

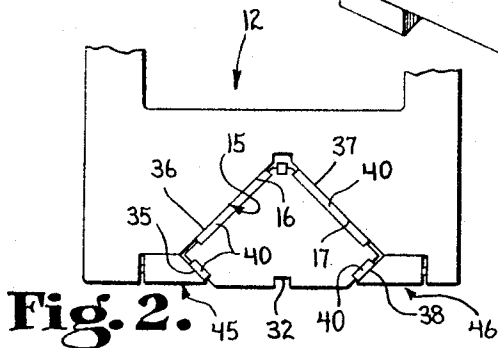
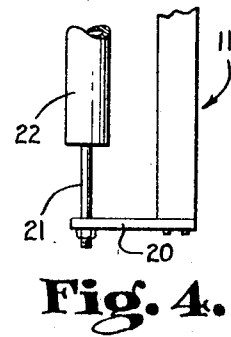
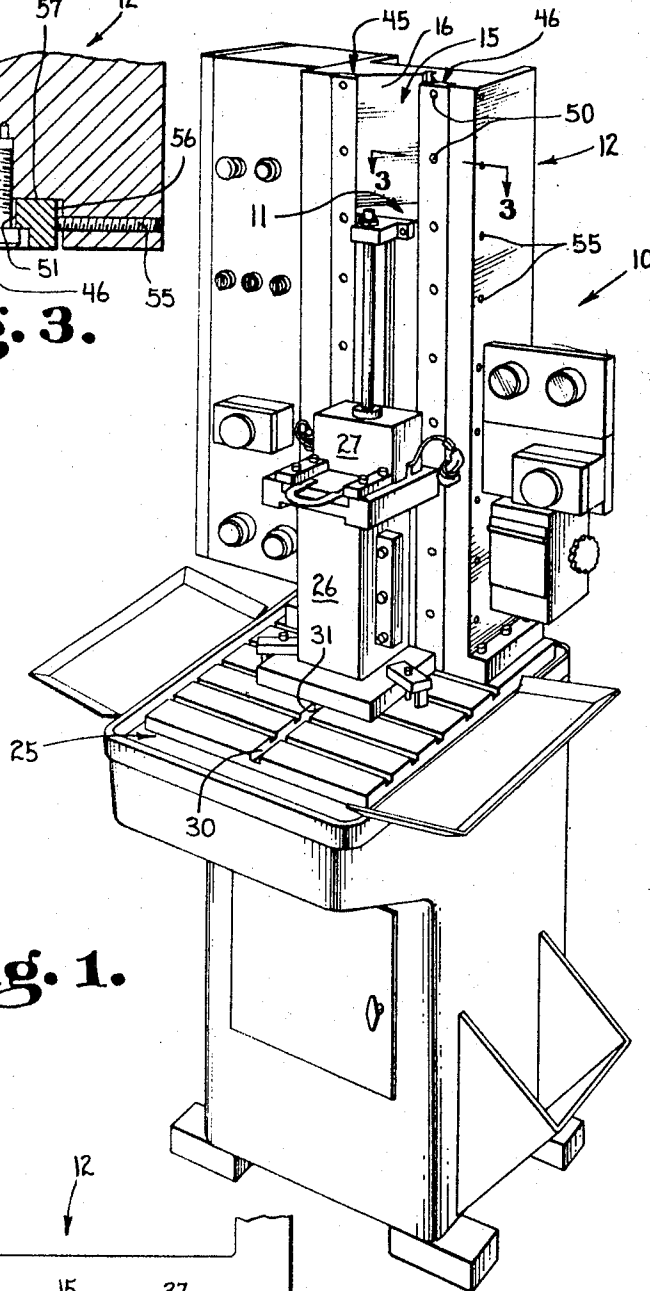
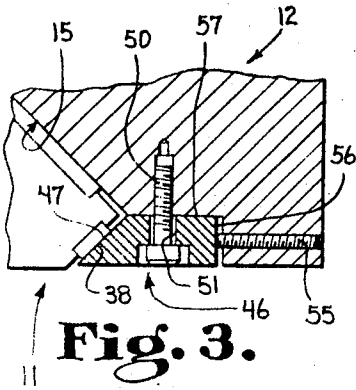
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R. R. HUSER ET AL

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RAM

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INVENTORS.
ROBERT R. HUSER, JOSEPH L. HUSER
and HERMAN A. LEONARD

BY

Woodard Weikert Emhardt & Naughton
Attorneys

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3,448,657

RAM

Robert R. Huser, Joseph L. Huser, and Herman A. Leonard, Indianapolis, Ind., assignors to B&H Tool and Machine Corporation, Indianapolis, Ind., a corporation of Indiana

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4 Claims

The present invention relates to broaching machines.

