

Tool Holder with Punching Units

The invention relates to a tool holder for a punch press with several punching units, which are seated in tool receivers
5 in the holder and have gas pressure springs for retracting the punches.

Besides the widely used steel springs embodied as helical or plate springs, punching units with gas pressure springs are known, for example from EP 0 646 427. The
10 advantage of gas pressure springs lies in the possibility of actively affecting the characteristic spring curves by changing the pressure level in the pressure chamber of the gas pressure spring. It is possible in this way to match the spring force to the material to be worked so that, for example when working
15 thick sheet steel plates, a very high pressure is generated in the pressure chamber, and when working thin aluminum sheets a comparatively low pressure is generated in the pressure chamber. The low pressure when working soft materials prevents damage to the delicate, possibly already coated surfaces.

This capability of setting is provided in known punching units with gas pressure springs, but in connection with tool holders, however, which can easily have ten or more tool receivers for punching units, it has been shown to be very complicated to match the pressure level in all pressures
20 chambers of the individual punching units to the material to be worked.
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It is the object of the invention to create a tool holder, whose punching units, which are provided with gas pressure springs, can be matched in a faster and simpler manner
30 to the material to be worked.

This object is attained in accordance with the invention in that the pressure chambers of the gas pressure springs of a tool holder of the type described at the outset are connected to a common feed line, which can be connected to a compressed
35 gas source.

Because of the central pressure supply for all pressure chambers, there is the possibility to change the interior

pressure of all gas springs simultaneously. The resetting times in connection with changing the materials to be worked are thereby considerably reduced. The common pressure supply also assures an even pressure level in all gas pressure
5 springs, should this be desired.

The feed line preferably constitutes a pressure reservoir. The relatively large volume of the feed line leads to more flattened characteristic curves of the gas pressure springs, since the displaced volume of one gas pressure spring
10 in the course of a punch stroke is relatively small in relation to the entire pressure volume. In contrast thereto, a gas pressure volume of comparable size can hardly be realized in the area of the gas pressure springs, since the structural space is greatly limited by the conditions of the tool holder
15 and the punch press.

In a preferred embodiment of the invention, a control valve for setting a defined pressure level in the feed line is provided between the compressed gas source and the feed line. The control valve makes possible the exact setting of the
20 pressure level if a pressure supply container of a given, very high pressure is used as the compressed gas source.

In a further embodiment of the invention it is provided that control valves for setting a defined pressure level in the respective pressure chambers are provided between the feed line
25 and at least a portion of the pressure chambers. Such an arrangement makes possible the individual setting of the pressure level in the various pressure chambers, in order to match the several punching units individually to the conditions. Depending on the effective piston surface and the
30 type of the punch, an even more exact optimization of the restoring forces to the respective worked material is possible with this.

In a typical embodiment, the tool holder is designed in a revolver shape, and the punching units are arranged in a
35 circle. With this type of tool holders the feed line is preferably arranged in a ring shape between the punching units.

This arrangement is particularly advantageous because there is

sufficient space available for the feed line in the space between the punching units, so that refitting of existing tool holders, which up to now had been used with punching units with steel springs, is easily possible.

5 Nitrogen, which is not inflammable, not poisonous and inexpensive, is preferably used as the compressed gas.

Exemplary embodiments of the invention will be covered in greater detail by making reference to the attached drawings.

Shown are in:

10 Fig. 1, a schematic top plan view of a tool holder with a feed line for gas pressure springs in the punching units,

Fig. 2, a cross section through the tool holder in Fig. 1.

A tool holder 10, which can be inserted into a turret
15 punch press, is represented in Fig. 1. The tool holder 10, which is designed disk-shaped, has receivers 12 (see Fig. 2), which are arranged in the shape of a circle and in which punching units 14 are received. In the exemplary embodiment represented, the structure of the punching units 14 follows
20 that described in DE 195 05 754, however, the plate spring packages provided there are replaced by gas pressure springs, such as are basically known from EP 0 708 267.

Otherwise, the punching units 14 consist of a guide
bushing 16, a multiple punch driver 18 and a punch 20,
25 connected with the punch driver 18 by means of a screw 19. A stripper plate 22 is provided between the lower end of the guide bushing and the punch 20. The gas pressure spring is arranged between a radially projecting head 24 and the rear end wall of the guide bushing 16.

30 The gas pressure spring 15 has a housing 26, which is essentially circular in cross section and in which cylindrical bores 28 are arranged, in each of which a piston 30 is guided in an axially displaceable manner. The cylindrical bores 28 are connected with each other via an annular conduit 32 and
35 together constitute the pressure chamber of the gas pressure spring 15. The pistons 30 are sealed in respect to the walls of the cylindrical bores 28 with the aid of seal rings 34. The

annular conduit 32 has a connecting conduit 36, into whose opening 38 a feed hose 40 is screwed by means of an appropriate threaded element. All punching units 14 in the exemplary embodiment represented have an identical structure, however, it would also be conceivable to combine punching units of different structure and differently designed gas pressure springs.

The feed hoses 40 of all punching units 14 are connected by means of suitable connectors 42 to an annular feed line 44, which is arranged centered in the center of the tool holder 10.

The feed line 44 itself has a pressure connector 46, which is connected with a compressed gas source (not represented). A control valve is arranged between the pressure connector 46 and the compressed gas source, by means of which the pressure level in the feed line 44 can be accurately set.

With the embodiment shown, wherein all pressure chambers are in constant connection with the feed line 44, the same pressure level as in the feed line 44 is present in all pressure chambers. It is also possible to provide additional control valves between the feed line and the individual pressure chambers, with whose aid the individual pressure levels in the separate chambers can be affected.

With other shapes of tool holders, the feed line would be matched to the structural space available in accordance with the shape of the tool holder and the arrangement of the punching units.

Claims

1. A tool holder for a punch press with several punching units (14), which are seated in tool receivers (12) in the holder (10) and have gas pressure springs (15) for retracting the punches, characterized in that the pressure chambers (28, 32) of the gas pressure springs (15) are connected to a common feed line (44), which can be connected to a compressed gas source.

2. The tool holder in accordance with claim 1, characterized in that the feed line (44) constitutes a pressure reservoir.

3. The tool holder in accordance with claim 1 or 2, characterized in that a control valve for setting a defined pressure level in the feed line (44) is provided between the compressed gas source and the feed line (44).

4. The tool holder in accordance with one of claims 1 to 3, characterized in that control valves for setting a defined pressure level in the respective pressure chambers (28, 32) are provided between the feed line (44) and at least a portion of the pressure chambers (28, 32).

5. The tool holder in accordance with one of the preceding claims, characterized in that it is designed in a revolver shape and the punching units (14) are circularly arranged.

6. The tool holder in accordance with claim 5, characterized in that the feed line (44) is annularly arranged between the punching units (14).

7. The tool holder in accordance with one of the preceding claims, characterized in that the compressed gas is nitrogen.

