Jan. 13, 1959 C. LOUIS ET AL 2,867,823

HEADING MACHINE HAVING AN ADDITIONAL PUNCH STROKE EFFECTIVE AT THE FORWARD POSITION OF THE HEADER SLIDE

Filed Sept. 12, 1955 3 Sheets-Sheet 1

Fig. 1

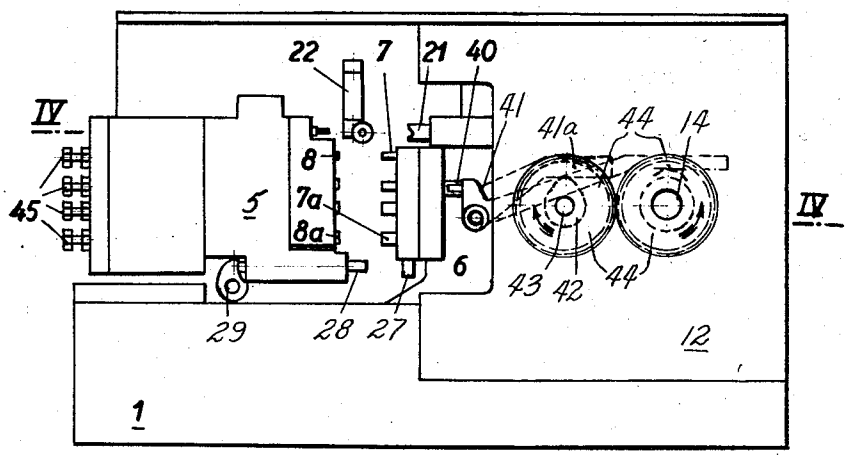
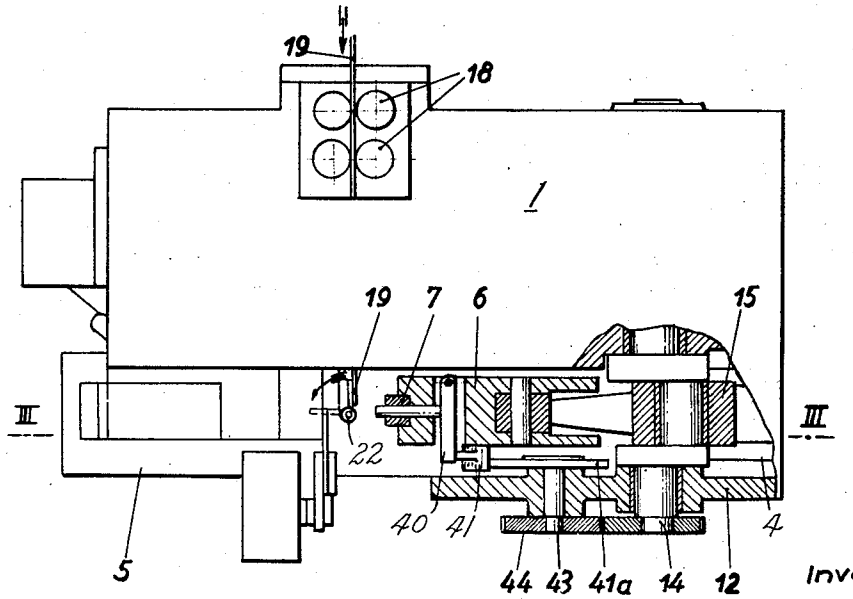


Fig. 2



Inventors:

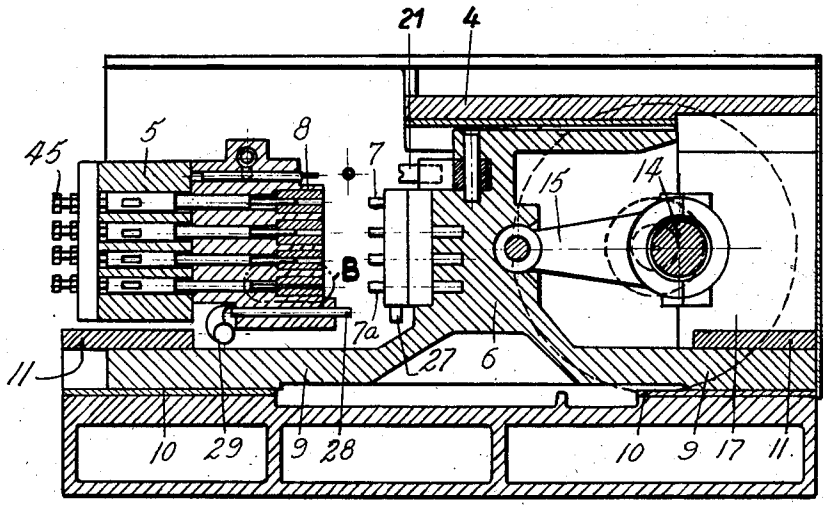
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Fig. 3



