Aug. 13, 1963 H. ESSER ET AL 3,100,409

FORGING AND UPSETTING MACHINES WITH IMPROVED CLAMPING JAWS

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Fig. 1

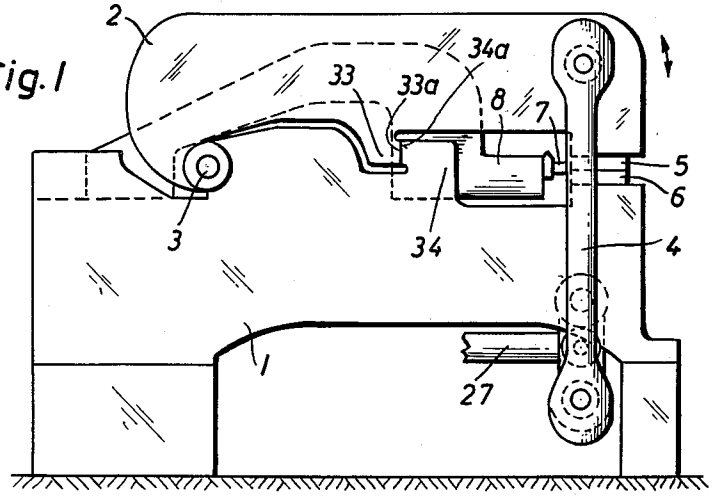

Fig. 5

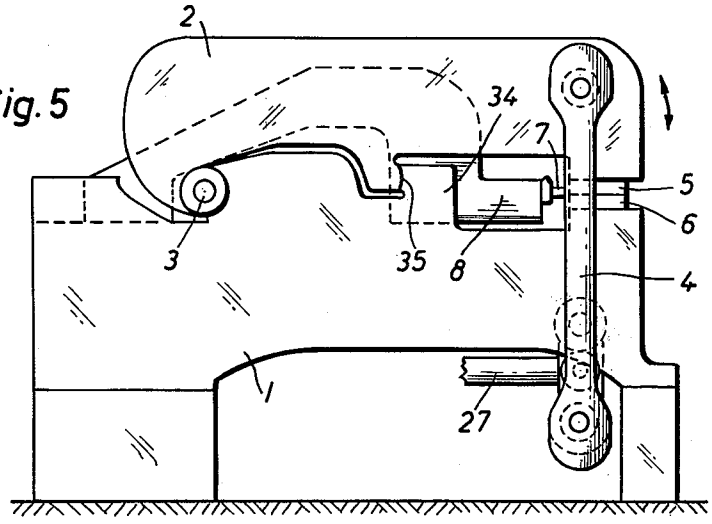

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Fig. 2

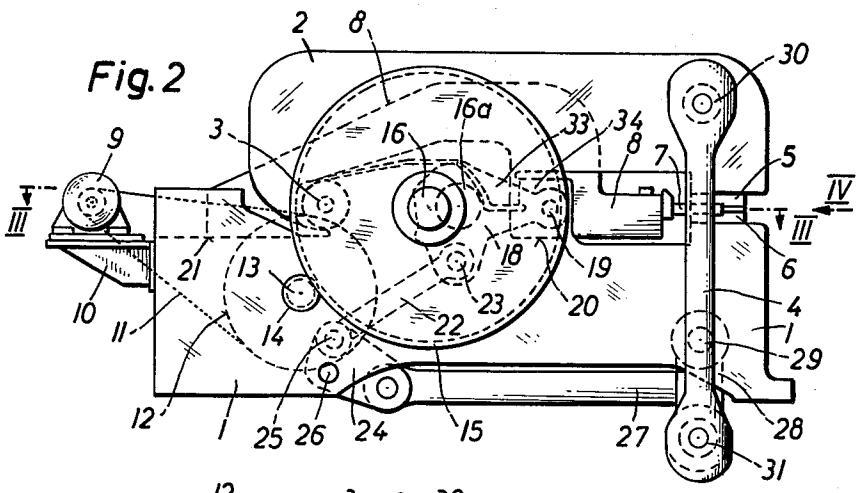


Fig. 3

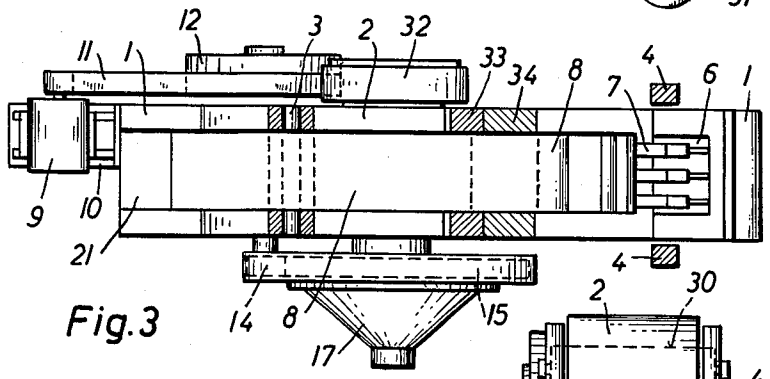
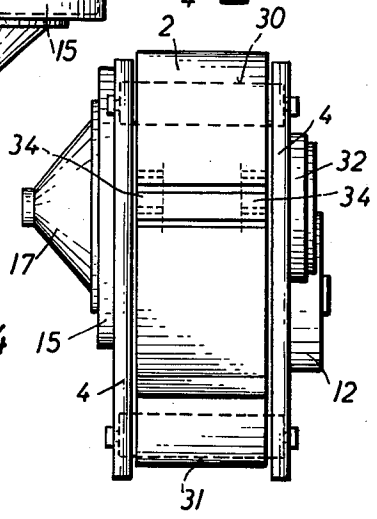


Fig. 4



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3,100,409

FORGING AND UPSETTING MACHINES WITH IMPROVED CLAMPING JAWS

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7 Claims. (Cl. 78—17)

This invention relates in general to new and useful improvements in forging and upsetting machines, and more particularly to novel clamping jaws for forging and upsetting machines.

It is well known, in forging and upsetting machines, to make use of divided clamping dies, one of which is fast in the machine frame, while the other is movable for producing the opening distance. The workpieces to be machined are clamped by the closing of the clamping dies and are then shaped by the upsetting tools. The upsetting force has to be taken up via the divided dies by the machine parts in which the dies are mounted. To prevent shifting of the workpieces, the machine parts in which the fixed and movable dies are mounted must have the same elongation, that is to say, the same stiffness. In forging and upsetting machines with clamping jaws, therefore, the jaw-yoke in which the movable die is mounted must have the same stiffness as the machine bed in which the fixed die is situated. This requirement necessitates a heavy jaw-yoke construction, especially since the jaw-yoke is of considerable length, being pivotally mounted at the rear end of the machine.

It is the object of the invention to provide an improved forging and upsetting machine of the kind mentioned having means for reliably eliminating the danger of shifting of workpieces during upsetting. The machine is characterized in that in order to shorten the jaw-yoke length subjected to elongation in the upsetting direction, the jaw-yoke is provided with locking means operative in the upsetting direction and interengaging with the machine bed. This results in a shortening of the jaw-yoke length subjected to elongation with the machine bed in the closed condition of the dies. For the same stiffness, the possibility of elongation of the jaw-yoke is substantially reduced as compared with existing jaw-yokes, thereby assisting substantially in preventing shifting of the workpiece.

