 Germany 2246059

[52] **U.S. Cl.** **241/182**; 241/299

[51] **Int. Cl.²** **B02C 17/22**

[58] **Field of Search** 241/181–183, 241/299

[56] **References Cited**

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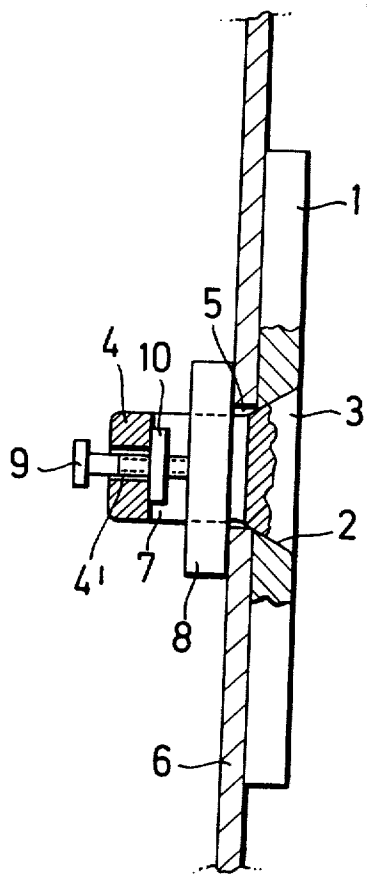
[57] **ABSTRACT**

Internal lining armor for impact crushers, particularly for impact crushers for the comminution of hard rock, is a combination of several armor plates arranged on the internal housing wall. Each armor plate is provided with at least one recess on which the head of a releasable, wear-proof pin engages, the pin passing through a corresponding opening in the housing wall and being tightly clamped on the outer side of the housing wall with a clamping device which may advantageously include a clamping bar and/or a spanner-type construction.

