Feb. 10, 1959 G. H. APPEL ET AL 2,872,832

PLURAL WORKPIECE FORGING MAGHINES

Filed Nov. 15, 1956 3 Sheets-Sheet 1

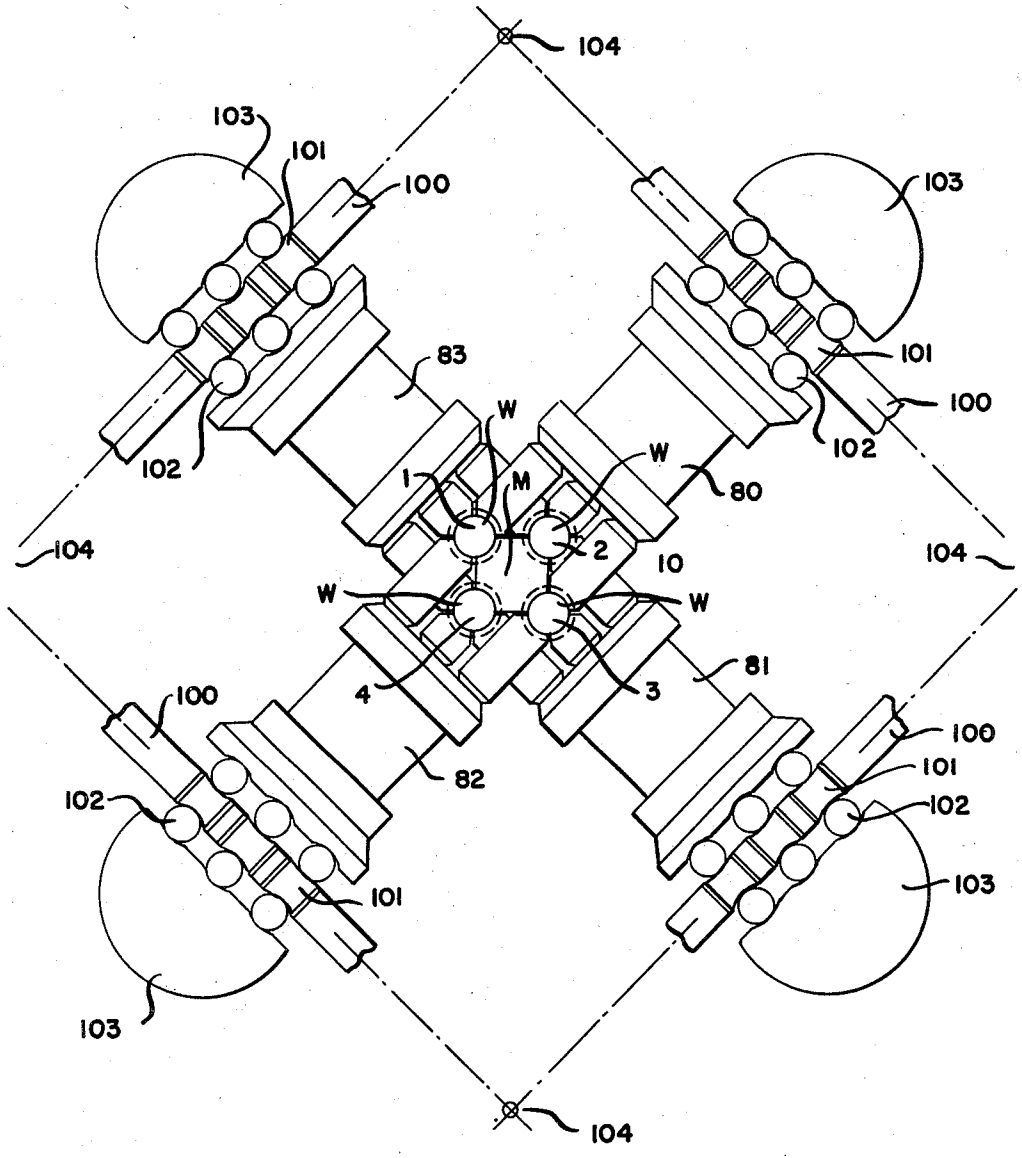


FIG. 1

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PLURAL WORKPIECE FORGING MAGHINES