Advantageously, the jaw-yoke is provided on the underside with a projection which, in the closed die position, is adapted to bear firmly against a stop on the machine bed. The locking elements should be situated as close as possible to the tools in order to keep as small as possible the jaw-yoke length subjected to elongation. On the other hand, the locking elements must be situated so far to the rear as not to hinder accessibility of the tools and hence automatic workpiece transport through the tools.

The abutment faces are advantageously plane surfaces. They may, however, be made arcuate in certain cases, for example, with a curvature corresponding to the radius to the pivoting point of the jaw-yoke.

An example embodiment of the invention is illustrated in the accompanying drawings wherein like parts are referred to by like reference numerals.

FIG. 1 is a schematic side elevation view and shows the forging and upsetting machine with the clamping jaws;

FIG. 2 corresponds to FIG. 1 and in addition shows the driving means for the upsetting ram and jaw-yoke;

FIG. 3 is a longitudinal section on the line III—III in FIG. 2 with the jaw-yoke removed and with a plane of the upsetting ram;

FIG. 4 is an end view of the forging and upsetting machine of FIG. 2 in the direction of the arrow IV; and

FIG. 5 is a fragmentary side view showing a modified form of stop.

Referring now to the drawings in detail, it will be seen that the machine includes a machine bed **1** carrying a jaw-yoke **2** which is pivotally mounted on a spindle **3** carried by the machine bed **1**. The pivoting movement of the jaw-yoke **2** is effected by means of connecting rods **4** and a multi-link mechanism hereinafter described. Connected to the jaw-yoke **2** is a top die **5**, while a bottom die **6** is fixed to the machine bed **1**. Upsetting punches **7** are mounted in the upsetting ram **8** which is horizontally movable.

Power from a driving motor **9**, which is mounted on a bracket **10** at the rear of the machine bed **1**, is transmitted by means of a V-belt **11** to flywheel **12** mounted on a countershaft **13**. Movement is transmitted from the countershaft **13** by a gearwheel **14** to a large gearwheel **15**, which is mounted on a crankshaft **16** and in which is incorporated a clutch **17**. On a crankpin **16***a* of the crankshaft **16** is mounted a push rod **18**, pivoted by pin **19** to the upsetting ram **8**. The upsetting ram **8** has the form of a yoke and is guided in the machine bed **1** at **20** and **21** in front of and behind the crankshaft mounting. This provides a considerable guiding length for the upsetting ram **8**.

