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(54) **Drive system for the jaws of forming presses**

(57) A drive system for the jaws of forming presses comprising series of pairs of opposed tools, punches (10) and dies (40), shaped according to the forming to be carried out, the punches (10) being clamped, by means of cylindrical actuators (101), to intermediaries (5), in turn clamped to an upper movable table (1) of the press, and the dies (40) being clamped, by means of cylindrical actuators (102), to a supporting bar (41); the cylindrical actuators (101, 102) are controlled during clamping by respective spring means (18, 54) and are hydraulically unclamped through the pressure of oil coming from special ducts made in the respective rear plates (22, 25).

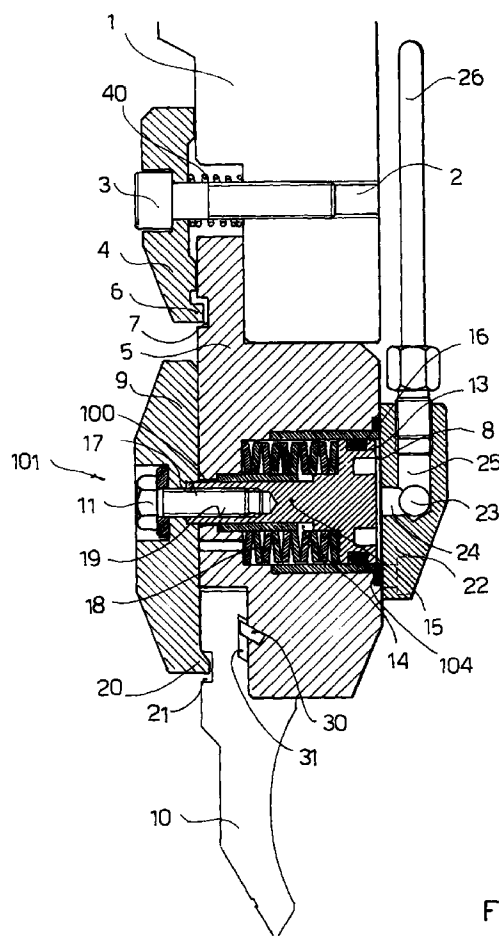


FIG 2

EP 0 934 782 A2

Description

[0001] The present invention relates to a drive system, particularly suitable to be used for clamping and unclamping of the jaws of forming presses.

[0002] Forming presses are normally used for cold forming of metal sheets, and normally comprise series of pairs of opposed tools, punches and dies, shaped according to the forming to be carried out.

[0003] The punches are normally disposed above the dies and are connected to the movable head of the press, commonly called the top table or slider, for example by means of additional members called intermediaries.

[0004] Fixing of the intermediaries to the top table, of the punches to the intermediaries and of the dies to their supports takes place by means of special jaws or brackets.

[0005] Each time there is a need to replace or move the tools of the press, such as the punches or the dies for example, it is necessary for said jaws to be released and subsequently clamped.

[0006] According to the prior art these operations are performed manually or by means of hydraulic or pneumatic control systems, the latter being faster to operate than the former. However, said systems hold the disadvantage of having to make flexible tubes for the supply of oil or air pass on the outside and in front of mechanical parts of the machine, with a resulting reduction in the space available for maneuvering and positioning the pieces being worked.

[0007] Moreover, forming presses that use a hydraulic or pneumatic system do not work in conditions of absolute safety. In fact during the forming operation clamping of the tools is ensured by the hydraulic or pneumatic system which could present faults.

[0008] The solutions of the prior art that use hydraulic or pneumatic actuators for clamping and unclamping the brackets of forming presses show a certain complexity in the creation of the intermediaries which must provide a chamber for the piston of the cylindrical actuator and ducts made in their own body to supply said chamber.

[0009] The object of the invention is to eliminate said drawbacks by providing a simple and easy-to-make operation system for locking and unlocking the jaws of forming presses.

[0010] This object is achieved, according to the invention, with the characteristics listed in appended independent claim 1.

[0011] Preferred embodiments of the invention emerge from the dependent claims.

[0012] In the forming press using the jaw drive system according to the invention, spring means are used which ensure the mechanical retain of the jaws during clamping, while unclamping of the jaws takes place hydraulically.