Presently available broaching machines can usually be rebuilt when some of the parts of the machine wear out. For example, if the ram of the machine wears a substantial amount, the ram can be replaced. If the ram carrier within which the ram moves wears a substantial amount, the carrier can be replaced. If both the ram and the carrier wear substantially, both can be replaced or the ram might be replaced by an oversized ram or the carrier by a smaller carrier. These parts are relatively expensive. Consequently, one object of this invention is to provide a broaching machine which requires only the replacement of inexpensive parts to provide for wear.

Still another object of the invention is to provide a broaching machine which is easily adjusted to provide for wear.

A further object of the invention is to provide a broaching machine which remains centered even though it has worn substantially.

Related objects and advantages will become apparent as the description proceeds.

One embodiment of the present invention might include a broaching machine comprising a ram carrier having an indentation therein, a ram slidable in said indentation, a pair of gib plates secured to said ram carrier and retaining said ram in said carrier.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a perspective view of a broaching machine embodying the present invention.

FIG. 2 is a fragmentary top plan view of the structure illustrated in FIG. 1.

FIG. 3 is a section taken along the line 3—3 of FIG. 1 in the direction of the arrows.

FIG. 4 is a fragmentary view of certain portions of the apparatus illustrated in FIG. 1.

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawing and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring now more particularly to the drawings, there is illustrated a broaching machine 10 which includes a ram 11 mounted for reciprocation in a ram carrier 12. The ram carrier 12 has formed therein an indentation 15 which is V-shaped in cross section and which has two surfaces 16 and 17 defining the V shape.

Referring more particularly to FIG. 4, the ram 11 is secured at its lower end by means of a strap 20 to the piston rod 21 of a hydraulic cylinder 22. The hydraulic cylinder 22 is secured in conventional fashion to the frame of the broaching machine and functions to raise and lower the ram 11 in the ram carrier 12. Mounted on the frame of the broaching machine in fixed relation to the ram carrier 12 is a workpiece-supporting table 25. A

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fixture 26 is mounted upon the table 25 so as to support a workpiece which is operated upon by a broaching tool 27 fixedly mounted upon the ram 11.

The workpiece-supporting table 25 is provided with a slot 30 which extends away from the ram 11 and is useful in locating the fixture 26 properly upon the workpiece-supporting table. Thus, the fixture 26 may be provided with a projecting portion 31 which extends downwardly from the fixture 26 into the slot 30 for properly positioning the fixture.

The ram 11 may also be provided with a slot 32 extending longitudinally of the ram which is usable in properly locating the broaching tool 27 on the ram. It is desirable that these two slots 32 and 30 remain aligned throughout the useful life of the broaching machine so that they can be used in properly positioning the broaching tool 27 and the fixture 26 for correct operation of the broaching machine. If over a period of time the slot 32 becomes slightly out of alignment with the slot 30, errors can be caused in the setting up of the machine for a particular broaching operation.

The ram 11 has a cross sectional configuration which is basically square shaped except for the fact that one corner of the square shape is removed. Thus, the ram 11 includes four surfaces 35, 36, 37 and 38 which represent the four sides of the square shape, the side 35 being at right angles to the side 36 and adjoining the side 36, the side 36 being at right angles to the side 37 and adjoining the side 37, and the side 37 being at right angles to the side 38 and adjoining the side 38. In each of the four sides 35, 36, 37 and 38 there is imbedded a bearing material 40 which may, for example, be the material known by the trademark Teflon, en grain formica or a similar type of long wearing material.

The ram 11 is mounted for reciprocation in the ram carrier 12 by means of a pair of gib plates 45 and 46. Because of the fact that the gib plates 45 and 46 are generally the same or identical except that one is the mirror image of the other, the gib plate 46 illustrated in FIG. 3 will be described as representative of the two gib plates. In FIG. 3, it can be seen that the gib plate 46 has a single bearing surface 47 which is complementary to the surface 38 of the ram 11. The gib plate 46 is secured to the ram carrier 12 by means of a plurality of screws 50 each of which extends through a respective bore 51 which is larger than the diameter of the screw 50. Thus, it is possible to release the various screws 50 and to adjust the position of the gib plate 46 to take up any wear in the ram or the ram carrier 12.