Driven directly from the push rod **18** is a multiple lever mechanism, which produces the clamping movement of the jaw-yoke **2** by means of the connecting rods **4**. This multiple lever mechanism consists of links **22** pivoted to the push rod **18** at **23** and to a bell-crank **24** at **25**. The bell-crank **24** is rotatable in the machine bed **1** at **26**. Movement is transmitted from the bell-crank **24** by means of a push rod **27** to a toggle lever **28** pivoted in the front part of the machine bed **1** at **29**. The connecting rods **4**, situated on either side of the machine, engage this toggle lever **28**, while their upper ends are pivoted by a pin **30** to the jaw-yoke **2**. The connection between the toggle **28** and the connecting rods **4** is produced by means of a pin **31**. The crank-shaft **16** also carries the friction brake **32**.

When the machine is running idle, the parts **9** to **15** rotate continuously in a uniform manner. For operating the machine, the large gearwheel **15** is connected to the crankshaft **16** by means of the clutch **17**, whereby the upsetting ram **8** is reciprocated by the push rod **18**. The movement of the push rod **18** produces at the same time the opening and closing of the jaw-yoke **2** by means of the connecting rods **4** and the multiple lever mechanism **22** to **31**. By means of this mechanism arrangement, closing of the dies **5** and **6** relatively to each other by means of the jaw-yoke **2** occurs at about 90° crank angle, remains closed for the next 180°, during which the upsetting process takes place by means of the upsetting ram **8** and the upsetting punches **7**, and the dies **5** and **6** are opened by the upward movement of the jaw-yoke **2** only on the last 90° crank angle.

To still more reliably eliminate shifting of the clamping dies **5**, **6** at the workpiece, without having to redesign the jaw-yoke, the jaw-yoke **2** in the closed position is locked with the machine bed **1** between the ends. For this purpose, the jaw-yoke **2** is provided with a projection **33** which, in the closed position of the dies, is adapted to bear firmly against a stop **34** in the machine bed **1**. It the parts **33** and **34** were non-existent, the elongation of the jaw-yoke **2** between the pivot **3** and the movable die **5** must be equal to the elongation of the machine bed **1** between the pivot **3** and the fixed die **6**. If, on the contrary, the interlocking parts **33** and **34** are provided, the elongation of the jaw-yoke only on the length be-

tween the projection **33** and the movable die **5** has to be equal to the elongation of the machine bed between stop **34** and fixed die **6**. This means that the machine parts behind the parts **33** and **34** can be made lighter in construction, since these parts in practice are no longer a decisive factor in the elongation.

Mutually abutting surfaces **33***a* and **34***a* of the parts **33** and **34** may be plane in construction. These surfaces may also have a curved form **35** with a radius about the pivoting point of the pin **3** of the jaw-yoke **2**, as indicated in FIG. 5.

From the foregoing, it will be seen that there has been devised suitable means for accomplishing the desired end. Although a preferred embodiment of the invention has been disclosed, it is to be understood that minor variations may be made therein without departing from the spirit and scope of the invention as claimed.

What is claimed as new is:

1. A forging and upsetting machine comprising a machine bed, a jaw-yoke having pivot means pivotally connecting the same to said machine bed, divided clamping dies carried by said machine bed and said jaw-yoke, an upsetting punch positioned between said jaw-yoke and said machine bed for cooperation with said clamping dies, drive means connected to said upsetting punch and said jaw-yoke for reciprocating said upsetting punch and opening and closing said clamping dies in timed relation, and means for locking said jaw-yoke to said machine bed intermediate said clamping dies and said jaw-yoke pivot means against movement in the direction of movement of said upsetting punch to thereby shorten the length of said jaw-yoke subject to elongation by the force exerted thereon through the associated one of said clamping dies during the operation of said upsetting punch.

2. The forging and upsetting machine of claim 1 wherein said locking means includes a depending projection on the underside of said jaw-yoke and a cooperating stop on said machine bed disposed in firm abutting relation in the closed position of said jaw-yoke.

3. The forging and upsetting machine of claim 2 wherein said locking means is rendered effective for a period of time corresponding to the upsetting stroke of said upsetting punch.

4. The forging and upsetting machine of claim 2 wherein said projection and said stop have planar abutting surfaces.

5. The forging and upsetting machine of claim 2 wherein said projection and said stop have arcuate abutting surfaces.

6. The forging and upsetting machine of claim 2 wherein said projection and said stop have arcuate abutting surfaces with a radius about the pivot point of the jaw-yoke.

7. The forging and upsetting machine of claim 1 wherein said locking means is rendered effective for a period of time corresponding to the upsetting stroke of said upsetting punch.

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