OVERLOAD STAMPING DEVICE FOR FULL OR PUSH DRIVES, PARTICULARLY IN STAMPING PRESSES

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In metalworking machines, in stamping presses, and particularly in multi-stamp stamping machines there is a possibility of the overloading of the machine, which may lead to the breakage of individual machine parts.
In the case of stamping machines this relates particularly to the exceeding of the nominal power, that is to say the maximum permissible stamping force.
The overload may for example arise from attempts to stamp with the machine an aperture:
(a) The cut area of which exceeds the permissible size for the prescribed shearing strength;
(b) Which through excessive shearing resistance, that is to say exceeding the prescribed shearing strength of the material, would require a stamping force in excess of the force permissible;
(c) In which the movement of the slide is blocked by contact between the top and bottom stamps;
(d) In which quite generally an abnormal or unintentional resistance within the transmission is transmitted from the slide to the eccentric through the set of springs in conjunction with the limit switch.

Multi-stamp presses are known in which the movement of the slide is effected from the eccentric through a rigid pull or push rod which acts mainly in a horizontal or inclined plane. The conversion of the direction of movement of the pull or push rod to the vertical direction of movement of the slide is preferably effected through a toggle lever or else through an angle lever, as illustrated in the accompanying drawings.
The invention accordingly consists in that between two connecting parts, and particularly between two joint heads axially slideable one in the other, there is disposed a set of springs which on the exceeding of a certain application of force undergoes a variation of shape beyond a clearly determined size. Alternatively, the overload safety device may also consist in that the set of springs is so disposed that it is not inserted directly in the movement mechanism but comes into action only when a determined maximum force is exceeded. According to the invention it is moreover proposed that the springing or a set of springs should be pre-stressed to a maximum compressive power. This measure facilitates the adjustment of the overload safety device for a determined maximum force. In one preferred embodiment of the invention moreover a limit switch is provided which is released only after a determined spring path. By this means the running of the machine is stopped or disconnected through the transmission at a determined overload.
The invention further proposes the utilisation of an eccentric bolt installed at one end of the overload safety device. On the operation of the overload safety device the machine or stamping press is locked. When use is made of an eccentric bolt, steps are taken to enable the eccentric bolt to be turned after the machine has been locked, so that the locking of the machine can be released.
The invention will now be explained by way of example with reference to a multi-stamp press or turret stamping press, in which the invention is incorporated with reference to the accompanying drawings, in which

FIGURE 1 illustrates by way of example the construction of an overload safety device for a push-rod in the transmission of a multi-stamp press in which the movement of the push-rod is transmitted from the eccentric to the machine slide by way of an angle lever;

FIGURE 2 shows a section on the line A—B in FIGURE 1 of the mounting for the intermediate member for converting the swinging movement of the angle lever into the straight movement of the machine slide, and also illustrates the construction of the top joint bolt of the intermediate member as an eccentric bolt;

FIGURE 3 illustrates a second embodiment of the invention in which an overload safety device is provided for a push-rod in conjunction with an angle lever, wherein the spring member is not inserted directly in the movement mechanism for the movement of the slide;

FIGURE 4 shows a sectional view on the line C—D in FIGURE 3, wherein details can be seen of the toggle lever drive from which a reaction is applied to the overload safety device as soon as the permissible compressive force is exceeded.

FIGURE 1 illustrates in side view by way of example the arrangement of a push-rod with overload safety device in the transmission of a multi-stamp or turret stamping press. In this exemplified embodiment the movement of the push-rod is transmitted from the eccentric to the machine slide 10 by way of an angle lever 19. The angle lever 19, which is swingably mounted on an axis 21, is connected through the bolt 60 to the overload safety device and through the eccentric bolt 18, the mode of operation of which will be explained below, and by way of the articulation member 23 to the slide 10.