Filed Nov. 15, 1956 3 Sheets-Sheet 2

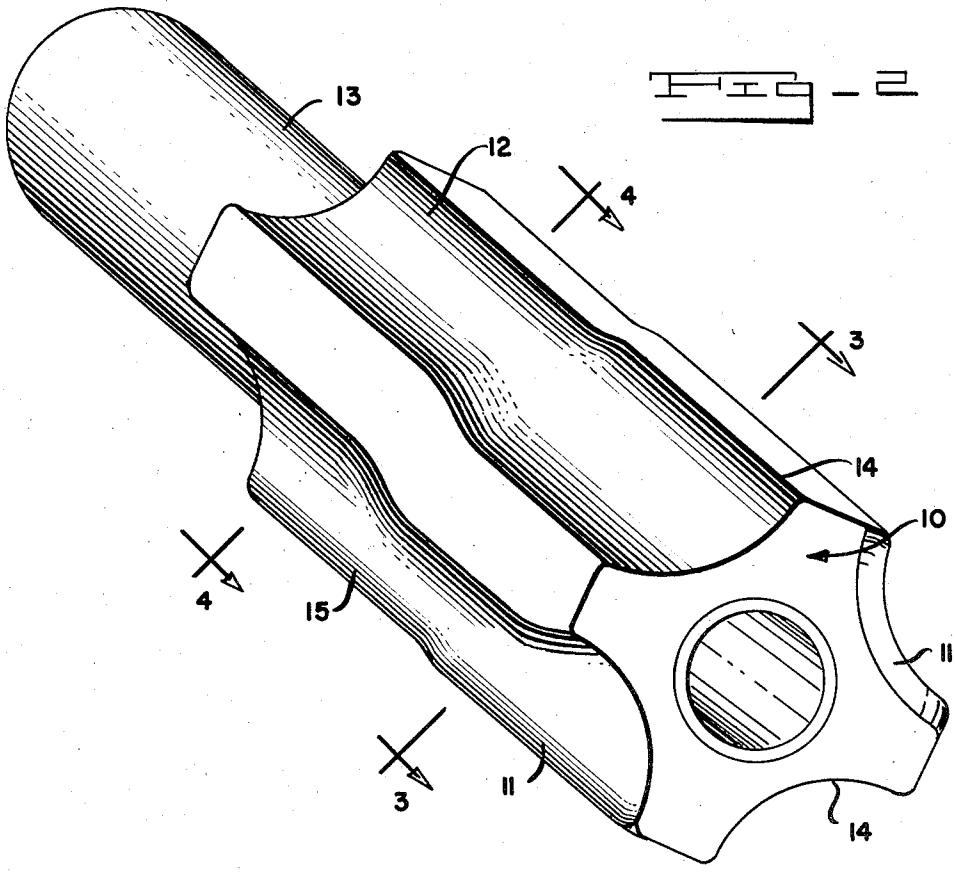
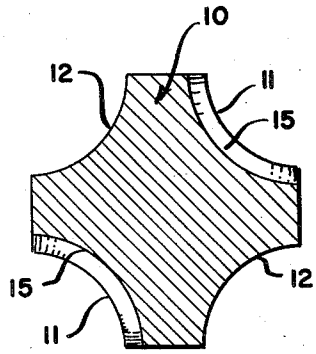


Fig - 2



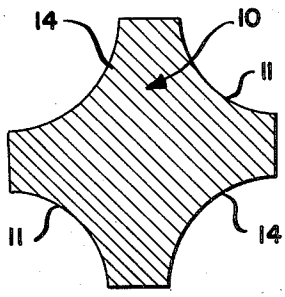


Fig - 3

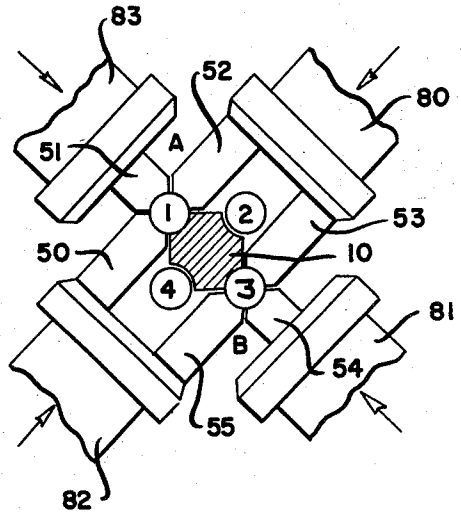
Fig - 4

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PLURAL WORKPIECE FORGING MAGHINES

