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OVERLOAD PROTECTION DEVICE

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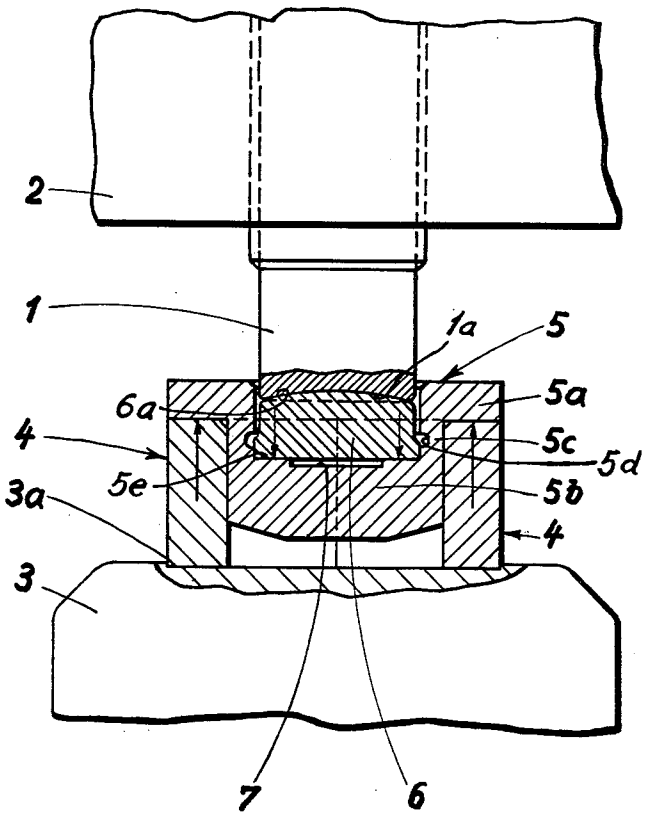

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OVERLOAD PROTECTION DEVICE

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The present invention relates broadly to an overload protection device having an interchangeable breaker block located between parts of machines which are loaded by opposing pressure-forces.

More particularly, this invention relates to a breaker block construction located between the screw-downs and the chocks in rolling mills. By the provision of such breaker blocks the rolls, the bearings, and last but not least the housing of a rolling mill are to be protected against damages which can result from excessive rolling pressure.

The problem is that the effective breaking load of breaker blocks known in the art cannot be accurately computed or calculated. Therefore, breaker blocks having the same dimensions might break at different high rolling pressures, so that unnecessary shut-down time, or damage to the machine parts might occur, and which eventualities should be avoided.

These difficulties arise from the fact that in the conventional types of breaker blocks, different kinds of stresses occur, namely predominantly bending and shearing stresses. Moreover, such breaker blocks in many cases entail an undesirable resiliency. In metal rolling mills such resiliency means less accurate tolerances of the stock.

It is therefore an object of this invention to provide an overload protection device, featuring a breaker block the breaking load of which can be accurately computed or calculated.

It is a further object of the invention to provide an overload protection device, featuring a breaker block in which only or mainly tension stresses occur.

A still further object of the invention is to provide an overload protection device of the aforementioned type which has the lowest possible inherent resiliency.

These objects are obtained by this invention by introducing the opposing pressure forces of the system into the breaker block in such an overlapping manner that in the breaking point cross-section of the breaker block, tension stresses are created. The machine parts in which pressure forces are evident, therefore, attack the breaker block in an overlapping manner, so that in the cross-section between the areas of attack of the forces, a breaking point cross-section is subjected to tension stresses only. These tension stresses can be accurately computed in advance, and thus the effective breaking load can also be accurately computed. The material providing the breaking point cross-section can be provided with a very short length of elongation, whereby the breaker block is imparted with a high elastic recovery force.

There are various possibilities of putting into practice the principle of the invention. In particular, for application to rolling mills, it is further proposed that the breaker block should have the shape of a pot. The opposing pressure forces are introduced both into the rim and into the pot-bottom which should have as much resistance to bending as possible. The breaking point cross-section is provided for in the wall of the pot. This particular shape not only saves space but has the advantage, due to the circular or annular shape of the breaking cross-section, of facilitating the subjecting of the steel-pot to a most effective heat treatment. The breaking cross-section, which is distributed over a relatively wide circumference, can be highly tempered and therefore, receive a uniform grain.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawing which is a fragmentary view illustrating an embodiment of the invention partially in vertical section and partially in elevation.

In the drawing the machine parts with which the breaker block is associated are illustrated as constituting an adjusting screw **1** supported by a cross frame or transverse **2** of a rolling mill housing and an upper chock **3** of a mill stand. As is known in the art, chock **3** will have to rise in order to relieve any force on the rolls, not shown. The rolling pressure is directed upwardly from the chock via an axially divided or split supporting ring **4** into the outwardly directed flange or rim **5***a* of a breaker block **5** of pot-shape form. The counter or what could be downwardly directed pressure force is exerted on the bottom **5***b* of the pot **5** via an intermediate piece or block **6**. Thus the upwardly directed force passes from ring **4** through the pot **5** and block **6** into the end face **1***a* of the adjusting screw **1**. The end face **1***a* is shaped as a spherical socket, whereas the upper pressure transmitting surface **6***a* of the intermediate block **6** is likewise of spherical shape. This shaping of these two contacting faces accommodates possible tilting movements of the chock **3** during roll deflection.