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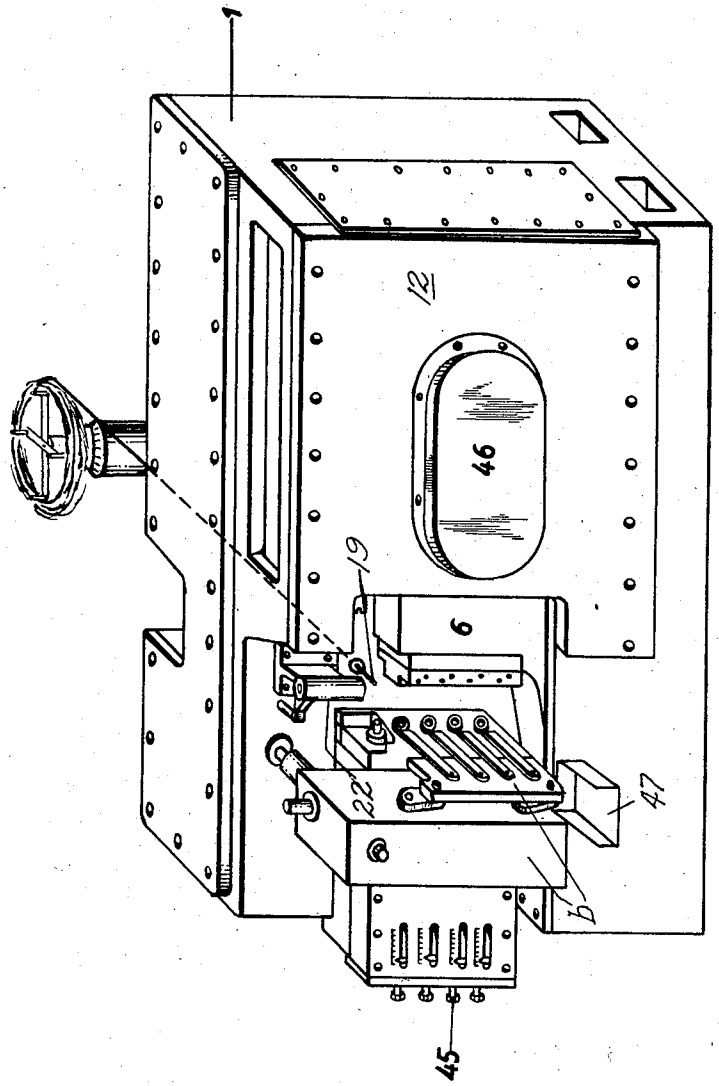


Fig. 4.

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United States Patent Office 2,867,823 Patented Jan. 13, 1959

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HEADING MACHINE HAVING AN ADDITIONAL PUNCH STROKE EFFECTIVE AT THE FORWARD POSITION OF THE HEADER SLIDE

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Application September 12, 1955, Serial No. 533,594

Claims priority, application Germany September 13, 1954

4 Claims. (Cl. 10—12)

This invention concerns an automatic multi-stage press for the manufacture of articles, such as threaded bolts or the like, from rod sections, said press having a plurality of dies and punches and also controlled ejectors.

Automatic presses of this kind usually include an automatic feed mechanism for the rod, from which during each working stroke a blank is cut off, and also an automatic cutting device serving this purpose. Furthermore, in such presses there is usually provided an automatic gripper device, which during each working stroke brings the cut-off blank up to the die of the first pressing stage, the pressed article ejected from this die to the die of the second stage, and if necessary, the pressed article ejected by the second die to the die of the third stage, and so forth. The number of dies and punches co-operating therewith and arranged on a reciprocating carriage is determined by the number of pressing stages required.

