

[54] **FORGING PRESS**

3,261,197 7/1966 Weyer..... 72/407
3,546,918 12/1970 Trainer..... 72/455

[75] Inventors: **Bruno Kralowetz; Hubert Grill,**
both of Steyr, Austria

[73] Assignee: **GFM Gesellschaft fur
Fertigungstechnik und
Maschinenbau Aktiengesellschaft,**
Steyr, Austria

*Primary Examiner—C. W. Lanham
Assistant Examiner—Gene P. Crosby
Attorney, Agent, or Firm—Kurt Kelman*

[22] Filed: **Aug. 5, 1974**

[21] Appl. No.: **494,758**

[57] **ABSTRACT**

Two press rams are mounted in a horizontal machine frame for horizontal movement relative thereto and operable to oppose each other. An understructure carries said machine frame. Fixing means are provided for fixing said understructure to a foundation at the center of the length of said understructure. Bearing support means are provided to support portions of said understructure which are remote from the center of its length on said foundation so as to permit a sliding longitudinal movement of said portions relative to said foundation.

[30] **Foreign Application Priority Data**

Sept. 25, 1973 Austria..... 8255/73

[52] U.S. Cl..... 72/407; 72/455

[51] Int. Cl..... **B21j 13/04**

[58] Field of Search 72/407, 455, 466; 100/264,
100/214

[56] **References Cited**

UNITED STATES PATENTS

3,118,329 1/1964 Hendrickson..... 72/456

12 Claims, 4 Drawing Figures

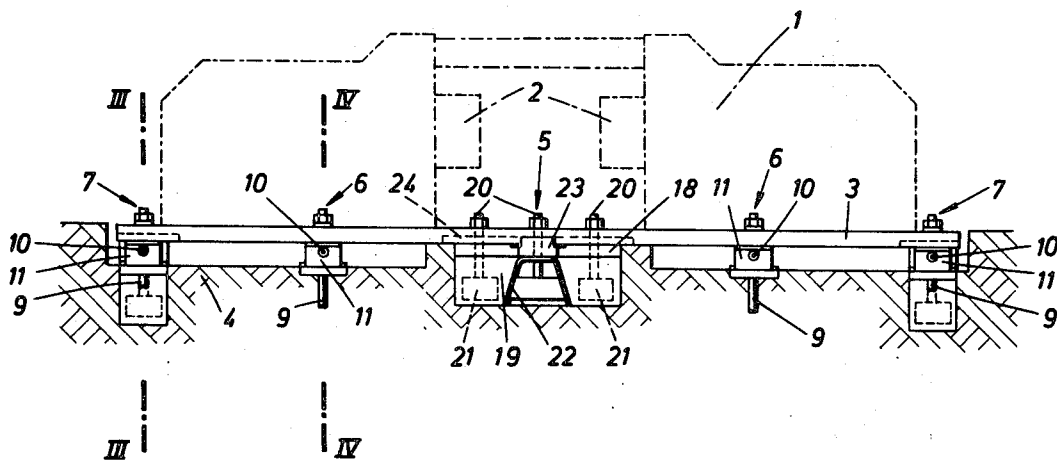
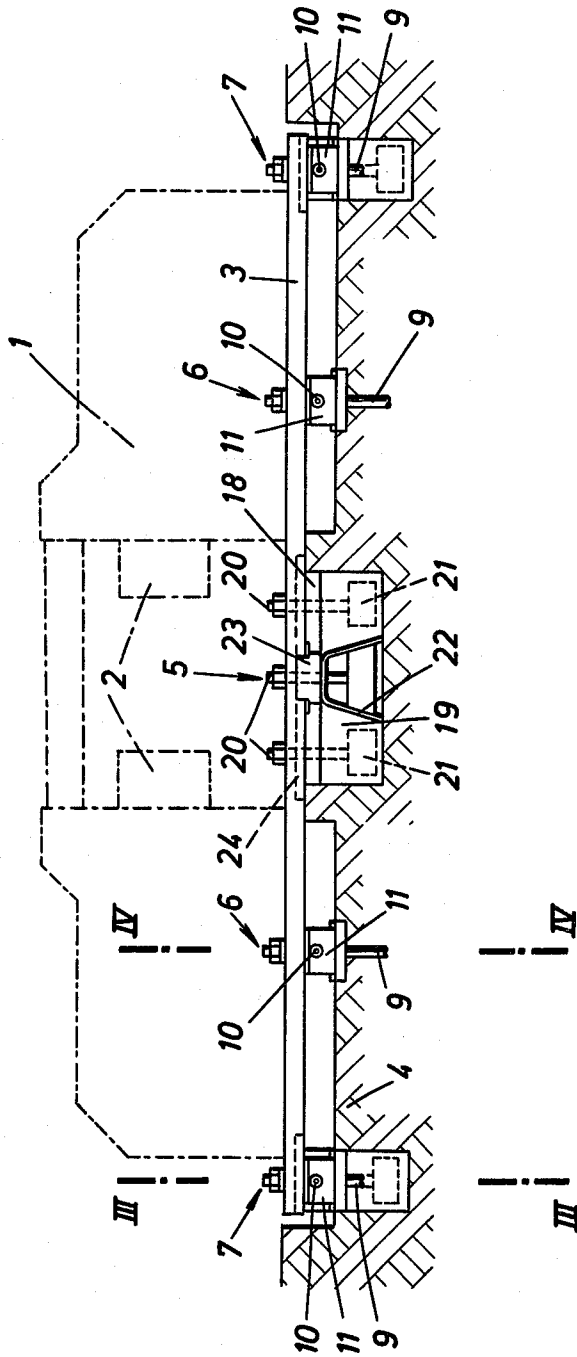