[0013] Ducts that pass through the entire jaw are

made in the jaws or rear plates. The ducts of a jaw are put into communication with those of the next jaw by means of flexible tubes which are situated at the back of the forming press. Oil enters the chamber in which the piston of the cylindrical actuator is contained through the ducts of the rear jaws and the oil pressure on the surface of the piston compresses the spring means, causing unclamping of the front jaws which retain the tool.

[0014] This system allows the forming press to work in conditions of maximum safety thanks to the mechanical locking. Furthermore, with this system intermediaries can be made in a single piece without internal ducts able to supply the chamber of the cylindrical actuator piston, which results in considerably less structural complexity with respect to the intermediaries to the prior art.

[0015] Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the appended drawings in which:

Figure 1 is a front view of an intermediary of a forming press that uses the jaw operating system according to the invention, in which the clamping jaws have been omitted for greater clarity;

Figure 2 is a section along the section line A-A showing the locking system for the punches;

Figure 3 is a front view of a die supporting bar that uses the drive system for jaws according to the invention;

Figure 4 is a section along the section line B-B in Figure 3 showing the locking system for the dies.

[0016] The drive system for jaws according to the invention for locking a punch 10 of a forming press is described with the aid of Figure 1 and Figure 2.

[0017] The forming press comprises a movable head called a top table 1 having a substantially rectangular shape and extending the entire length of the press.

[0018] Clamping of intermediaries 5 in different positions on the top table 1 takes place by means of jaw or bracket means 4. Threaded holes 2 (only one visible in Figure 2) are made in the top table destined to receive a threaded clamping bolt 3. The bolt 3 engages with the jaw 4 by manual screwing causing advancement thereof. The jaw 4 then abuts against the intermediary 5 causing the surface of the intermediary 5 to be drawn against the surface of the top table 1. Retention and clamping of the intermediary 5 to the top table 1 are ensured through engagement of a tooth 6 made in the jaw 4 with a cavity 7 made in the intermediary 5.

[0019] In the rear part of the body of the intermediary 5 there is a cylindrical cavity 8, connected to a second

coaxial cylindrical cavity 100 with a smaller diameter than the cavity 8 and extending to the outer front surface of the intermediary 5. The two cavities 8 and 100 are destined to house the drive means of a cylindrical actuator 101 that controls a front jaw 9 able to lock the punch 10 to the intermediary 5. A piston 13 is housed in the cavity 8, said piston bearing a shank 14 with a smaller diameter from which extends a cylindrical rod 15 with an even smaller diameter, about equal to the diameter of the cavity 100 wherein it slides. The front end of the rod 15 protrudes from the front of the intermediary 5 and engages in a cavity 17 made in the front jaw 9.

[0020] A bolt 11 fixes the jaw 9 to the rod 15, entering the outside of the jaw and screwing into a threaded hole 19 made in the rod.

[0021] A piston ring 16 is fitted around the piston 13 to ensure a good seal during sliding inside the cavity 8.

[0022] A pressure spring 18 which pushes the piston backwards causing clamping of the front jaw 9 on the punch 10 is positioned in the seat 8 around the shank 14 of the piston 13. Clamping and retention of the punch 10 are ensured by engagement of a tooth 20 provided in the front jaw 9 in a cavity 21 provided in the punch 10.

[0023] A rear plate 22 that covers the cavity 8 containing the piston 13 is clamped behind the intermediary 5. The tightness of the back plate 22 is ensured by a gasket 104 placed behind the intermediary 5 around the cavity 8. A main duct 23 that extends longitudinally for the entire length of the plate is made in said rear plate 22. Transverse ducts 24, also made in the rear plate 22, connect the main duct 23 with the cavity 8 that contains the piston 13. Lastly, a connecting duct 25 is made in the rear plate 22 and extends vertically, starting from the main duct 23 and exiting from the plate to connect with a tube 26 which can preferably be flexible.

[0024] The tube 26 extends into the rear part of the machine and connects the rear plate 22 with a similar rear plate of an adjacent intermediary.

[0025] In order to unclamp the front jaw 9, the oil is sent from the hydraulic system of the machine through an input tube similar to the connecting tube 26 and then, through the ducts 25, 23, 24 made in the rear plate 22, enters the cavity 8 exerting pressure on the piston 13; in this manner the elastic force of the spring 18 is overcome and the piston 13 can advance, completing a stroke of about 4.5 mm, causing release of the front jaw 9.

[0026] To prevent the punch 10 from falling during release, a tooth 30 is provided in the intermediary 5 that engages in a cavity 31 made in the punch 10.