As is clear in the drawing, the bottom **5***b* of the pot is very thick so as to have as high resistance to bending as possible. Likewise, in order to minimize any deflection in this strong and rigid bottom **5***b*, a central recess or cavity **7** is formed in the upper surface of the bottom **5***b*. This recess or cavity is circular in plan so that the pressure transferring surface or contact area between the flat bottom of the intermediate piece or block **6** and the upper face of bottom **5***b* of the breaker pot **5** is reduced to a wide circular ring or annular contact surface or area **5***e*.

The wall of the breaker pot **5** provides the breaking point cross-section and to assure this an internal annular groove **5***d* is formed in this wall to provide the breaking point cross-section at **5***c*. Due to the fact that the pressure forces exerted at the areas or surfaces indicated by the arrows overlap, that is, the top of the supporting ring **4** bears against or attacks the undersurface of the flange or rim **5***a* while the adjusting screw **1** via the block **6** exerts pressure on the annular contact surface **5***e* of the bottom **5***b* of the breaker pot, only tension stresses are created in the wall of the pot particularly at the breaking point cross-section **5***c*. Thus, as shown, the respective pressure contact areas are both annular or of ring shape with their points of application lying in vertically displaced planes and one contact area being radially outward to the other. This relationship provides the overlapping of the pressure forces so that tension stresses are created in the wall of the breaking pot. In other words, the breaker block of this invention, contrary to known prior art arrangements, does not establish any bending or shearing stresses in the breaker block.

This tension stress is ensured by the fact that the opposing forces are exerted over areas of contact that are radially spaced from one another by a distance equivalent to the thickness of the wall of the pot and which areas of contact are in planes displaced axially of the line of application of the forces so that the pressure forces are truly introduced into the breaker block in an overlapping manner.

If the system is overloaded, the bottom **5***b* with part of the wall of the breaker pot **5** breaks at the breaking point cross-section **5***c*. The now separated upper and lower parts of the breaker pot can be easily removed, after the parts of the bipartite or split supporting ring **4** are taken away laterally. In order to put in laterally below the screw-down **1** a new one-piece breaker pot **5**, together

with the inserted intermediate piece or block **6**, the adjusting screw **1** need not be moved up. A pre-condition is, that the intermediate piece **6** or the space between the bottom **5***b* and the chock **3** is high enough. Thereupon, the parts of the supporting ring **4** are inserted again between the rim **5***a* of the breaker pot and the chock **3**. To secure the position of the supporting ring **4**, a centering recess **3***a* is provided in the upper surface of the chock **3**.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawing and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. In an overload protection arrangement for interposition between machine elements subjected to opposing pressure forces, a breaker block including a body member having spaced pressure receiving faces and a portion extending therebetween, said faces being disposed in parallel planes spaced axially of the line of application of force, and one face being spaced radially of the other whereby when said faces are subjected to opposing pressure forces the portion of the breaker block between said faces is subjected to tension stress.

2. An overload protection arrangement for interposition between machine elements subjected to opposing pressure forces comprising a body member including a bend resistant bottom, a wall structure and a flange extending outwardly from said wall structure in spaced relationship to the bottom, said bottom having a thickness in excess of the thickness of the flange, a load receiving member within the body and bearing against the inner surface of said bottom and a load transmitting member bearing against the undersurface of said flange, whereby when said body is subjected to opposing loads tension stresses are created in said wall structure.

3. An overload protection arrangement as claimed in claim 2 and in which said bottom is provided with a central recess to delimit in combination with the inner surface of said wall structure an annular pressure receiving face.

4. An overload protection arrangement as claimed in claim 2 and said wall structure having an internal groove at a location between said bottom and said flange to define a breaking point cross-section.

5. An overload protection arrangement as claimed in claim 2 in which said load transmitting member is a split-ring.

6. An overload protection arrangement as claimed in claim 2 in which said load transmitting member has an extent parallel to the line of application of force in excess of the distance between the undersurface of said flange and the outer surface of said bottom and said load transmitting member surrounding said wall structure in close-fitting guiding relationship to confine the material of said wall structure.

7. A breaker block construction for interposition between machine parts subjected to load, particularly between an adjusting screw and a roll chock in a rolling mill, said breaker block comprising a body member including a bottom and a wall structure, a flange extending outwardly of the wall structure and having a surface parallel to and spaced from said bottom, said bottom being thicker than said flange and said wall structure, the inner surface of the bottom and the undersurface of said flange defining pressure receiving contact areas respectively spaced axially of the lines of transmission of pressure forces with one area being radially spaced from the other by the thickness of said wall structure so that upon application of forces opposing to said areas said wall structure is subjected to tension.

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