July 24, 1962 B. KRALOWETZ 3,045,515

FORGING MACHINE

Filed Jan. 26, 1960 2 Sheets-Sheet 1

FIG.1

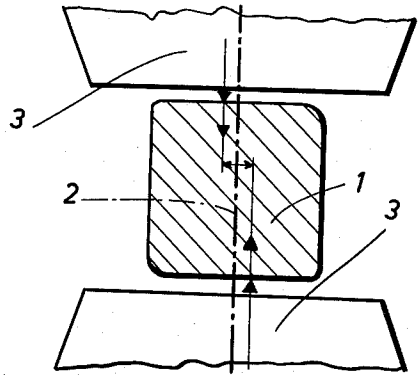


FIG.2

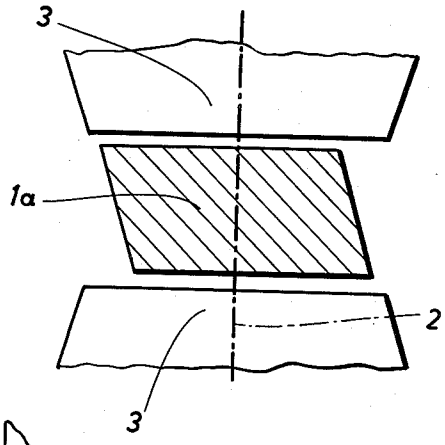
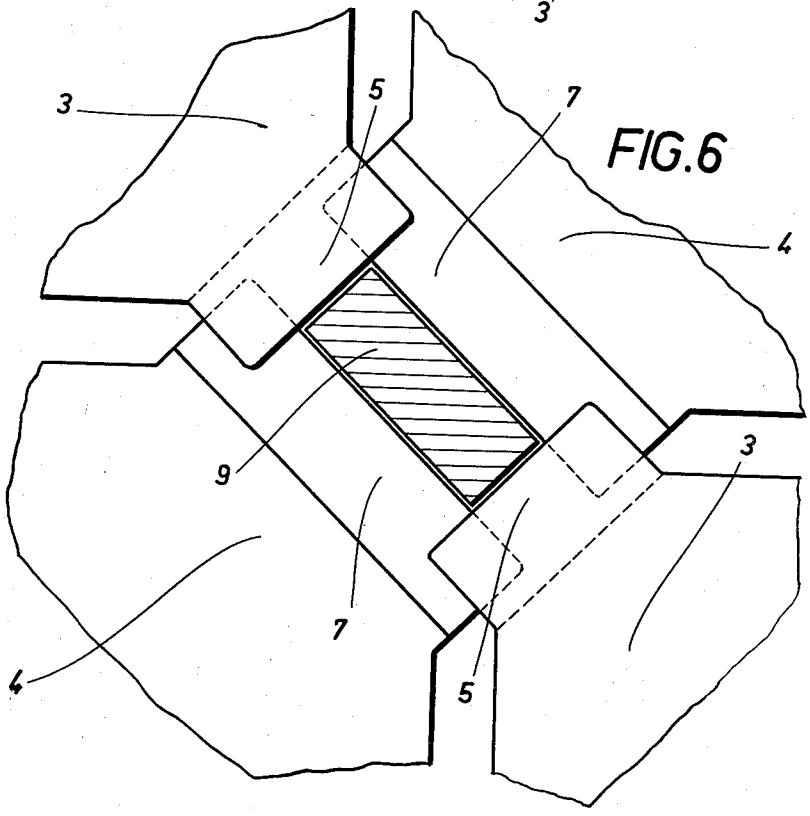