In the push-rod head 1 the connecting rod 2 is fastened by fitting bolts or cylindrical pins 3, while the joint head 5 is guided with axial movability on the extension 4 of said connecting rod at the other end. On the middle stem 6 of the connecting rod 2 there is disposed the spring member F, consisting of the support discs 7 and 8 and the ordinary commercially available spring elements, for example annular springs 9, clamped theretwixt. While the supporting disc 8 bears against the push-rod head 1, the supporting disc 7 moves against the spring tension when an overload is transmitted from the tool slide 10 or when locking occurs. The spring member F or spring set F is prestressed with its spring elements 9 by the nut 11. The spring tension is thus supported against the nut 11 with its screw thread on the threaded extension 13 of the connecting rod 2.

Through the stem 4 of the connecting rod 2, the connection of the push-rod head 1 to the joint head 5 is axially movable. In order to enable the slide 10 to be pulled back into its starting position after a stamping stroke has been performed, the connecting rod 2 is provided with the collar 15, which transmits the return force to the joint head 5 by way of the two half fitting plates 14. When the push-rod is subjected to compressive stress, there is no tension between the joint head 5 with the half thrust washers 14 and the collar 15, that is to say there is merely a connection without play.
The protective sheath 16 for the set of springs F is connected to the axially slideable supporting disc 7 and thus participates in the movement compressing the set of springs F in the axial direction when an overload occurs in the press. After a determined path X has been travelled, corresponding to the permissible over-stressing through the stamping force, the stop 17 connected to the protective sheath 16 strikes against the limit switch 27 connected to the push-rod head 1, whereby the drive of the press is switched off electrically. The movement of the push-rod is transmitted to the push-rod slide 10 through the angle lever 19 and the articulation member 22. The angle lever 19 is mounted swingably on an axis 21 which is connected to the machine frame. The articulation mem-
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The articulation member 22 is connected by a bolt 61 to the slide 10 guided in the machine frame, so that the articulation member 22 can perform a rocking movement in relation to the slide 10, which is guided rectilinearly.

Figure 2 illustrates the articulation member 22 between the angle lever 19 and the tool slide 10. The connection between the angle lever 19 and the articulation member 22 is made by means of an eccentric bolt 18. Hexagonal extensions 18a and 18b are provided on both sides of the eccentric bolt 18, so that the position of the eccentric can be accurately fixed by means of the locking fork 20. When the stamping machine or press has been locked through overload, the locking fork 20 is removed by slackening and removing the screws 62, so that the eccentric bolt 18 can be turned by applying a hexagonal spanner to the hexagonal extensions 18a and 18b respectively on the bolt, so that the locking of the stamping machine can be released.

The present invention comes into operation when the machine is overloaded and such overloading usually occurs if the tool becomes deadlocked. The result of the overload is that the set of springs 9 (Figure 1) is compressed to release the tensioned springs, the full distance from the eccentric 65 to the tool must be shortened so that the set of springs can again expand and hence, relax. Such relaxation is effected by the eccentric bolt 18. More specifically, the screws 62 which connect the locking fork 20 to the articulation member 22 are loosened whereby the fork 20 can be detached from the member 22. The fork 20 is so arranged that it embraces the hexagonal extensions 18a of the bolt 18 so that the bolt is prevented from turning. As soon as the fork 20 is removed, suitable wrenches may be applied to the hexagonal extensions 18a or 18b, and by means of such wrenches the eccentric bolt 18 is rotated until the distance between the eccentric 65 and the tool is shortened sufficiently for the set of springs 9 to again relax.

After the release of the tension, the cause for the jamming of the machine can also be removed, and when this has been accomplished, the bolt 18 is again rotated to its original position. The bolt is locked in such position by the fork 20 and screws 62.

Figure 3 illustrates by way of example in a side elevation, an arrangement of the spring member 4 as a pure overload safety device in the drive of a multi-stem for turret stamping machine.

