

The present invention relates to an apparatus for the mass force balancing at punch presses, with a balancing means for the balancing of the oscillating forces, which is drivingly connected via intermediate members to a balancing means for the balancing of the rotating forces supported directly on the crank or eccentric, resp., shaft.

Such a mass force balancing apparatus is disclosed e.g. in the GB-A-2 189 730. The balancing weight for the balancing of the oscillating forces is thereby vertically guided by guiding members. There is now the possibility that at machines having larger dimensions difficulties arise at the structural members used for the vertical guiding which are due to thermically caused expansions.

Furthermore, a mass balancing apparatus is described in the GB-A-141 118, in which the balancing weights for the balancing of the oscillating forces are pivotally mounted to a stationary part of the apparatus at areas facing each other. Also here thermically caused difficulties arise in case of larger dimensions.

Here the invention intends to provide the remedy. The invention such as characterized in the claims solves the object to provide an apparatus for the mass balancing at punch presses, in which the ends of the balancing weights facing each other guide each other in the vertical direction.

The advantages gained by the invention are substantially seen in that no guiding members for the vertical guiding of these ends of the balancing weights connected to the machine frame are present, which in operation due to thermal expansions in case of larger dimensions can lead to difficulties.

Below the invention will be explained more in detail based on drawings illustrating merely one embodiment.

There is shown in:

Fig. 1 a vertical section, in which an embodiment of the invention is illustrated, and

Fig. 2 a section along line II-II of Fig. 1.

5 A crank- or eccentric shaft 5 is supported in the frame 7 of the machine. Depending on the prevailing design it drives one or a plurality of punching rods 11, which are pivotally mounted in accordance with known techniques to the punch 12 of the punch press. Further-
 10 more, the yoke 6 is supported on the eccentric shaft 5 via antifriction bearings 13. This yoke serves for the balancing of the rotating forces. A respective intermediate member 3, 4 designed as link member is mounted to the two lateral ends of the yoke 6. These intermediate mem-
 15 bers 3, 4 are in turn pivotally mounted to balancing weights 1, 2, which balancing weights 1, 2 operate to balance the oscillating forces.

Accordingly, it can be seen that in operation the yoke 6, which balances the rotating forces, drives
 20 via the link members 3, 4 the balancing weights 1, 2 for the balancing of the oscillating forces.

As can be seen from the drawings, these balancing weights 1, 2 are designed symmetrically relative to the vertical plane extending to the axis of rotation
 25 of the eccentric shaft 5. The ends of the balancing weights 1, 2 which face each other include each two bearing eyelets 9, 10 (see also Fig. 2). These bearing eyelets overlap each other and are pivotally connected to each other via a pivot member. According to Fig. 2 this
 30 pivot member 8 extends vertically between the bearing eyelets 9, 10 and is pivotally mounted at its respective ends to the eyelets 9, 10. At the ends opposite of the bearing eyelets 9, 10 the balancing weights 1, 2 include respective projections 14, 14a and 15, 15a. These projec-
 35 tions are supported on shafts 16, 17, which in turn are supported in the machine frame 7.

Accordingly, in operation the two balancing weights 1, 2 are pivotally moved upwards and downwards by the link members 3, 4 around the shafts 16, 17, wherewith the balancing of the oscillating forces takes place. Obviously, during operation a change of the horizontal distance at the bearing eyelets 9, 10 of the balancing weights 1, 2 takes place due to the section of a circular line, through which they move. This small change is absorbed by the pivot member 8, which accordingly will attain a slanted position.

Due to the fact that two balancing weights 1, 2 for the balancing of the oscillating forces are present, which at the one end are pivotally mounted to the machine frame 7 and at the other end via the pivot member 8 to each other, the vertical guiding which until now has been necessary is no longer needed.

It is to be noted that the mutual vertical guiding of the balancing weights 1, 2 by means of the pivot member 8 is only one of a plurality of embodiments. Embodiments are foreseen, in which e.g. the balancing weights 1, 2 mesh at the ends facing each other e.g. by racks or may be interconnected via steel strips for the guiding in the vertical direction.



Patent Claims

5 1. Apparatus for the mass balancing at punch
presses, having a means (1, 2) for the balancing of the
oscillating forces, which are drivingly connected, via
intermediate members (3, 4) with a force balancing means
(6) for the balancing of the rotating forces supported
10 directly on the crank- or eccentric, resp., shaft (5),
which force balancing means for the balancing of the os-
cillating forces includes balancing weights (1, 2), which
are located relative to the vertical plane which includes
the axis of rotation of the crank- or eccentric, resp.,
15 shaft (5) symmetrically opposite of each other, are piv-
otally connected at first areas to the machine frame (7)
and by respective locations distant therefrom via inter-
mediate members (3, 4) designed as links to the weight
balancing means (6) for the balancing of the rotating
20 forces, and which balancing weights (1, 2) include second
areas remote from the first ones, facing each other and
performing a pivoting movement, characterized in that the
second areas of the balancing weights (1, 2) include each
two projecting bearing eyelets (9, 10), which bearing
25 eyelets (9, 10) overlap each other and are pivotably con-
nected to each other via a pivot member (8), which pivot
member (8) is vertically arranged between the overlapping
bearing eyelets (9, 10) and is pivotably mounted at two
locations located at a mutual distance from each other at
30 a respective pair of eyelets (9, 10), whereby the balanc-
ing weights guide each other mutually at the second loca-
tions in the direction of the vertical component of the
movement of the pivoting movement.

 2. Apparatus according to claim 1, character-
35 ized in that the balancing weights (1, 2) are pivotably
mounted at locations opposite of the bearing eyelets (9,
10) to the machine frame (7) and between these locations



and the bearing eyelets (9, 10) via respective links forming the intermediate member (3, 4) to the yoke (6).