5 Claims, 7 Drawing Figures



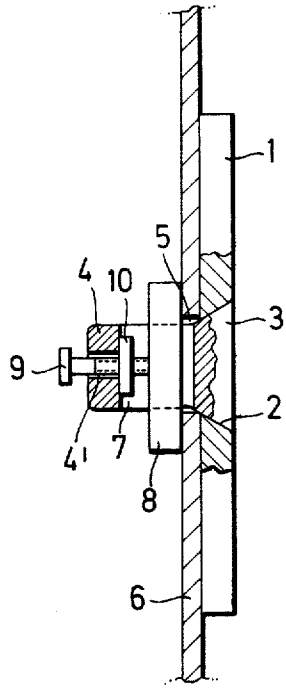


FIG. 1

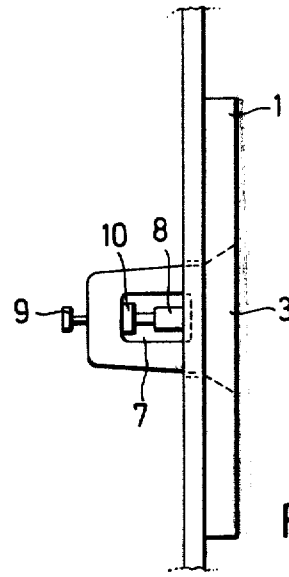


FIG. 2

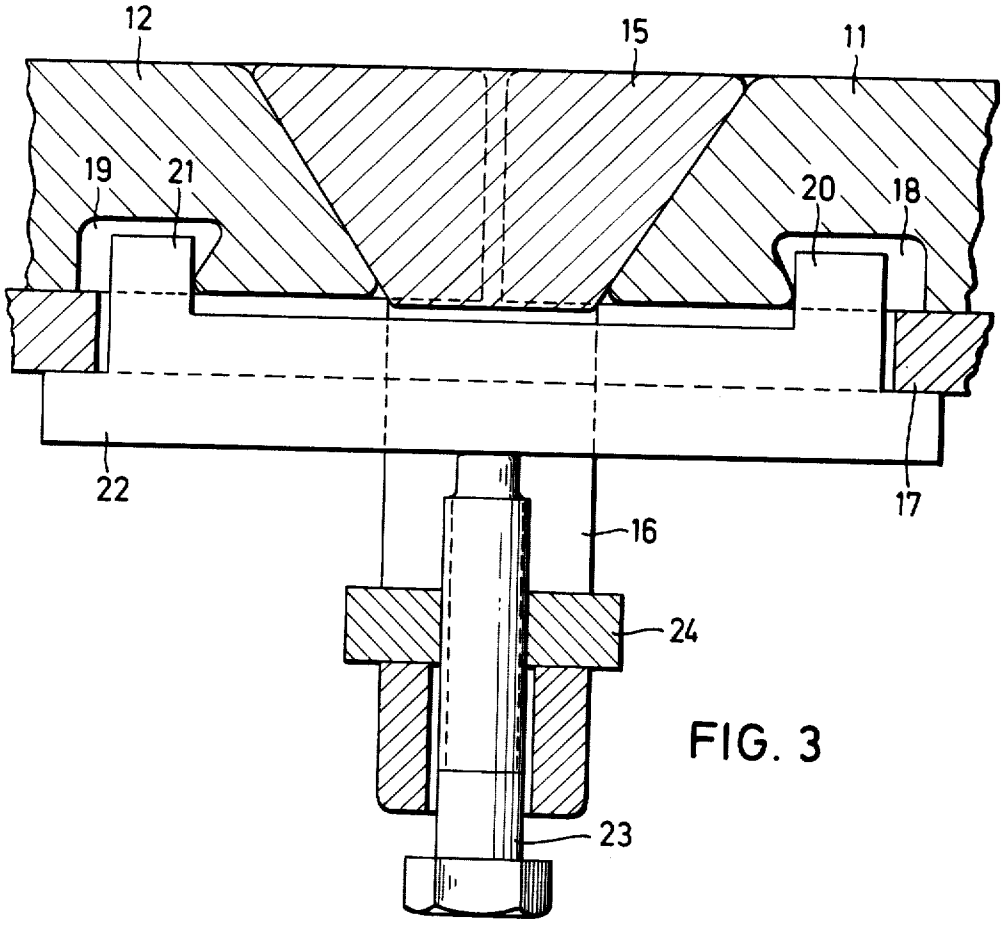


FIG. 3

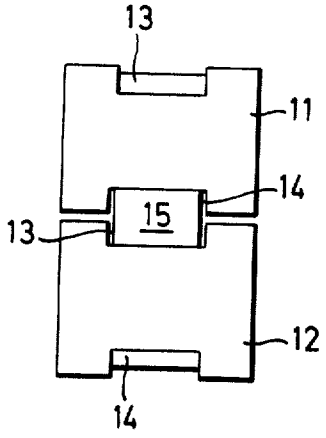


FIG. 4

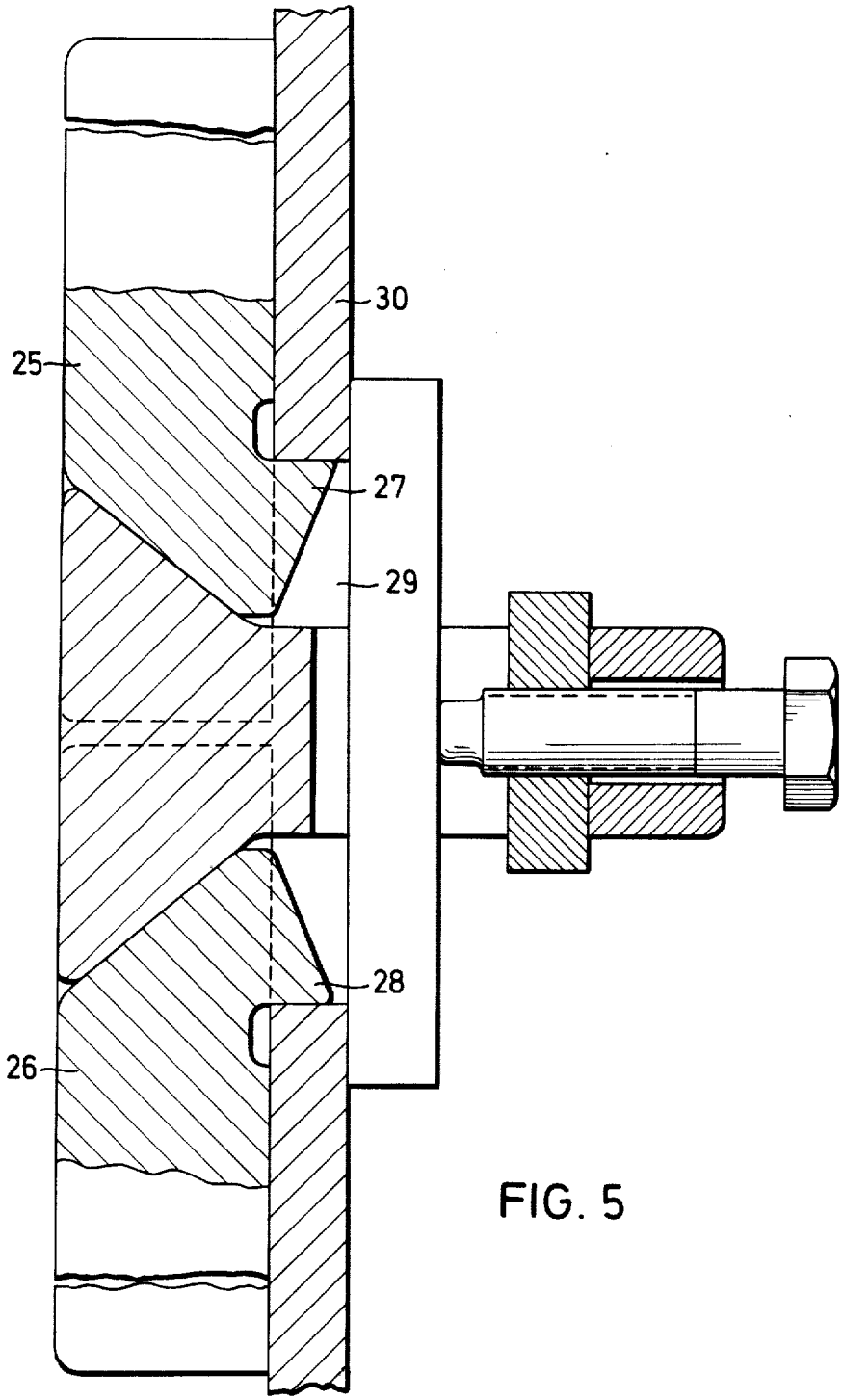


FIG. 5

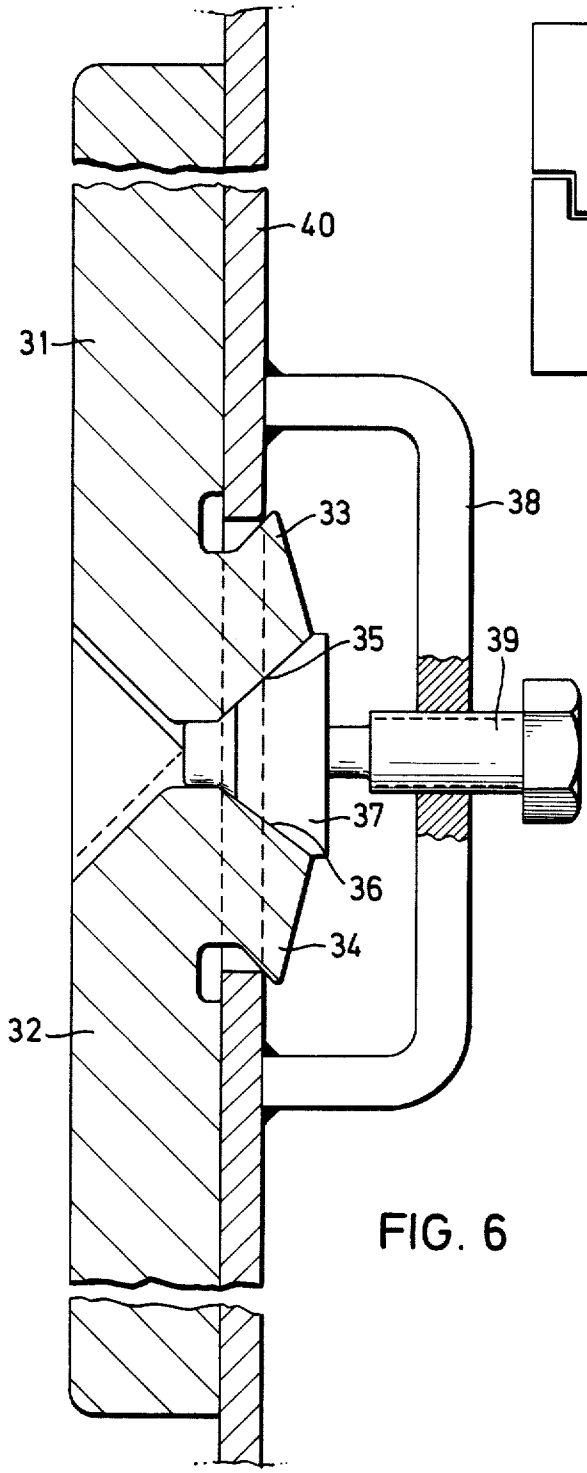


FIG. 6

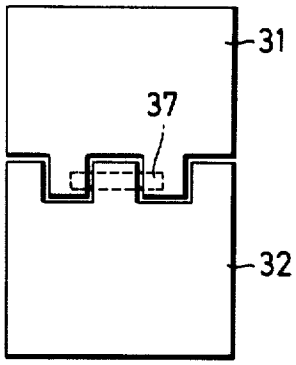


FIG. 7

INNER LINING CONSTRUCTION FOR IMPACT CRUSHERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an inner lining for impact crushers, particularly for impact crushers for the comminution of hard rock, which lining is constructed of several armor plates arranged on the inner wall of the housing.

2. Description of the Prior Art

In known impact crushers, the armor plates are fixed on the internal housing wall by means of screws. This type of armor or iron-clad