In this arrangement the joint head 31 is mounted rotateably or rockably on the axis 30 which is made fast to the machine frame. The connecting rod 36 is anchored fast in the supporting disc 32 which is provided on one side with supports 33 for mounting the axis 34 connecting to the angle lever 35. The guide pin 37 of the connecting rod 36 is mounted axially slidably in the joint head 31. The previously mentioned angle lever 35 does not serve the same purpose as the angle lever 39 in the embodiment illustrated in Figure 1, because in the present case, namely in the case of Figure 3, the drive is effected by the drive rod 47 through a toggle lever. This toggle lever drive will therefore first be described. The fixed point of the toggle lever system, the bolt 48, is mounted in the bottom half of the angle lever 35. A rocking movement of the angle lever 35 about the axis 49, which is mounted in the machine frame, is effected only when the machine, more particularly a stamping machine, is overloaded. The bolt 51, which makes a connection to the slide 45, then becomes the fixed point of the toggle lever system. The movement initiated by the pull-rod 47 forces the toggle lever system to yield upwards. In this case the angle lever 35, which then turns about the axis 49, compresses the pre-tensioned spring set F, the construction of which will now be described.

The spring member or spring set F is pre-tensioned with its spring elements 38 against the likewise axially slideable supporting disc 39 by the nut 41 situated on the threaded extension 40 of the connecting rod 36. The protective sheath 42 is connected to the supporting disc 32 and thus when an overload exists in the press participates in the movement of compression of the spring member F in the axial direction. The stop 43 disposed at the other end of the sheath 42 strikes against the limit switch 44 connected to the joint head 31 after travelling the path bolt, and the drive of the stamping machine is switch off electrically. The arrangement of the spring member F as an overload safety device is similar to that illustrated in Figure 1, its mode of operation is the same in accordance with its purpose, and in contrast to Figure 1 it is at rest in normal operation, that is to say until subjected to maximum stressing by the stamping pressure, and thus does not participate directly in the transmission to the stamping movement.

The actual stamping movement of the tool slide 45 is effected through the toggle lever joint 46 from the machine eccentric by way of the pull-rod 47, preferably in the horizontal direction as illustrated in Figure 3. The articulation point 48 is during normal operation the relatively immovable abutment of the toggle lever 46 against the toggle the stamping pressure. When the stamping pressure exceeds the permissible limit, the articulation point 48 yields through a rotary movement of the angle lever 35 about the axis of rotation 49, while the articulation point 34 of the angle lever 35 transmits the yielding movement to the spring member F, whereby the latter operates in the above-described manner.

In this embodiment the angle lever 35 may also be dispensed with in certain circumstances. An essential condition for this to be done is that the spring set F must extend in the same direction as the pull-slide 45, the bolts 34 and 48, and their axes, coinciding at one point.

It is self-explanatory that an overload safety device can be effectively disposed in the above-described manner, and as illustrated, direct on the tool slide, without any conversion of the direction of movement being necessary, as is shown in the accompanying drawings. Quite generally it can be said that the invention can be applied wherever it is required to limit the pulling or pushing action of a machine part or to protect the machine itself against breakage or damage.

I claim:

1. An overload safety device for push or pull drives for stamping machines operable related to means serving for the transmission of a driving force to a slide or comprising a sheath having opposite ends, a supporting disc secured to one end of the sheath, a second supporting disc adjacent the opposite end of the sheath, spring means pre-tensioned to a maximum compressive power located between and adapted to hold said discs apart at a predeter-
which the means for transmission of a driving force to the slide comprises a pull rod, toggle lever means operably related thereto, an angle lever movable about a fixed axis of rotation, means coupling an upper arm of the toggle lever means to the angle lever with such angle lever engaging by way of the articulation point the safety device hingedly connected at the opposite end to an axis serving as a fixed point.

5. The overload safety device as claimed in claim 1 in which said spring means are defined by annular springs comprising inner and outer rings contacting each other by means of conical surfaces.

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