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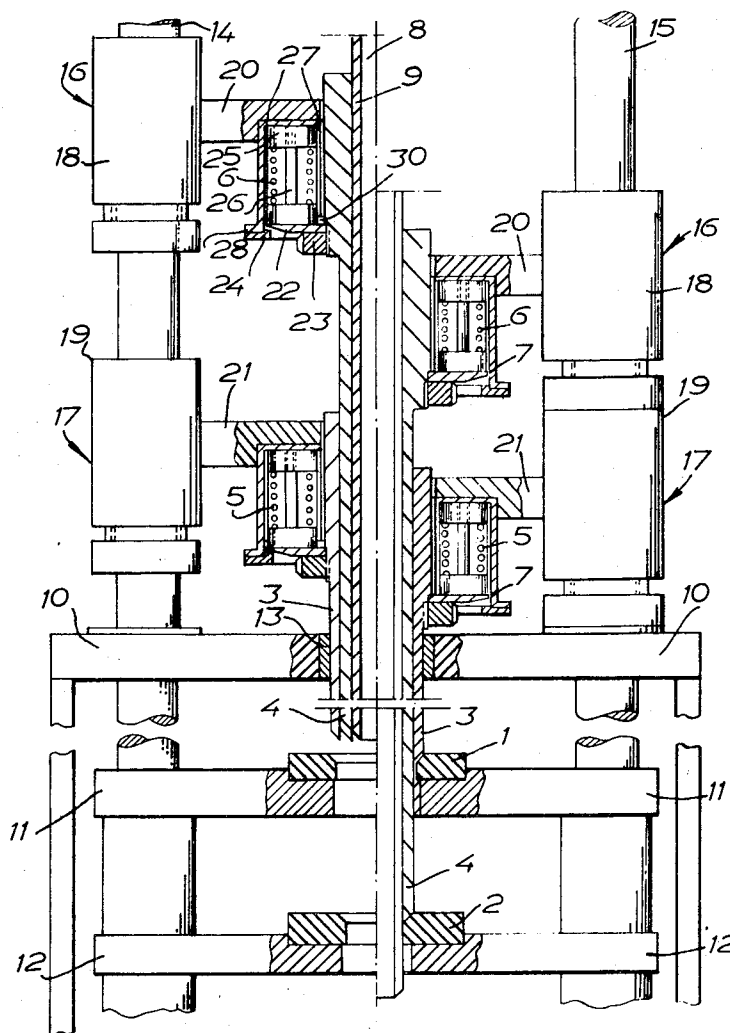
[54] DEEP DRAWING HYDRAULIC PRESS	
5 Claims, 1 Drawing Fig.	
[52]	U.S. Cl. 72/349, 72/433
[51]	Int. Cl. B21d 22/28
[50]	Field of Search 72/347-349, 433, 434