FIG. 1



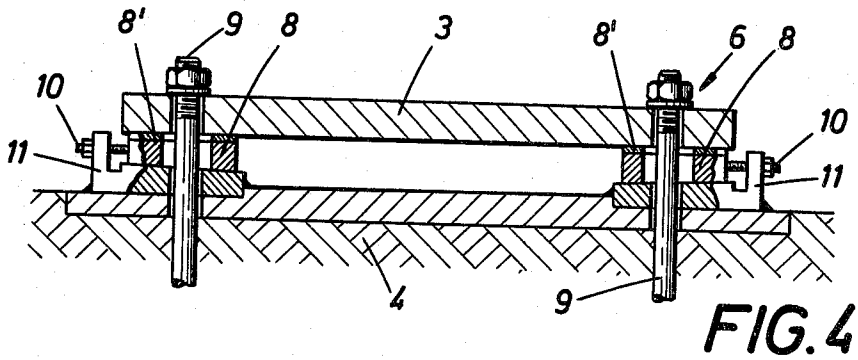
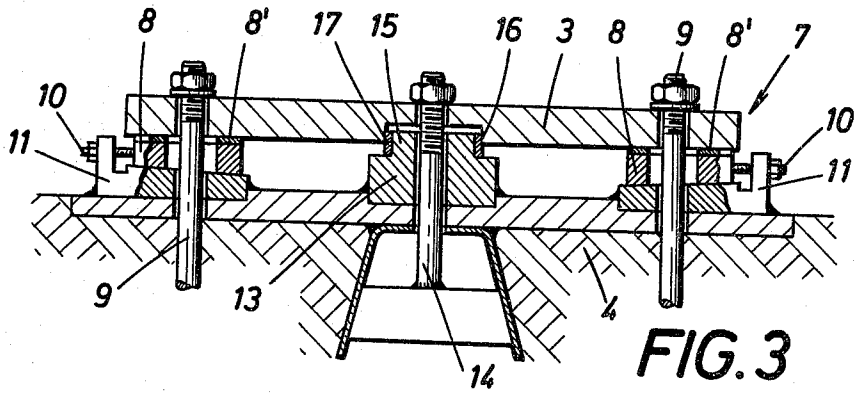
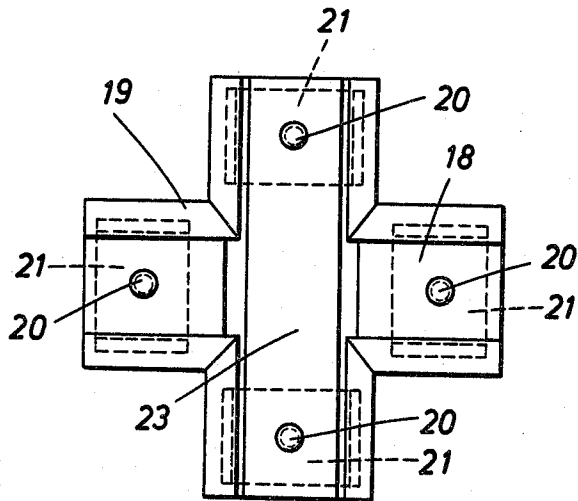


