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(54) Device for adjusting the stroke of a mechanical press and method for adjusting said stroke by means of said device

(57) A device is described which allows the stroke of a mechanical press to be adjusted, particularly during descent of the mobile part (6) and around its bottom dead centre.

The device comprises, in combination with each other, a first kinematic mechanism (2) able to cause a shaft (3), for example a crankshaft, to rotate with a variable angular speed, a second kinematic mechanism (1) - driven by said shaft (3) - able to transmit the movement from said shaft (3) to the mobile part (6) of the press, a joint (4) able to uncouple the first kinematic mechanism (2) from said shaft (3) and means (5) designed to cause said shaft (3) to rotate with respect to the first kinematic mechanism (2), with the press at rest.

A method of adjusting the stroke of a mechanical press by means of the device forming the subject matter of the present invention is also described.

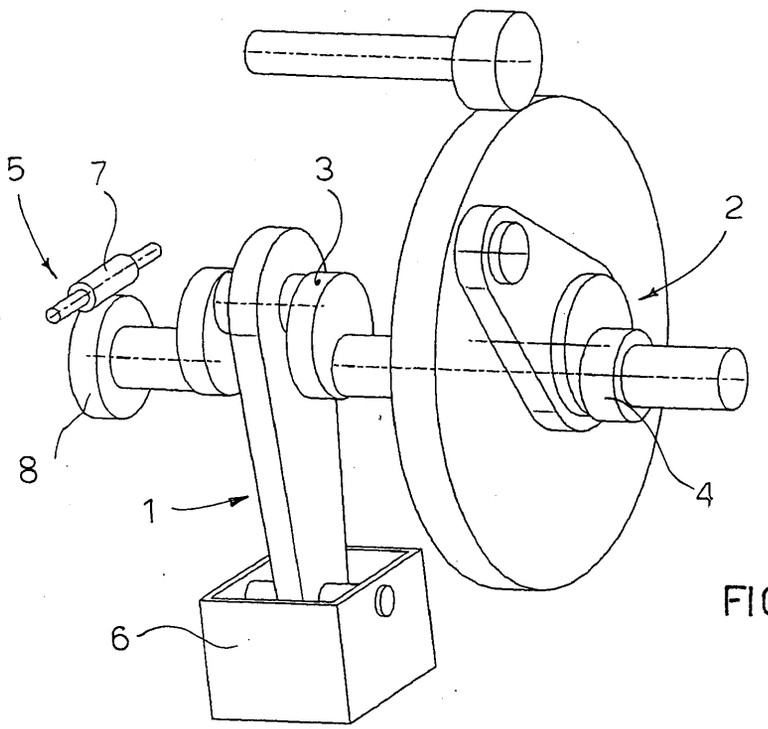

FIG. 1

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Description

[0001] The present invention refers to a device which allows the stroke of a mechanical press to be adjusted - in particular during descent of the mobile part of the press and around its bottom dead centre - and to a method of adjusting the stroke of the press by means of the aforesaid device.

[0002] In a mechanical press the mobile part has a cyclical movement, with respect to the fixed part, which brings it from a top dead centre to a bottom dead centre and vice versa.

[0003] The characteristics of the movement of the mobile part of the press around the bottom dead centre (speed of descent, position - in degrees - of the bottom dead centre, dwell period around the bottom dead centre etc.) are of particular importance because they affect the ability of the press to perform the work required (drawing, deep drawing, punching, coining, etc.), the wear of the press members and of the dies, and so on.

[0004] In fact, for drawing it is necessary for the mobile part of the press - in order to avoid "tearing" the sheet to be drawn - to slow away from the bottom dead centre, to maintain a constant speed until it reaches the bottom dead centre and to return upward rapidly; for coining it is advisable for the mobile part of the press to descend more rapidly, to slow down near the bottom dead centre, to make a gentle, long-lasting "strike" on the minting die and to rise rapidly, and so on.

[0005] A known means of giving the movement of the mobile part of the press, in particular around the bottom dead centre, the optimal characteristics for the specific use for which the press is intended on each occasion is the use of systems comprising a number of levers, inserted in the "chain" which transits the movement from a motor to the mobile part of the press, which modify the characteristics of said movement to adapt it to specific requirements.

[0006] Said systems do not, however, allow the characteristics of the movement of the mobile part of the press to be adjusted, unless substantial, costly modifications are made to said systems. These modifications require considerable time and must be carried out with the press at rest, thus considerably reducing the productivity of the press.

[0007] Another known means of giving the movement of the mobile part of the press, in particular around the bottom dead centre, the optimal characteristics for the specific use for which the press is intended on each occasion is to insert into the "chain" which transmits the movement from the motor to a shaft (normally a crankshaft) that moves the mobile part of the press means (controllable by the operator) designed to modify the position of a gear belonging to the said "chain" with respect to the axis of the shaft, thus modifying the position (in degrees) of the bottom dead centre and, consequently, the speed of descent of the mobile part of the press.