[0027] The jaws drive system for clamping and unclamping dies is described with reference to Figures 3 and 4.

[0028] A die 40 is positioned on a supporting bar 41 to which a front jaw 53 and a rear plate 55 are connected. A first locator 42 is positioned between the front jaw 53 and the front surface of the die 40 and a second locator 43 is positioned between the rear surface of the die 40

and the rear plate 55; the locators 42 and 43 abutting respectively against the front and rear surfaces of the die 40 they ensure that it is centered on the supporting bar 41.

[0029] A groove containing a piston ring 106 is provided on the rear surface of the front jaw 53, in contact with the supporting bar 41, to avoid dirt depositing between the two contact surfaces.

[0030] The supporting bar 41 has a first cylindrical cavity 44 at the rear, connected to a second coaxial cylindrical cavity 50 having a smaller diameter than the first cavity 44 and extending to the front surface of the supporting bar 41. The two cavities 44 and 50 are destined to house the drive means of an actuator cylinder 102 that controls movement of the front jaw 53. Five actuator cylinders 102 per meter are usually provided.

[0031] A piston 46 is housed in the cavity 44 and carries a cylindrical shank 47 with a smaller diameter than said piston 46, ending in a cylindrical rod 48 with a slightly smaller diameter than the cylindrical shank 47 and about equal to the diameter of the second cavity 50 so as to be able to slide therein. Axially to the cylindrical rod 48 a threaded hole 51 is made for engagement of a bolt 52 which serves to lock the front jaw 53.

[0032] Disposed in the cavity 44, around the shank 47, is a pressure spring 54, acting on the piston 46 to cause advancement thereof and thus clamping of the jaw 53 which abuts against the locator 42 locking the die 40, which is fixed at the rear by the second locator 43 locked by the rear plate 55. The stroke of the piston 46 is 0.4-0.5 mm, sufficient to allow clamping to be released.

[0033] In the upper plate 55 a main duct 56 extending the whole length thereof and connecting ducts 57 connected to the main duct 56 and ending in respective cavities 44 made in the supporting bar 41 are provided.

[0034] When the hydraulic system is operated, the oil is pushed through an entry duct into the main duct 56 and is then sent through the connecting ducts 57 into the cavities 44. In said cavities 44 the pressure of the oil against the surface of the piston 46 causes compression of the spring means 54 and thus unclamping of the front jaw 53. The tight seal of the piston is ensured by a peripheral gasket 49.

[0035] From what is described it is clear that the jaw drive system according to the invention allows the forming press to work in conditions of maximum safety thanks to the mechanical clamping of the tools. In this manner pressure can be created in the hydraulic or pneumatic system only for unclamping of the tools.

Claims

1. A drive system for the jaws of forming presses comprising a series of pairs of opposed tools, punches (10) and dies (40), shaped according to the forming to be carried out, the punches (10) being clamped, by means of cylindrical actuators (101), to interme-

diaries (5), in turn clamped to a movable top table (1) of the press, and the dies (40) being locked, by means of cylindrical actuators (102) to a supporting bar (41) characterized in that spring means (18, 54) are provided such as to control mechanically clamping of at least one of said respective cylindrical actuators (101, 102).

2. A system according to claim 1, characterized in that two coaxial cavities (8, 100) are made in each intermediary (5), communicating with each other and destined to contain a piston (13) with relative rod (15) of a respective cylindrical actuator (101) and said spring means (18). 10
3. A system according to claim 1, characterized in that two cavities (44, 50) are made in said supporting bar (41), able to contain a piston (46) of a respective cylindrical actuator (102) and said spring means (54). 15
4. A system according to claims 1 and 2, characterized in that fixed to the rear part of each intermediary (5) is a rear plate (22) that covers said cavity (8) of the intermediary (5), wherein ducts (23, 24, 25) for supplying the operating fluid of said cylindrical actuator (101) are present. 20
5. A system according to claim 4, characterized in that said ducts (23, 24, 25) comprise a main duct (23) passing through the rear plate (22) of the intermediary for its entire length, a transverse duct (24) connecting said duct (23) to the housing cavity (8) of a respective piston (13), and an outlet duct (25) for connecting an external feed tube (26). 25
6. A system according to claim 5, characterized in that said outlet duct (25) is in a substantially vertical position and is connected by means of said outer connecting tube (26) to the rear plate (22) of an adjacent intermediary. 30
7. A system according to claim 6, characterized in that said connecting tube (26) is flexible and is disposed at the back of the forming machine. 35
8. A system according to claim 1 or 3, characterized in that a rear plate (55) is fixed rearwards of said supporting bar (41) and covers said cavity (44) of the supporting bar (41), wherein ducts (56, 57) are provided to supply the working fluid of said cylindrical actuator (102). 40
9. A system according to claim 8, characterized in that said ducts (56, 57) comprise a main duct (56) passing through the plate (55) for its entire length and a transverse duct (57) that connects said main duct (56) to the housing cavity (44) of a respective piston 45

(46).