FIG. 2



FORGING PRESS

This invention relates to a forging press comprising a horizontal machine frame in which two mutually oppositely acting press rams are mounted, which are horizontally movable, and an underframe or the like, which is mounted to be longitudinally displaceable relative to the foundation.

In the design of forging presses, special attention must be directed to the means for taking up the bending moments which are due to the pressing operation. Compared to vertical forging presses, forging presses having a horizontal machine frame have the advantage, in that connection, that the bending moments which arise can be transmitted to the foundation. On the other hand, special attention must be given in the design of the horizontal machine frame to the fact that the strong longitudinal forces which are exerted result in an elongation of the frame. A known forging press comprises a machine frame which rests on cast-iron slideways, which are firmly connected to the foundation. That sliding-surface bearing arrangement has the great disadvantage that it permits of a longitudinal movement of the underframe but cannot oppose at all any bending stress on the underframe. Where that known sliding-surface bearing is provided for the machine frame, the bending moments resulting from the forging operation cannot be transmitted to the foundation because the underframe would yield to any bending stress and would then lift from the sliding surface. For this reason that machine frame is designed so that any bending stress on the base frame is inherently avoided. This requires a very high structural expenditure because the press rams must be counterbalanced by equivalent hydraulic actuators disposed on the other side of the slideways. These hydraulic actuators impose on the machine frame an additional load, which corresponds to the forging forces exerted, so that the underframe is disposed in a virtually neutral zone and is stressed only in tension. To offset the bending moment which is due to the forging forces exerted at a distance from the slideway, these additional forces acting on the machine frame produce an opposing bending moment. They impose an additional load on the machine frame and specifically on the underframe in the longitudinal direction so that the elongation is much increased. For this reason the known sliding-surface bearing for the machine frame involves such a high structural expenditure that it cannot be used in many cases.

It is an object of the invention to eliminate these disadvantages and to provide a forging press which is of the kind defined first hereinbefore and which has a simple machine frame and mounting means which can take up all loads to be expected or can transmit them to the foundation.

This object is essentially accomplished according to the invention in that the underframe or the like is fixed in the middle of its length to the foundation and at all additional points of support is held to be longitudinally movable. Because the underframe is firmly fixed to the foundation at one point, the bending moments which are due to the forging operation and which load the base frame can be transmitted to the foundation. These bending moments tend to lift the central portion and to depress the end portions of the base frame. This tendency is opposed by the fixation at one point and by the points of bearing support. On the other hand, there is

no resistance opposing any elongation of the underframe because the underframe is fixed in the middle of its length and this portion is not involved in an elongation which is directed from said fixed point to both ends of the base frame, and because the remaining points of support permit of a longitudinal displacement of the underframe relative to the foundation. The means provided according to the invention for mounting the underframe can take up bending moments and longitudinal elongations without involving a high expenditure.

According to a particularly desirable feature of the invention the underframe or the like rests at the points of bearing support on slide plates, which consist preferably of self-lubricating plastics material, and is held down by foundation bolts fixed to the foundation. The slide plates present a low frictional resistance to a longitudinal movement of the underframe and the foundation bolts yield resiliently to accommodate said movement. At each point of bearing support, the foundation bolts ensure a snug engagement of the underframe with the slide plates so that a satisfactory transmission of the vertical components of force from the underframe to the foundation is also ensured. All other components of force will be taken up by the machine frame itself.