It is known in such presses to form the press frame as a closed casing, to accommodate the press drive therein and to arrange in front of an outer wall of the frame casing, a block rigidly connected to said wall, which block contains the dies and ejectors, and also the punch carriages. The afore-mentioned auxiliary devices, namely the cutting and the gripper device must, of course, be disposed between the die block and the punch carriage. In known presses, these auxiliary devices considerably hamper the accessibility and the possibility of observing the press tools, and every time a press tool has to be changed, they have to be dismantled or swung out. Moreover, the rod from which the press cuts off a blank during each working stroke, is advanced in the direction of movement of the punch carriage. The controlled cutting device for cutting off the blank must consequently operate transversely to this direction of movement, whereby a considerably complicated power transmission from the press drive to the cutting device results. The feed device of the rod, which must be secured either to the die block or to the stationary guide for the punch carriage, is located externally of these parts and thus increases the overall length of the press.

It is an object of the invention so to arrange the afore-mentioned auxiliary devices that the press tools remain readily accessible and may be conveniently kept under observation and exchanged.

A further object of the invention consists in adapting and arranging the feed mechanism of the rod from which the blanks are cut off, in such a manner that any increase of the given overall length of the press is unnecessary. By the given overall length there is to be understood the length resulting from the dimensions of the die block and the punch carriage, together with the carriage drive and the size of the working space of the press tools.

Yet another object of the invention is substantially to improve the guide of the punch carriage, in such a manner that with a predetermined bearing play, the deviation of the punches from the constructional plane

of movement when the carriage advances, remains as slight as possible.

A still further object of the invention lies in adapting the press in such a manner that it is rendered possible to manufacture articles of extremely varied shape therewith, by a simple exchanging of the press tools. The afore-mentioned known presses are generally single purpose presses and only permit the manufacture of articles of a definite shape and dimensions, e. g. of threaded nuts and/or threaded bolts only.

Further objects and advantages of the invention, and the manner in which they are realised, will hereinafter be more fully described, by way of example with reference to the accompanying generally simplified drawings, which show one preferred embodiment of the invention, and in which:

Fig. 1 is a side elevation of the press constructed in accordance with the invention,

Fig. 2 is a plan view thereof, partly in section,

Fig. 3 is a vertical cross-section through the working parts of the press, taken on the line III—III of Fig. 2,

Fig. 4 is a front perspective view of the press.

The frame, generally denoted **1**, of a fully automatic multi-stage press for manufacturing shaped objects from rod sections, is constructed in the form of a closed casing. Rigidly fixed to the outside of the front wall **2** of the frame casing **1**, which encloses a hollow internal space **1***a*, there is a guide **4** and a block **5** which preferably form an integral unit with the casing **1**. Reciprocating in the guide **4** there is a punch carriage **6** which at the end facing the block carries several superposed punches **7**. Mounted in the block **5** on the same levels as the associated punches **7** there are several fixed dies **8**. The punches **7** and the dies **8** are interchangeably arranged on their holders in the usual manner.

The punch carriage **6** is supported on a lower fixed slide bearing **10**, in the manner of a cross-head, by means of extensive supporting surfaces **9** projecting beyond the carriage body. The bearing **10** encloses a plurality of chambers **10***a* through which flows a cooling liquid. As shown in Fig. 3, the bed **10***b* of the slide bearing **10** which is formed integrally with the frame **1**, extends over the whole length of the press, and underneath and beyond the die block **5**.

The punch carriage **6** is externally covered by an end plate **12** rigidly arranged on the frame **1** and containing a bearing **13** for the end of the shaft **14** of a crank drive **15** by which said carriage is displaced. The drive shaft **14** of this crank drive, which is also enclosed relative to the outside by the end plate **12**, passes through the internal space **1***a* of the frame **1** and at its other end runs in a bearing **16** formed in the rear wall **3** of the frame. On the shaft **14** is mounted a gear wheel **17**, which may be rotated by the main drive of the press. For the sake of clarity the main drive has been omitted from the drawing and may be arranged inside or externally of the frame **1**.