There are also provided additional screws 55 which extend through the ram carrier 12 and which engage the side 56 of the gib plate 46. By tightening the screws 55, or in other words by screwing them leftwardly as viewed in FIG. 3, the amount of adjustment available to the gib plate 46 can be reduced and the gib plate can be moved leftwardly toward the ram 11. As mentioned, the gib plate 46 and its associated screws are representative of the gib plate 45 which can be adjusted in a similar fashion.

There is or can be provided in the adjustable nature of the gib plates 45 and 46 sufficient adjustment to take up for wear in the ram and the ram carrier for a period of years. After such a period of years the back face 57 of each of the gib plates can be shaved off to provide for additional adjustment. Thus, for example, in one specific embodiment of the invention, after a period of two or three years, the back face 57 of the gib plates might be shaved off by five or ten thousandths in order to provide adjustment for another period of two or three years. Also, since the gib plates are much less expensive to replace than the ram 11 or the ram carrier 12, the gib plates themselves can be replaced after the above described shaving

operation is no longer feasible or instead of carrying out the above described shaving operation.

It will be noted that the wear on the face 16 of the ram carrier will be generally the same as the wear on the face 17 of the ram carrier and that the wear on the faces 36 and 37 of the ram will also be generally equal. Furthermore, the wear on the faces 35 and 38 of the ram will generally be equal so that proper adjustment of the broaching machine to take up for wear will be accomplished by a generally equal inward adjustment of the gib plates 45 and 46. The final result of such an adjustment will be a situation in which the slot 32 remains aligned with the slot 30.

It will be evident from the above description that the present invention provides a broaching machine which requires only the replacement of inexpensive parts to provide for wear. It will also be evident that the present invention provides a broaching machine which is easily adjusted to provide for wear and which remains centered even though the ram and the ram carrier have worn substantially.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention and the scope of the claims are also desired to be protected.

The invention claimed is:

1. A broaching machine comprising a ram carrier having a substantially V-shaped indentation therein including a pair of surfaces, a ram having a cross section which is substantially square shaped with at least one corner portion of the square removed leaving at least two corners of said square shape, said two corners being on the opposite sides of said square shaped cross section, said ram cross section including a central corner portion between said two corners, said central corner portion being complementary to and slidably received in said substantially V-shaped carrier indentation, a pair of gib plates secured to said ram carrier and retaining said ram in said carrier, said gib plates each engaging a respective one of said two corners, a workpiece supporting table fixed relative to said ram carrier and being substantially transverse thereto, said table having a workholder locating slot on the surface thereof which extends away from said carrier at an equal angle to each surface of said V-shaped indentation, said ram including a longitudinally extending broaching tool slot between said two corners, said tool slot and said workholder slot being in a predetermined relation to one another and being substantially perpendicular to each other whereby they can be used in properly positioning a

broaching tool and workholder, and means for adjustably moving each of said gib plates toward said two corners to take up wear between said ram and carrier and to maintain said slots in alignment.

2. The broaching machine of claim 1 additionally comprising screws securing said gib plates to said ram carrier, said gib plates having openings therethrough which receive said screws and are larger than said screws whereby the position of said gib plates can be adjusted by releasing said screws.

3. The broaching machine of claim 2 further comprising additional screws threaded through said ram carrier and engaging said gib plates, said additional screws being adjustable to force said gib plates toward said ram.

4. A broaching machine comprising a ram carrier having a V-shaped indentation therein, a ram having a cross section which is substantially square shaped with one corner portion of the square removed leaving three corners of said square shape, said three corners including a central corner and two outside corners, said central corner being complementary to and slidably received in said V-shaped carrier indentation, a pair of gib plates secured to said ram carrier and retaining said ram in said carrier, said gib plates each engaging a respective one of said outside corners, a workpiece supporting table fixed relative to said ram carrier and being substantially transverse thereto, said table having a workholder locating slot on the surface thereof which extends away from said carrier at an equal angle to each surface of said V-shaped indentation, said ram including a longitudinally extending broaching tool slot between said two outside corners, said tool slot and said workholder slot being aligned with and being substantially perpendicular to each other whereby the can be used in properly positioning a broaching tool and workholder, and means for adjustably moving each of said gib plates toward said outside corners to take up wear between said ram and carrier and to maintain said slots in alignment.

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ANDREW R. JUHASZ, *Primary Examiner.*

G. WEIDENFELD, *Assistant Examiner.*

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