plate securement to the internal housing wall is, however, disadvantageous in crushers designed for the comminution of hard rock, as the screw heads wear down appreciably more rapidly than the armor or iron-clad plates due to their lesser resistance to wear, and therefore the fastening devices must be renewed or exchanged very frequently. An attendant disadvantage is that the exchange of fastening screws for the armor plates is often very cumbersome, as in many cases the threads cannot be easily released due to the formation of rust on or damage thereto. The exchange of the armor plates is therefore connected with great expenditures of time and money.

The German Pat. specification, No. 1,249,646, which has been laid open for public inspection, discloses an armor plate for impact crushers which carries an attachment piece on its rear side for fastening to the housing of a crusher. The armor plate and attachment piece are cast as a one-piece construction, whereby the construction has an appreciable material volume for reasons of fastening, as well as for reasons of the casting process. This has, however, the disadvantage that appreciable quantities of material occur as scrap on exchange of the armor plates, so that the wear costs are relatively high for the pertaining impact crusher.

A further disadvantage of the just-mentioned armor plate construction is that the plates are held with respect to the housing wall solely by means of a wedge or a resilient bracket or clamp, which may drop out or break, respectively, due to the vibrations which occur during operation of the crusher, so that the entire armor plate may fall during an impact operation and cause appreciable damage.