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I

FIG - 5

II

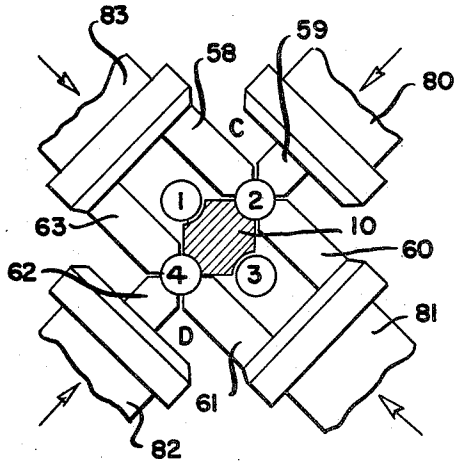


FIG - 6

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PLURAL WORKPIECE FORGING MACHINES

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Application November 15, 1956, Serial No. 622,293

2 Claims. (Cl. 78—24)

This application relates to forging machines and particularly to plural workpiece forging machines.

A prior application, Serial No. 450,500, filed August 17, 1954, discloses a forging machine wherein a single workpiece may move in the direction of its longitudinal axis in a path encircled by four opposing forging dies and wherein each forging die is opposed in its movement to the movement of an opposite forging die.

The broad object of this invention is to interpose what may be termed a substantially stationary anvil between a pair of forging dies opposed in their movement and whereby two workpieces which may be moveable in the direction of their longitudinal axes in parallel paths may each be positioned between a forging die and a side of the anvil; and the pressing force of one forging die towards its workpiece and the anvil providing a counterbalancing reaction for the pressing force of the other forging die towards its workpiece and the anvil. In this way a plurality of workpieces may be forged simultaneously.

A further object of the invention is to position an anvil centrally of four forging dies of a similar general arrangement to that shown in application Serial No. 450,500 and wherein four workpieces are arranged around the anvil for simultaneous forging thereof, each workpiece being engaged and shaped at one point by two opposing forging dies and a third forging die movable towards the anvil, the arrangement being such that one die mover moves three forging dies towards three of the workpieces.

In this application there is disclosed an arrangement which comprises the provision of a plurality of workpieces arranged around a central anvil between them. The numerous forging dies are arranged in groups positioned around the various workpieces and the various groups are arranged in assemblies positioned along the workpiece axes in different anvil sections which are spaced along the workpiece axes.

This construction enables forging to be accomplished on numerous workpieces simultaneously and at different anvil sections along the workpiece axes.

This construction also permits the use of a single die mover for moving different forging dies so that a single die mover may be common to a plurality of forging dies.

A principal object of the present invention therefore is to provide a machine for simultaneously forging a plurality of workpieces.

A further object is to provide a machine having a plurality of forging dies moved by a common die mover.

A further object is to provide a central anvil between parallel workpieces, opposing the forces from forging dies.

The foregoing objects and others are obtained by the machine of this invention, an embodiment of which is disclosed in the appended drawings.

In these drawings:

Fig. 1 is an end view of certain parts of the machine;

Fig. 2 shows an anvil forming part of the machine;

Figs. 3 and 4 are cross-sectional views, to a slightly

reduced scale, taken on arrows 3—3 and 4—4, respectively of Fig. 2;

Fig. 5 is a view of certain parts in one plane looking endwise corresponding to the anvil section of Fig. 4, omitting parts in a second plane behind the first plane, as viewed in Fig. 1;

Fig. 6 is a view like Fig. 3 but showing the parts of such second plane corresponding to the anvil section of Fig. 5 and omitting the parts of the first plane whose parts are shown in Fig. 5.

Referring to the drawings, it will be seen that Fig. 1 shows a forging machine diagrammatically. The machine comprises a head, not shown, through which axially passes a plurality of workpieces 1, 2, 3 and 4 with their central axes defining workpieces axes W.

Central of the machine and the workpieces and arranged on a longitudinal axis M parallel to the workpiece axes W and thus transverse to the radial axes or forging paths, is a central anvil 10. It will be observed that this anvil is positioned generally where the workpiece axis W is positioned in the machine of the prior application where there is a single workpiece axis W for a single workpiece.

The anvil 10 extends longitudinally of the machine and is formed as shown in Fig. 2 with a pair of concave anvil surfaces 11 in the forward section of the mandrel and a pair of concave anvil surfaces 12 in the rear section of the anvil and with a holding or retaining portion 13 which enables the anvil to be held firmly within the machine in the position indicated.