It will be particularly desirable if the slide bearing plates taper in thickness in a direction which is transverse to the longitudinal direction of the underframe and are connected to adjusting screws or the like which bear on abutments that are fixed to the foundation. These adjusting screws then permit in a very simple manner of the levelling of the machine frame and of a readjustment of slide bearing plates which have become worn.

To avoid any distortion of the underframe in the longitudinal direction, it is a feature of the invention to provide longitudinal guides for the underframe or the like, which guides are disposed adjacent to the terminal points of bearing support. These longitudinal guides may also be provided with slide bearing plates so that they do not present a substantial frictional resistance to a longitudinal movement of the base frame.

In accordance with the invention the fixing means comprise a cross-shaped horizontal member, which has a lower part that has a flaring inverted U-shape in cross-section and is embedded in the foundation, and an upwardly protruding upper part, which fits a mating groove in the underframe, the cross-shaped lower part is provided at each arm with at least one T-head bolt for fixing the underframe, and the head of said bolt has end faces which mate the inclined flanges of the U-shaped cross-section. The fitting upper part permits of a definite fixation of the center of the underframe relative to the foundation and the T-head bolts cooperating with the lower part of the cross-shaped member ensure a rigid fixation of the central portion of the underframe to the foundation because the tightening of these bolts results in a holding down of the underframe and in an expanding of the lower part in the foundation.

An embodiment of the invention is shown diagrammatically and by way of example on the accompanying drawings, in which

FIG. 1 is a side elevation, partly in section, showing a forging press according to the invention,

FIG. 2 is a top plan view showing the fixing means, and

FIGS. 3 and 4 are transverse sectional views taken on lines III—III and IV—IV in FIG. 1.

The forging press according to the invention comprises a horizontal machine frame 1, in which two mutually opposing press rams 2 are mounted, which are horizontally movable. The machine frame 1 is carried by an underframe 3, which is longitudinally mounted on a foundation 4 so as to be longitudinally slidable relative thereto except at fixing means 5, by which the underframe is fixed in the middle of its length to the foundation 4. The underframe rests on the foundation so as to be movable relative thereto at points of bearing support 6, 7. At these points of bearing support, the underframe 3 rests on slide plates 8, which are covered with self-lubricating plastics material 8', and is held down by foundation bolts 9 embedded in the foundation 4. The slide bearing plates 8 present a low frictional resistance to a sliding movement of the underframe 3 and the foundation bolts 9 can bend resiliently to accommodate a displacement of the underframe. The slide bearing plates 8 taper in thickness in a direction which is transverse to the longitudinal direction of the underframe and are connected to adjusting screws 10, which bear on abutments 11 that are fixed to the foundation. By means of these adjusting screws and the tapered slide bearing plates, the base frame 3 can be exactly levelled and any wear of the slide bearing plates 8 may be compensated. To avoid a distortion of the underframe 3 in the longitudinal direction and to define exactly the direction in which said underframe can expand, longitudinal guides 12 are provided adjacent to the terminal points of bearing support 7. Each of these longitudinal guides consists substantially of a guide block 13, which is fixed to the foundation 4 by means of T-head bolts 14 and has a guiding portion 15, which is slidable in a longitudinal groove 16 of the underframe 3. Slide bearing plates 17 of plastics material are disposed between the surfaces of the groove and the guiding surfaces of the guiding portion 15.

The means 5 for fixing the underframe at its center to the foundation 4 comprise a cross-shaped horizontal member 18, which comprises a lower part 19 that is inserted in the foundation 4. That cross-shaped lower part 19 has a flaring inverted U-shape in cross-section and is provided at each of its arms with a T-head bolt 20 for fixing the underframe. The head 21 of said bolt has end faces 22, which mate with the inclined flanges of the U-shaped cross-section. The cross-shaped member 18 has an upwardly protruding part 23, which fits a mating cross-shaped groove 24 in the underframe 3 so that the fitting part 23 immovably locates the center of the underframe and the latter can be firmly fixed at this center by means of the cross-shaped member. To fix the underframe, the T-head bolts 20 are tightened so that the underframe is depressed and owing to the inclined end faces 22 of the T-heads 21 and the flaring cross-section of the lower part 19 the cross-shaped member is expanded in the foundation.