SUMMARY OF THE INVENTION

The object of the present invention, therefore, is to provide an inner lining for an impact crusher, having armor plates constructed such that the costs for exchanging worn plates is lowered and a more positive and tight fastening of the armor plates to the housing wall is made possible in a simple and economical manner.

The foregoing object is achieved in that each armor plate is provided with at least one recess for receiving the head of a releasable, wear-proof pin. The pin extends through a corresponding opening in the housing wall and is tightly clamped on the outer side of the housing wall by means of a clamping element. The fastening pin, which is advantageously produced from the same or a harder material than the armor plates, may be used several times so that both the production costs for the armor plates as well as the material costs caused by wear are considerably reduced for the crusher housing lining.

In an advantageous development of the invention, the shaft of the pin is provided with an opening through which a transverse anchor or cross bar is passed, which anchor or cross bar is pressed, by means of the screw, tightly against the housing wall from the outside thereof. Through this construction, the armor plates are securely held and permit tight clamping to the housing wall.

According to a further advantageous embodiment of the invention, at least one part of the armor plate has, in each case, on at least one plate edge, a recess and on the rear side at least one hook element, whereby the plates are connected with the housing wall through the pin head, as well as by means of the hook elements. With this construction of the armor plate, a clamping of two plates by means of one pin is advantageously provided.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description of preferred embodiments of the invention, taken in conjunction with the accompanying drawings, on which:

FIG. **1** is a partial section through the housing wall and an armor plate of an impact crusher, constructed according to the present invention;

FIG. **2** is a side view of the armor plate construction illustrated in FIG. **1**;

FIG. **3** is a partial section of another embodiment of an armor plate constructed according to the present invention;

FIG. **4** is a top plan view of the apparatus illustrated in FIG. **3**;

FIG. **5** is a partial section view of another embodiment of an armor plate construction according to the present invention;

FIG. **6** is another embodiment of an armor plate construction, shown in partial section, according to the present invention; and

FIG. **7** is a left side plan view of the apparatus illustrated in FIG. **6**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2**, an embodiment of the invention is illustrated wherein an armor plate **1** is provided with an opening **2** extending conically inwardly for receiving a releasable, wearproof pin. The pin is provided with a conically shaped head **3** which bears against the conical surface of the opening **2**, and a shaft **4** which extends through an opening **5** in the housing wall **6**. The shaft is provided with an opening **7** through which a cross bar **8** extends to span the opening **5**. At the rear end of the pin **4** is an axially extending bore **4'**, through which a screw **9** is inserted. The screw **9** engages the cross bar **8** through a nut **10** which spans the bore **4'**, and presses the cross bar **8** tightly against the housing wall **6**. The conical recess **2** in the armor plate **1**, the cross bar **8**, the pin head **3** and the pin **4** may remain, very advantageously, in a rough condition and do not need to be further processed, whereby in comparison with known fastening devices for armor plates attached to the inner wall of the housing, particularly in

impact crushers of the kind described, an appreciable diminishing of production costs is achieved. In addition, in the embodiment of the invention illustrated, in the construction, very simple and material-saving armor plates of the desired size may be utilized and may be fixedly clamped to the housing wall of the impact crusher.

The clamping of the armor plate **1**, in this connection, may be undertaken very easily with the aid of a screw-spanner by means of tightening of the screw **9** from the outside. For this purpose, the cross bar **8** is pressed tightly against the outer surface of the housing wall **6**, while the adjacent nut **10** in the opening **7** of the pin **4** is moved outwardly and actuates the pin **4** in this direction. In this manner, the armor plate **1** is held by the head **3** of the pin **4** tightly on the housing wall. The armor plate **1**, if need be, may be rapidly released in a very simple manner by means of loosening of the screw with an appropriate tool, such as a screwdriver, wrench or the like, and may be rapidly tightened again. The particular advantage of this embodiment of the invention, as compared with previously known armor plates, resides in the fact that the clamping elements may be utilized more than once. The wear-proof pin **4**, with the conically constructed head **3**, in particular may be utilized repeatedly for the clamping of plates with the housing wall. In this connection it is not necessary that the entire pin be constructed of wear-proof material, it is sufficient to have the wearproof construction directed to the head alone, as only the head of the pin is subjected to wear in the operation of the impact crusher.