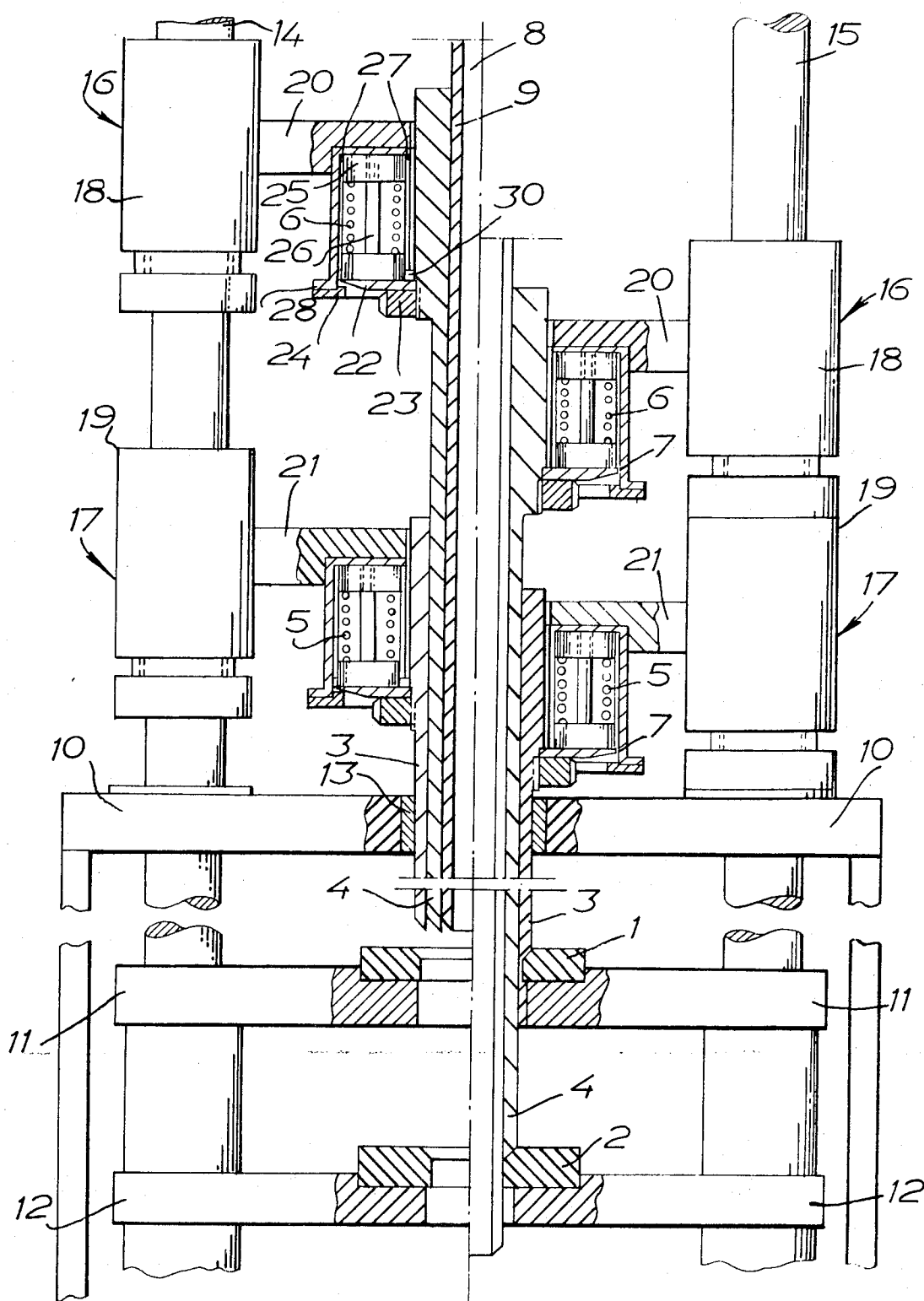
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ABSTRACT: The present invention relates to a deep drawing hydraulic press having a composite telescopic punch, which consists of an inner punch and at least one tubular punch concentrically surrounding the inner punch, in which press between the hydraulic driving mechanism and the tubular punches, flexible intermediate members standing under an initial tension and a force transmitting element are arranged, which during a drawing stroke of the press, produce a connection between the driving mechanism and the tubular punches, a stop being provided in the forward path of the composite punches which shortly before the punch reaches a subsequent and smaller die, cuts off the hydraulic drive from the respective punch.





DEEP DRAWING HYDRAULIC PRESS

The present invention relates to a deep drawing hydraulic press having a composite telescopic punch which consists of an inner punch and at least one tubular punch concentrically surrounding the inner punch.

Deep drawing hydraulic presses having a composite telescopic punch are known which consist of an inner punch and several for example, three, tubular punches concentrically surrounding the inner punch. With presses of this type the hydraulic drive can be transmitted, for example, by means of sliding crossheads and guides to the individual punches. The press is operated as follows:

A workpiece disc, that is a piece of sheet metal cut to size, is first placed on a die. The edge of the disc is held on the die by a holddown mechanism. The drawing process, which consists of several draws then begins. During the first draw, the outermost tubular punch of the composite punch acts as the drawing punch. The first draw is ended when the front of the drawing punch has reached the next smaller die, which is located under the first mentioned die. A further draw follows, that is, the next tubular punch draws the workpiece through the next smaller die. The outermost tubular punch, which has served as the drawing punch of the first draw, thereby acts as a workpiece holddown, and so forth.

During the drawing operation the force with which the punch is moved is determined by both the resistance of the workpiece and by the speed of drawing. In the holddown phase the punch performs no mechanical work. However, during subsequent draws, the punch must exert a specified static force on the edge of the workpiece and therefore on the drawing die. If the force is too large or too small, the workpiece may be damaged, for example, wrinkles or cracks may be formed. The holddown force is in every case less than the drawing force. In the case of the known presses the holddown forces is produced hydraulically.

The present invention seeks to produce a constant holddown pressure for deep drawing presses of the above discussed type without hydraulic switching parts being required therefor.

According to the present invention there is provided a deep drawing hydraulic press having a composite telescopic punch, which consists of an inner punch and at least one tubular punch concentrically surrounding the inner punch, in which press between the hydraulic driving mechanism and the tubular punches, flexible intermediate members standing under an initial tension and a force transmitting element are arranged, which during a drawing stroke of the press produce a connection between the driving mechanism and the tubular punches, a stop being provided in the forward path of the composite punches which shortly before the punch reaches a subsequent and smaller die cuts off the hydraulic drive from the respective punch.

Preferably the intermediate members are springs. Helical springs or plate springs may be used, while tubular pieces may serve as force transmitting elements.

In a further form of the invention, the position of the stop is variable.

The invention will now be described further by way of example with reference to the accompanying drawing, the single figure of which is a diagrammatic partly sectional view of a deep drawing press including a holddown mechanism according to a preferred embodiment of the present invention.