In the interior space **1***a* of the box frame **1** there is also provided a mechanism **18** comprising a pair of driven rollers for feeding a rod **19** in the horizontal plane. The front end of the rod **19** is guided in a sleeve **20**, which traverses the interior space **1***a* and extends through the front wall **2** of the frame **1**. A cutter device **21** of known construction arranged on the punch carriage **6** serves to cut a blank **19***a* off the rod **19** at each working stroke of the carriage **6**. Each blank **19***a* cut off from the rod **19**, the length of which depends upon the adjustable feeding speed of this rod, may be swung by means of a gripper device **22** (Fig. 2) through an angle of 90°, so that its longitudinal axis becomes aligned in the direction of movement of the punch carriage **6**. The blank **19***a* when in this position, is seized by a second gripper

device *b*, which for reasons of clarity is shown only in Fig. 4.

While the uppermost tongs or the like of the gripper device *b* grip the blank **19***a*, tongs located below simultaneously seize the pressed article ejected from the uppermost die **8**. Further tongs at the same time seize the other pressed articles ejected from the other dies in the direction of the punch carriage. All the tongs then move downwards through a distance of one die, so that all pressed articles in the gripper device *b* come to rest in front of the next lower, and the blank **19***a* in front of the uppermost, die **8**. The gripper device *b* thus operates in the perpendicular direction during the stationary of the press tools **7** and **8** which are oppositely disposed in pairs, so that during each working stroke of the punch carriage **6**, a pressed article is located in each die **8**.

Ejectors, and grippers of known construction are employed.

The main drive of the press acts directly on the punch carriage **6** by way of the gearwheel **17**, the shaft **14** and the crank drive, and also acts by way of the same gearwheel **17** and the cam drive **17***a*, **32** directly on the control slide **31**. The drive to the remaining mechanisms of the multistage press, namely the feed device **18**, the gripper device **22**, the further gripper device *b* and the ram **28** may, in the usual way, be taken off from the main drive in such a manner that said mechanisms are given a movement corresponding to the operational cycle of the press.

It may possibly be desired, depending upon the nature of the individual operations, to impart an additional stroke to a punch different from the punch **7***a*, when the punch carriage **6** is in its forward dead centre position. For this purpose it is clearly possible to use an arrangement similar to the members **27** to **29** as for the punch **7***a*. An alternative method of construction of such an arrangement is shown in Figs. 1 and 2. A lever **40** acting on a punch **7** and a thrust member **41** positively engaging the free end of this lever are pivotally mounted on the punch carriage. One arm **41***a* of the thrust member **41** reciprocating with the carriage **6** rests on a cam disc **42**, whose shaft **43** is driven by the shaft **14** by way of a reduction gearing **44**. The drive **43**, **44** is covered by an exterior cap **46** (Fig. 4) which is detachably mounted on the cheek **12**.

When the cam disc **42**, whose shaft **43** is mounted in the cheek **12** of the U-shaped guide **4**, lifts the arm **41***a* the lever **40** is slid to the left by the thrust member **41**. This lever thus urges the associated punch **7** also to the left, in the direction towards the associated die **8**, so that the punch in question executes an additional stroke relative to the carriage **6**. Depending upon the arrangement and construction of the cam disc **42** it is possible for the additional stroke to be imparted to the associated punch shortly before, during or shortly after the ending of a working stroke of the punch carriage **6**.

It is also possible by means of this arrangement to control an ejector arranged co-axially relative to a hollow punch on the carriage **6**. The drive for this ejector or a punch which has to execute an additional stroke, may also be transmitted directly from the connecting rod of the carriage **6**. In this case, the connecting rod and the connecting pin are rigidly connected with one another, thus imparting a reversible rotary movement to the connecting pin by the connecting rod.

A toothed segment mounted on the connecting pin engages in a second toothed segment arranged on a shaft parallel to the connecting pin. By this means, an arm mounted on a shaft, which is connected with the ejector or the punch in question, is caused to execute a reciprocating swinging movement. This swinging movement of the driving arm is transmitted to the ejector or the punch as a reciprocating linear movement in the direction of movement of the carriage **6**.

All the driving mechanisms accommodated in the frame **1** are separated from the operational parts of the press by the wall **2**. It is therefore possible to provide a separate independent lubricating or cooling agent supply respectively for the driving mechanism on the one hand and for the operational parts of the press on the other hand. It is further readily possible, if required, to change the driving mechanism and the operational parts for others independently of one another. By this means it is possible to convert the press for the purpose of carrying out different pressing operations in short time and with the least possible effort.