As illustrated in FIGS. **3** and **4**, in another embodiment according to the invention, a pair of armor plates **11** and **12** in each case have a plate edge recess **13** and **14**, respectively. The head **15** of a pin **16** engages the plates within these recesses for clamping of the plates **11** and **12** with the housing wall **17**. On the rear side, the armor plates **11** and **12** are provided with recesses **18** and **19**, respectively, for receiving respective lug-shaped projections **20** and **21** of a cross bar **22**. The lug- or nose-shaped projections **20** and **21** on the cross bar **22** are, in this connection, passed through corresponding openings in the housing wall **17**. The clamping of the armor plates **11** and **12** with the housing wall **17** takes place, as in the previous embodiment, with the aid of an axial screw **23** and nut **24** which passes through an open shaft of the pin **16**. The particular advantage of this construction of the armor plates, according to the invention, resides in that with the aid of a single pin, two armor plates may be fixedly clamped simultaneously with the housing wall. In this manner, clamping elements are saved or eliminated.

In another embodiment of the invention, a pair of armor plates **25** and **26** may be advantageously provided on the respective rear sides thereof with respective hook elements **27** and **28**, which extend into a corresponding opening **29** of a housing wall **30**, as illustrated in FIG. **5**. Also, with this construction of the armor plates, two armor plates may be fixedly clamped with the housing wall at the same time by means of a simple clamping device.

Referring to FIGS. **6** and **7**, it may also be suitable to provide a pair of armor plates **31** and **32** with hook elements **33** and **34** on the respective rear sides thereof and respective recesses **35** and **36** which receive and engage a correspondingly shaped pin head **37**. The pin head **37** presses the armor plates **31** and **32** by means of a pressure screw **39** arranged in a bracket **38** which is secured to the housing wall **40**. In this manner, a tight clamping of the armor plates **31** and **32** with the housing wall **40** is likewise attained.

Although I have described my invention by reference to specific illustrative embodiments thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. I therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of my contribution to the art.

I claim:

1. Armor structure for the housing of impact crushers, comprising a housing wall having inner and outer surfaces, means defining an opening through said housing wall, a plurality of armor plates, each of said armor plates comprising at least one recess, a pin including a wear-proof head extending through the wall opening with said head disposed in said recess, said pin further including a shaft extending through the wall opening, a transverse opening through said shaft, and means on the outer surface of said housing wall clampingly urging said pin outwardly of the housing, including a cross bar extending through the transverse opening through said shaft and spanning the housing wall opening, and a screw threadingly engaging said shaft for pressing said cross bar tightly against the outer surface of said housing wall.

2. Armor structure according to claim **1**, wherein said plates are substantially coplanar at adjacent edges thereof to form a composite recess, and said wear-proof head disposed in said composite recess for clamping adjacent plates.

3. Armor structure for the housing of impact crushers, comprising a housing wall having inner and outer surfaces, means defining an opening through said housing wall, a plurality of armor plates, each of said armor plates comprising at least one recess, pairs of said armor plates disposed substantially coplanar at adjacent edges thereof with the respective recesses thereof adjacent each other, a hook element carried on each of said plates adjacent the respective recesses, and means connecting said hook elements with the outer surface of said housing wall, including a pin extending into said recesses, and means connected to the outer surface of said housing wall for clamping said pin in said recesses.

4. Armor structure according to claim **3**, wherein said hook elements extend into and into engagement with the opening through said housing wall.

5. Armor structure according to claim **3**, wherein said hook elements include means defining recesses adjacent said element, and said connecting means includes a cross bar with lugs extending into recesses adjacent said hook elements.

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