In the drawing a deep drawing press is shown in an unloaded position to the left-hand side of the figure and in an operating position on the right hand of the figure. A rigid supporting frame has several tables 10, 11, 12 arranged one above the other. Guide columns 14, 15 are mounted on the frame and sliding guides 16, 17 are guided on them. Each tubular telescopic punch of the deep drawing press is fitted to one of the sliding guides.

A guiding ring 13 for the composite punch is located in the top table 10 of the frame. At a further position, now shown, a first die is mounted, the inside radius of which is larger than

the outside radius of the outermost tubular punch 3 of the composite punch by the desired wall thickness of the workpiece. Furthermore, a holddown mechanism (not shown) is arranged on this plate. In the further tables 11, 12 further dies 1, 2 are mounted which are associated with the individual punches of the telescopic punch assembly. The telescopic punch has a middle tubular punch 4 and an inner tubular punch 9 in addition to the outermost punch 3. The tubular punches 3, 4 and 9 concentrically surround an inner punch 8.

In the drawing process only the sliding guides 16 and 17 which are associated with the tubular punches 3 and 4 are shown. In fact, an individual sliding guide is associated with the inside punch as well as with each of the tubular punches. The sliding guides 16, 17 consist of lateral sliding cylinders 18, 19 and crossheads 20, 21. The guides 16, 17 are moved by a hydraulic circuit (not shown) and movement of the guides and crossheads causes the individual punches to become loaded.

The crossheads 20, 21 are not directly connected to the tubular punches 3, 4 of the punch assembly. Between the crossheads and the tubular punches are located springs and power transmission parts, which during a drawing operation couple the drive with the tubular punches. For this purpose an annular supporting member 22 is located at the top end of the punch 4 as viewed which in turn rests on a ring 23 of the punch 4, for which the type of connection between crossheads and punch is described below by way of example. The crosshead 20 is not rigidly connected with the punch 4, but has in the central part thereof a ring-shaped recess, the edge of which surrounds the end of the punch 4, with clearance. Between the crosshead 20 and the supporting member 22 are arranged several helical springs 6 distributed evenly around the periphery. These are initially compressed by means of a tie rod 26 which connects the intermediate pieces 24, 25 in which the ends of the springs are mounted. All the springs are surrounded by a common housing 28. Inside the housing 28 the springs 6 are surrounded by tubular thrust pieces 27. The latter are of such a length that in the resting position (on the left hand of the drawing) i.e., when the springs 6 are extended, an intermediate space 30 remains free. The space 30 represents the distance by which the springs 6 can be further compressed.

When the deep drawing hydraulic press is started and a downwardly directed force is exerted on the sliding guide 16 and its crosshead 20 by the hydraulic circuit, the springs 6 are compressed and the intermediate space 30 disappears. In this position, the sliding guide 16 acts on the tubular punch 4 by means of the tubular thrust 27, as may be seen on the right-hand side of the drawing at 7. The tension in the springs 6 is completely released during the forward movement. The tubular punch 4 is now pushed forward by the hydraulic circuit against the resistance to deformation of the workpiece (not shown). Shortly before the tubular punch 4 rests on the die 2, which is the next smaller die, the sliding guide 16 strikes against a stop. In the example shown, the stop is formed by the sliding guide 17, which is associated with the tubular punch 3 via the crosshead 21. The position of the stop is effected before the tubular punch has reached the die. In this position the hydraulic pressure is then transmitted to the supporting frame. The tubular punch is only affected by the spring compression. By a suitable choice of the spring constants the compression of the spring can be accurately adjusted to give the desired holddown force. Small corrections are possible by variation of the stop, for example by intermediate pieces or by threaded parts.

I claim:

1. In a deep drawing hydraulic press having an inner punch and at least one tubular punch concentrically surrounding said inner punch and a hydraulic driving ram transmitting drive through sliding crossheads and guides to said respective punches the improvement of providing a workpiece holddown unit at each redraw stage, each holddown unit being located in a power assembly a hydraulic drawing ram for a respective stage and its drawing punch and being movable between a compressed condition and an extended condition, each hold-

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down unit comprising at least two prestressed elements, at least two force transmission elements peripherally spaced around said drawing punch or punches, a working stroke of said hydraulic ram both transmitting a drawing force from said hydraulic ram through the force transmission elements to the respective stage drawing punch and compressing said prestressed elements in the respective holddown unit, stop means for arresting a working stroke of the hydraulic ram prior to the leading edge of the respective drawing punch arriving at the next subsequent die, to thereby remove the hydraulic ram force from a respective punch so that said

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punch acts as the workpiece holddown through the force of the respective prestressed elements acting thereon.

2. A hydraulic press as set forth in claim 1 wherein said prestressed elements are helical springs.

5 3. A hydraulic press as set forth in claim 2 wherein the force transmission elements are tubular sleeves.

4. A hydraulic press as set forth in claim 3 wherein each helical spring is received within a tubular sleeve.

10 5. A hydraulic press as set forth in claim 1 wherein the position of the stop means is variable.

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