The widely spaced sliding guides **10** for the punch carriage **6** together with the afore-mentioned bearing play, ensure a highly accurate guiding of the carriage. Depending upon the kind of pressing operations carried out, the material resistance to be overcome in a pair of tools located eccentrically relative to the horizontal centre plane of the carriage may be considerable. Also, correspondingly high tipping moments act on the slide. Owing to the high clearances of the sliding guides from the actual carriage itself, i. e. owing to the long lever arms, the additional bearing pressure caused by the tipping moments is kept comparatively low.

Due to the arrangement of the cutter **21** on the punch carriage **6**, the bearing pressure of this carriage is, of course, increased somewhat when a blank **19***a* is cut off. Since the carriage **6** is supported in accordance with the invention, on the sliding bearing **10** in the manner of a cross-head, however, there results on the whole a considerably lower bearing pressure than in the known usual slide guides. The double, widely spaced mountings of the shaft **14** in the rear wall **3** and the cheek **12** of the frame **1** prevent this shaft from developing a flutter. Consequently, the power transmission from the shaft which executes an accurate linear movement, to the carriage **6** acts centrally, without the punches **7** deviating from their constructionally established lines of movement to one or the other side.

The arrangement of the cutting device **21** on the punch carriage **6** enables this device to be controlled by the carriage drive, and a separate drive for the cutting device is no longer necessary. This results in a particularly advantageous structural and operational simplification of the press constructed in accordance with the invention, compared with the known presses.

The supplying of the rods **19** to the cutting device **21** through the hollow interior space **1***a* of the frame **1** at right angles to the direction of movement of the carriage **6**, renders possible the disposal of the feeding device **18** within the existing overall length of the press. Furthermore, the whole feed mechanism lies outside the working space of the press and outside the punch and die supports. Therefore, this mechanism in no way hinders the construction of said press parts in any way. The feed of the rods **19** effected at right angles to the direction of movement of the punch carriage **6** in the press constructed according to the invention, thus offers considerable advantages.

The gripper devices **22** and *b* acting as conveying devices have adjustable or interchangeable tongs, in order to enable blanks or pressed articles of varying shapes and dimensions to be moved. Simply by changing the press tools and the tongs of the conveying devices, or correspondingly adjusting said tongs, it is possible in the press proposed by the invention, to change from one type of manufactured article to another without any other structural or operational alterations being required. Therefore, it is possible on this press to manufacture articles of extremely varied shapes and different dimensions, as long as the available driving power to the press is sufficient for the purpose.

We claim:

1. In a forging machine for upsetting blanks, having a frame and a die block fixedly mounted therein, a reciprocating carriage having a punch mounted therein in alignment with the die block, a slide bearing supporting

said carriage, a crank gear constituting the drive means for reciprocating the carriage, a shaft mounted in the frame for supporting said crank gear, said punch being longitudinally displaceable and adapted to execute an additional stroke, said punch comprising a lever pivotally mounted on the carriage, a thrust member mounted on the carriage and having one arm engaging the other end of the lever, a cam disc rotatably driven by the drive means actuating said carriage, the other arm of said thrust member engaging the cam disc for imparting a reciprocating motion to the thrust member, the additional movement of said punch being derived from the cam disc at the forward position of the carriage.

2. A press as set forth in claim 1, and a fixed stand for said press, said stand presenting at the front working side thereof, a guide track extending over the whole length of said stand and adapted to receive the slide bearing of the punch carriage located on the same.

3. A forging machine as set forth in claim 1, and a connecting rod actuated by said carriage drive, a connecting pin rigidly connected with said connecting rod, a gear carried by said crank drive shaft, a second pin rigidly disposed parallel to said connecting pin, an arm rigidly arranged on said second pin, a second shaft, a

second gear mounted on said second shaft, said second gear meshing with said first gear, a rotary cam secured to said second shaft, said arm pivoted on said cam, said arm deriving from the rotary movement of the cam a swinging movement which it is adapted to transmit, in the form of a linear movement, to said longitudinally displaceable punch.

4. A forging machine as set forth in claim 1 and a closed box-line frame enclosing said slide bearing and carriage, said frame presenting a guide track adapted to receive said bearing and being formed below said guide track with a hollow space through which a cooling fluid is passed, the remainder of the box space being adapted to receive lubricating fluid for the elements of said press.

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