FIG.6



INVENTOR
BRUNO KRALOWETZ
BY
AGENT

July 24, 1962 B. KRALOWETZ 3,045,515

FORGING MACHINE

Filed Jan. 26, 1960 2 Sheets-Sheet 2

FIG. 3

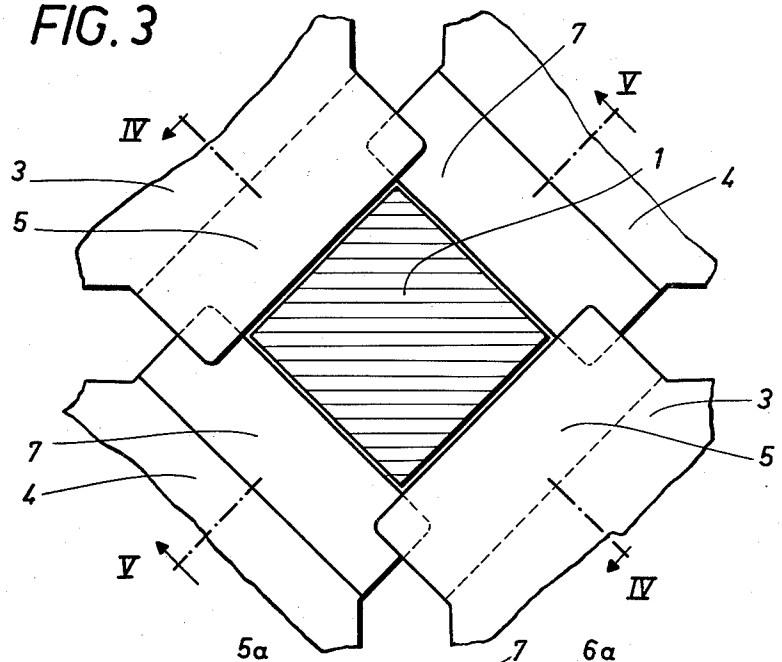


FIG. 4

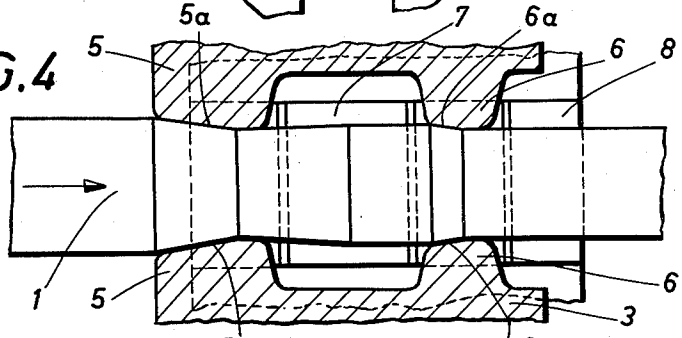
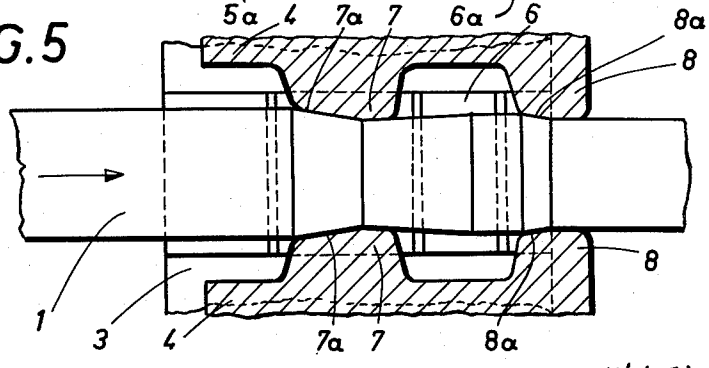


FIG. 5



INVENTOR
BRUNO KRALOWETZ
BY
AGENT

United States Patent Office 3,045,515 Patented July 24, 1962

3,045,515

FORGING MACHINE

Bruno Kralowetz, St. Ulrich, near Steyr, Austria

Filed Jan. 26, 1960, Ser. No. 4,812
Claims priority, application Austria Feb. 4, 1959
3 Claims. (Cl. 78—20)

When workpieces of square or rectangular cross-section are forged between two tools to effect a reduction in the cross-section and a stretching of the workpieces acute-angled edges are often formed because the workpieces do not retain their rectangular or square cross-sectional shape but the profile is displaced to form a rhombus or parallelogram. This is due to the fact that the original cross-section of the workpiece is not always exactly symmetrical with respect to the center line parallel to the impact direction or regions of different hardness of material exist on both sides of this center line or for similar reasons. Such irregularities have the same effect as though the oppositely directed impact forces are relatively offset so that a torque results which causes the displacement of the profile. During manual forging the formation of acute-angled edges can be compensated by additional blows in the diagonal direction. This is not possible, of course, in forging machines. The forging of quadrangular-section workpieces must be carried out with tools the impact surface of which is longer than the corresponding side of the cross-section of the workpiece. Even if the length of the impact face corresponds exactly to the side length of the initial cross-section, the progressive stretching and the resulting reduction of the cross-section will lead to a reduction in the side length of the cross-section relative to the length of the impact surface of the tool. For this reason the previous forging machines use only two tools acting on mutually opposite sides of the cross-section of the workpiece. In this case a formation of acute-angled edges is liable to occur. Whereas forging machines having four hammer tools arranged 90° apart are known, the hammer tools in these machines do not strike simultaneously in forging quadrangular-section workpieces. Such a simultaneous striking would also be impossible because the impact faces exceed the side length of the workpiece. The hammer tools in these machines strike in succession so that the formation of acute-angled edges is not opposed.

It is an object of the invention to eliminate these disadvantages and provide an apparatus with the aid of which the formation of acute-angled edges is safely avoided also in forging machines.