The means provided according to the invention for mounting the underframe on the foundation constitute a simple structure which is capable of accommodating the longitudinal elongation which is due to the forging forces and of transmitting to the foundation the forces and bending moments resulting from the forging operation unless said forces and moments are taken up by the machine frame.

What is claimed is:

1. A forging press which comprises a horizontal machine frame.

two press rams mounted in said machine frame for horizontal movement relative thereto and operable to oppose each other,

an understructure carrying said machine frame, fixing means for fixing said understructure to a foundation at the center of the length of said understructure, and

bearing support means for supporting portions of said understructure which are remote from the center of its length on said foundation to permit of a sliding longitudinal movement of said portions relative to said foundation.

2. A forging press as set forth in claim 1, in which said understructure comprises an underframe.

3. A forging press as set forth in claim 1, in which said bearing support means comprise terminal bearing support means disposed near the ends of said understructure and

longitudinal guides are provided, which are adapted to be fixed to said foundation adjacent to said terminal bearing support means and serve to guide said understructure in its longitudinal direction.

4. A forging press as set forth in claim 1, in which said understructure comprises on its underside a downwardly open cross-shaped groove at the center of its length and

said fixing means comprise a horizontally extending, cross-shaped member having a cross-shaped lower part adapted to be fixed in said foundation and a cross-shaped upper part adapted to protrude upwardly from said foundation and fitting said groove, and

said lower part has a flaring inverted U-shape in cross-section and comprises four arms, each of which has inside lateral surfaces and is provided with at least one screw fixed to said understructure and having a T-head contained in said arm, said head having inclined end faces in mating contact with said inside lateral surfaces of said arm.

5. A forging press installation as set forth in claim 1, in which

said bearing support means comprise slide bearing plates and

foundation bolts are provided which are fixed to said foundation and hold down said understructure on said slide bearing plates.

6. A forging press installation as set forth in claim 5, in which

said slide bearing plates taper in width in a direction which is transverse to the longitudinal direction of said understructure,

abutments are fixed to said foundation, and adjusting screws are supported by said abutments and connected to said slide bearing plates.

7. A forging press as set forth in claim 1, in which said bearing support means comprise slide bearing plates and

foundation bolts are provided which are adapted to be fixed to said foundation and to hold down said understructure on said slide bearing plates.

8. A forging press as set forth in claim 7, in which each of said slide bearing plates has an upper surface covered with self-lubricating plastics material.

9. A forging press as set forth in claim 7, in which said slide bearing plates taper in width in a direction which is transverse to the longitudinal direction of said understructure.

5

adjusting screws are provided which are connected to said slide bearing plates, and abutments are provided, which are adapted to be fixed to said foundation and support said adjusting screws.

10. A forging press installation which comprises a foundation,

a forging press comprising a horizontal machine frame, two press rams mounted in said machine frame for horizontal movement relative thereto and operable to oppose each other, and an understructure carrying said machine frame,

fixing means fixing said understructure to said foundation at the center of the length of said understructure, and

bearing support means supporting portions of said understructure which are remote from the center of its length length said foundation to permit of a sliding longitudinal movement of said portions relative to said foundation.

11. A forging press installation as set forth in claim 0, in which

said bearing support means comprise terminal bearing support means disposed near the ends of said

6

understructure, and longitudinal guides are fixed to said foundation adjacent to said terminal bearing support means and arranged to guide said understructure in its longitudinal direction.

12. A forging press installation as set forth in claim 10, in which

said understructure comprises on its underside a downwardly open cross-shaped groove at the center of its length,

said fixing means comprise a horizontally extending, cross-shaped member having a cross-shaped lower part fixed in said foundation and a cross-shaped upper part protruding upwardly from said foundation and fitting said groove, and

said lower part has a flaring inverted U-shape in cross-section and comprises four arms, each of which has inside lateral surfaces and is provided with at least one screw fixed to said understructure and having a T-head contained in said arm, said head having inclined end faces in mating contact with said inside lateral surfaces of said arm.

* * * * *

5
10
15
20
25
30
35
40
45
50
55
60
65