10. A forming press comprising pairs of opposed tools, punches (10) and dies (40), shape according to the forming to be carried out on a sheet being worked, characterized in that a drive system is provided for the clamping jaws (9, 53) of said punches (10) and dies (40), according to any one of the preceding claims.

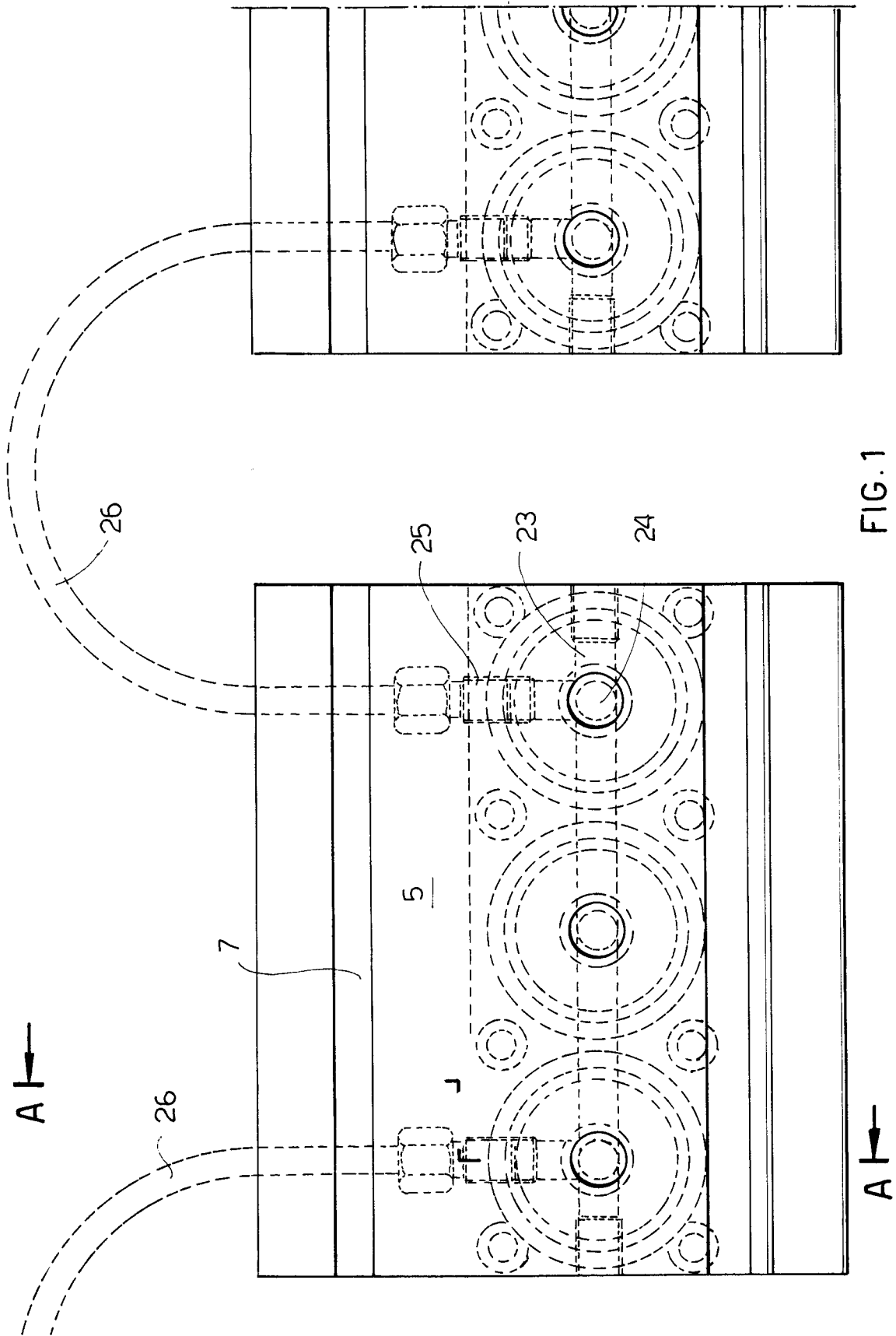


FIG. 1

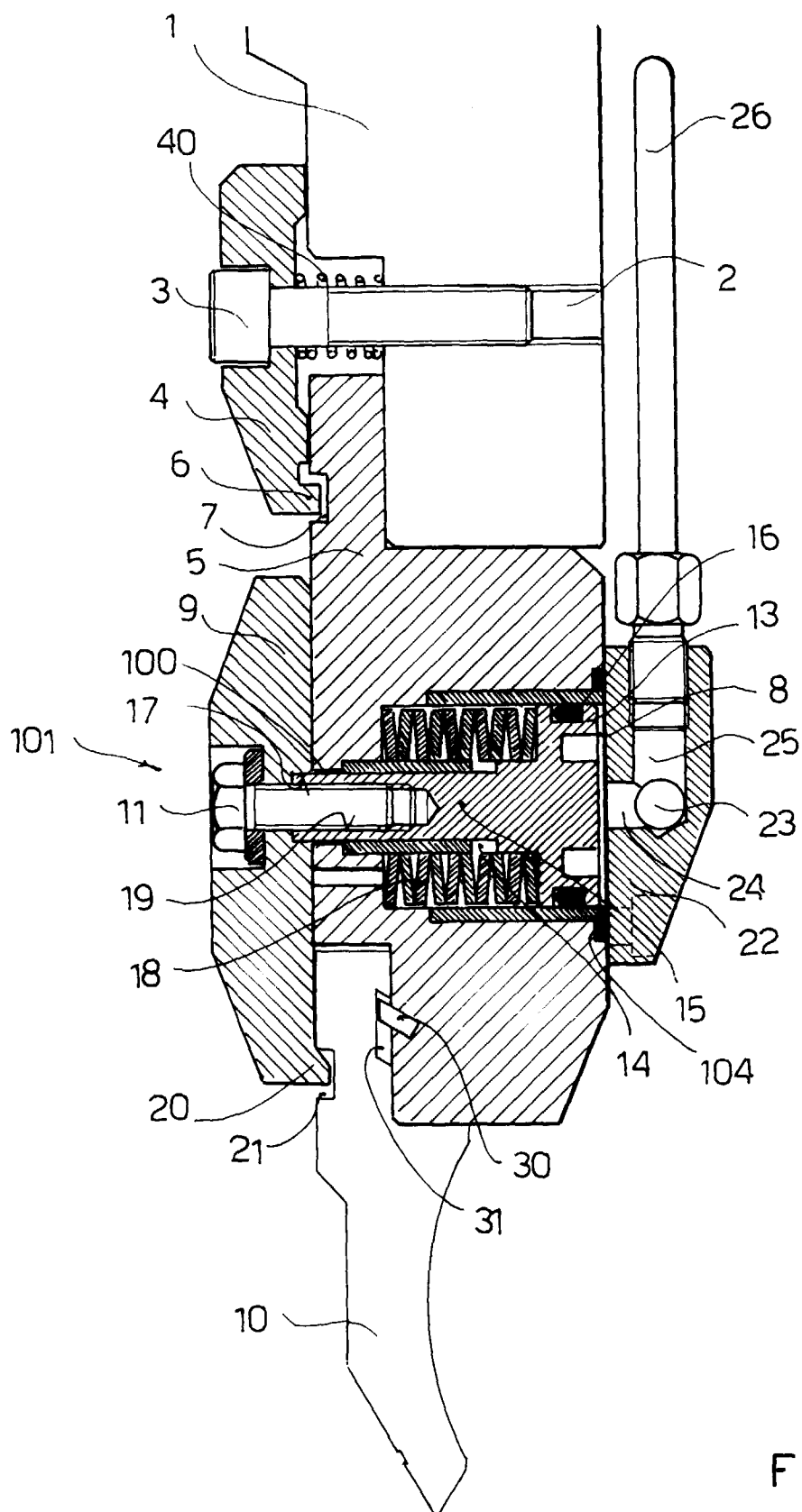


FIG 2