The invention is based on a forging machine having four hammer tools spaced 90° apart and longer than the corresponding sides of the cross-section of the workpiece. The invention resides essentially in that the hammer tools form preferably two projecting impact ledges which extend transversely to the workpiece axis, the impact ledges of directly adjacent tools being staggered clear of each other in the direction of the workpiece axis and all four tools striking simultaneously while their ledges interengage like teeth. As a result, the hammers do not strike during each blow only on two mutually opposite sides of the workpiece but act in the same manner on the other two sides of the workpiece so that there will be no displacement of the profile or formation of acute-angled edges even in the case of adverse properties of the workpiece because the workpiece is gripped between the impact ledges spaced 90° apart. The provision of the impact ledges and their staggering clear of each other solves the problem of striking simultaneously with four tools the length of which exceeds the side length of the cross-section of the workpiece without causing the workpieces to hit and damage each other.

It is particularly suitable if all impact ledges have on

the side from which the workpiece is fed an inclined guide surface and the impact ledges on the input side are wider than those on the output side. This will provide for a considerable reduction in cross-section and stretching of the workpiece. The guide surface at the impact ledges disposed rearwardly with respect to the feeding of the workpiece is necessary because each blow in one direction will cause the corresponding portion to bulge somewhat in the other direction, which bulge must subsequently be compensated.

The subject matter of the invention is diagrammatically shown by way of example in the accompanying drawings. FIGS. 1 and 2 show the shaping of a workpiece of square-cross-section with the aid of two forging hammers involving a formation of acute-angled edges. FIG. 3 shows the arrangement and shape of the hammers provided according to the invention to forge a square-section workpiece, in elevation, seen in the direction of the workpiece axis. FIGS. 4 and 5 show the hammer tools in sectional views taken on lines IV—IV and V—V of FIG. 3, and FIG. 6 shows the relations during the forging of a rectangular-section workpiece in a similar view as in FIG. 3.

If the workpiece 1 has a cross-section which is non-symmetrical with respect to the center line 2, as is indicated in FIG. 1 by a generally square cross-section which is rounded only at two diagonally opposed corners, or if other irregularities exist on both sides of the center line, the axes of symmetry of the forces generated by the impact of the tools 3 will not act in a common line or plane but will be relatively offset. This offsetting causes a displacement of the profile as shown in FIG. 2, where the workpiece 1*a* has assumed a parallelogram-shaped cross-section. This displacement of the profile is referred to as a formation of acute-angled edges.

According to the invention the formation of acute-angled edges is opposed by providing four tools 3, 4 spaced 90° apart and striking simultaneously rather than two tools. The simultaneous striking would not be possible with tools of known shape because the length of the impact faces of the tools must always exceed the side length of the cross-section of the workpiece so that the hammers would not strike the workpiece but each other. For this reason each tool forms two protruding impact ledges 5, 6, 7, 8 extending transversely to the axis of the workpiece 1. The impact ledges 5, 6, and 7, 8, respectively of the tools 3, 4 are staggered clear of each other in the axial direction, as is apparent from FIGS. 4 and 5, so that they can interengage like teeth when striking simultaneously. For this reason the one tool 3 can no longer hit the adjacent tools 4 whereas the impact ledges acting in succession in the feed direction are sufficient to prevent a displacement of the profile by the previously acting impact ledges.

To reduce the cross-section of a rectangular-section workpiece 9 by forging (FIG. 6), the tools 3, 4 and their impact ledges 5, 6 and 7, 8 are given different lengths. The construction remains the same in other respects.

It is apparent from FIGS. 4 and 5 that all impact ledges 5, 6 and 7, 8 have an inclined guide face 5*a*, 6*a* and 7*a*, 8*a*, respectively, on the input side and that the impact ledges 5, 7 on the input side are wider than those on the output side.

What I claim is:

1. A forging machine for forging workpieces of rectangular cross-section, which comprises four hammer tools each of which is operable to strike one side of the workpiece, each of said hammer tools having a striking face arranged to confront said side of said workpiece and having a length which is larger than the width of said side, each of said striking faces having at least one impact ledge extending transversely to the axis of said work-

piece, the impact ledges of immediately adjacent ones of said tools being staggered to clear each other in the direction of the axis of the workpiece, said tools being operable to strike the workpiece simultaneously to cause their impact ledges to enter into toothlike interengagement.

2. A forging machine as set forth in claim 1, in which each of said tools has two impact ledges spaced in the direction of the axis of the workpiece.

3. A forging machine as set forth in claim 2, in which the workpiece is adapted to be fed through the machine in a predetermined direction to determine an input side and an output side and in which each of said impact ledges has on its input side an inclined guide surface confronting the workpiece and the impact ledges of each tool are arranged on the input and output sides of said tool, respectively, the impact ledge on the input side of each tool being wider than that on the output side.

References Cited in the file of this patent

UNITED STATES PATENTS

186,999	French	Feb. 6, 1877
992,890	Lewis	May 23, 1911
2,872,832	Appel et al.	Feb. 10, 1959