It will be observed in the machine shown, that the two pairs of anvil surfaces 11 and 12 engage four workpieces. The two anvil surfaces 11 are oppositely positioned as are the two anvil surfaces 12, the surfaces 11 being spaced circumferentially 90° in relation to the surfaces 12.

The anvil 10 is also formed with two pairs of enlarged concave workpiece clearing areas 14 and 15 in similar arrangement to the two pairs of anvil surfaces 11 and 12, surfaces 11 being in longitudinal alignment with and merging from the areas 15 and the surfaces 12 in longitudinal alignment with and merging from the areas 14, to provide workpiece clearance areas 14 at the forward end of the anvil for workpieces forged at the rear section of the anvil in surfaces 12. Likewise clearance areas 15 at the rear end of the anvil provide clearance areas for workpieces forged in surfaces 11 at the front section of the anvil. The smaller grooves 11—12 shown are anvil surfaces and the larger grooves 14—15 shown are clearance areas.

In the anvil section containing the anvil surfaces 11 is positioned forging group I. This includes two forging sub-groups A and B and is shown in Fig. 5. Each forging sub-group is arranged around a workpiece. Forging sub-group A is arranged around workpiece 1 and comprises dies 50, 51 and 52. Forging sub-group B comprises dies 53, 54 and 55 arranged around workpiece 3.

In an anvil section behind the forging groups shown in Fig. 5, and at anvil surfaces 12 of anvil 10, is disposed the forging group II shown in Fig. 6 and comprising two forging sub-groups C—D. Forging sub-group C comprises dies 58, 59 and 60 and is arranged around workpiece 2 and the other forging sub-group D comprising dies 61, 62 and 63 is arranged around workpiece 4.

For moving the various dies radially there are provided a plurality of die movers 80—83 inclusive.

For moving the die movers radially there are provided a plurality of drivers 100 having cams 101 and rollers 102 which cooperate with backing elements 103 whereby movement of the drivers in paths transverse to the radial axes of movement of the die movers will cause the die movers and the dies to move radially. Movement of the

drivers **100** is effected by the provision of eccentrics at **104** and other moving apparatus, all clearly disclosed in prior application, Serial No. 450,500.

The construction and arrangement of the eccentrics, the drivers, the cams, the rollers, the backing elements, and in relation to these parts, the construction and arrangement of the die movers forms no part of the present invention which is directed specifically to the arrangement of workpieces, dies, and anvil, and all these in relation to one another and in relation to the die movers.

It will readily be observed that forging dies of different forging groups are moved in part at least by a common die mover. Thus, die mover **80** moves forging dies **52**, **59** and **63**; die mover **81** moves dies **60**, **54**, and **61**; die mover **82** moves dies **50**, **62** and **55**; and die mover **83** moves dies **63**, **51**, and **58**.

It will also be observed that the provision of the anvil **10** between the several workpieces enables simultaneously forging a number of workpieces and forging these workpieces at a number of sections simultaneously on these several workpieces and wherein each workpiece is formed by three movable dies in cooperation with the anvil **10** which by way of its counterbalanced reaction renders the workpieces plastic at the anvil surfaces of the anvil. Due to the anvil **10** being located centrally of the forging dies movable in radial relation thereto it therefore establishes the necessary compressive forces in such a manner that their components are directed to the centers of the workpieces.

Now having described the embodiment herein disclosed, reference should be had to the claims which follow.

We claim:

1. A forging machine for simultaneously forging a plurality of workpieces comprising an elongated anvil having a plurality of elongated grooves each extending the operating length of the anvil and adapted to cooperate with one workpiece; said grooves arranged in pairs around

the anvil, the grooves of each pair being in alignment on opposite sides of said anvil; a plurality of movable dies cooperating with a portion of each anvil groove to form therewith a workpiece throat; one of said dies moving in said direction of alignment and the other of said dies moving in the direction of alignment of another pair of grooves; each plurality of movable dies and their cooperating anvil grooves successively located at alternate different localities along the length of said grooves so that only a portion of each groove forms a workpiece throat; an actuator for said dies grouped in pairs; each pair being associated with a pair of grooves; the actuator of one pair located on one side of said anvil and the other actuator of said pair located on the other side of said anvil; each actuator engaging and moving all dies located on its side of the anvil that are moving in its direction of movement.

2. A construction according to claim 1 wherein there are four grooves in the anvil and wherein there are three dies at the forward part of each groove and three dies at the rearward part of each groove, there being twelve dies in all; and wherein there are four actuators, each associated with three dies.

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