[0008] The aforesaid means are (generally) complex and costly and do not allow the beginning the flattened part of the movement curve of the mobile part to be adjusted with respect to the bottom dead centre whilst the position (in degrees) of the bottom dead centre remains unchanged.

[0009] The device forming the subject matter of the present invention allows the drawbacks and/or limitations of the above described known devices to be overcome simply and economically.

[0010] A device realised according to the invention has at least the characteristics set forth in claim 1; further characteristics of said device are set forth in the dependent claims.

[0011] Furthermore, a method - having the characteristics set forth in claim 12 - is described for adjustment of the stroke of the mechanical press by means of the aforesaid device.

[0012] Exemplary embodiments of the invention will be described by way of non-limiting disclosures with reference to the appended drawings, in which:

Fig. 1 shows diagrammatically a first embodiment of a device, made according to the invention, for adjusting the stroke of a mechanical press;
Fig. 2 shows diagrammatically the device of Figure 1, in which the crankshaft is uncoupled from the first kinematic mechanism;
Fig. 3 shows diagrammatically a second embodiment of a device, made according to the invention, for adjusting the stroke of a mechanical press.

[0013] In the appended drawings like elements will be identified by the same reference numerals.

[0014] Figure 1 shows diagrammatically a first embodiment of a device, made according to the invention, for adjusting the stroke of a mechanical press.

[0015] Said device comprises, in combination with each other:

- a first kinematic mechanism 2 able to make a shaft 3 to rotate with a variable angular speed;
- a second kinematic mechanism 1, driven by the shaft 3 and able to transfer the movement from the shaft 3 to the mobile part 6 of the press;
- a joint 4 able to uncouple the first kinematic mechanism 2 from the shaft 3; and
- means 5 designed to cause the shaft 3, uncoupled from the first kinematic mechanism 2 by means of the joint 4, to rotate with respect to the first kinematic mechanism 2.

[0016] Normally, the means 5 make the shaft 3 to rotate with respect to the first kinematic mechanism 2 with the press at rest.

[0017] In the embodiment described in the appended drawings the shaft 3 is a crankshaft but, without departing from the scope of the invention, it is possible to make the shaft 3 by means of any other known functionally

equivalent mechanism.

[0018] The joint 4 illustrated in the appended drawings is a clutch joint but, without departing form the scope of the invention, it is possible to replace it with any other type of per se known functionally equivalent joint.

[0019] The first and second kinematic mechanism (2, 1) illustrated in the appended drawings will not be described because they are per se known and, without departing from the scope of the invention, they can be replaced with another per se known functionally equivalent kinematic mechanism.

[0020] In Figures 1 e 2 the means 5 designed to make the shaft 3 rotate with respect to the first kinematic mechanism 2 consist of a geared motor coupled to the shaft 3 in a per se known manner (for example by a worm screw 7 - worm wheel 8 coupling) but, without departing from the scope of the invention, it is possible to replace the geared motor 5 and/or the worm screw 7-worm wheel 8 coupling with other functionally equivalent devices.

[0021] In the appended Figures 1 and 2 the worm screw 7 - worm wheel 8 coupling is situated at one end of the shaft 3 but, without departing from the scope of the invention, said coupling can be in an intermediate position on the shaft 3.

[0022] Figure 2 shows diagrammatically the device of Figure 1 in which the shaft 3 is uncoupled from the first kinematic mechanism 2 by means of the joint 4.

[0023] The method of adjusting the stroke of the mobile part 6 of the mechanical press by means of the device of Figure 1 will be described with reference to appended Figures 1 and 2 and comprises at least the steps of:

- uncoupling the shaft 3 from the first kinematic mechanism 2 by means of the joint 4, with the press at rest and with the mobile part 6 of the press at the top dead centre;
- driving the means 5 to make the shaft 3 rotate with respect to the first kinematic mechanism 2 and to make the mobile part 6 of the press move according to the pattern required;
- act on the joint 4 to make the shaft 3 integral with the first kinematic mechanism 2 again;
- act on the first kinematic mechanism 2 to return the mobile part 6 of the press to the top dead centre.

[0024] Figure 3 shows diagrammatically a second embodiment of a device, made according to the invention, for adjusting the stroke of a mechanical press, which differs from that shown in Figures 1 and 2 essentially in that the means 5 designed to cause the shaft 3, uncoupled from the first kinematic mechanism 2 by means of the joint 4, to rotate with respect to the first kinematic mechanism 2 consist of a mobile piston 9 (preferably but not necessarily a hydraulic piston) which is carried by a support 10 integral with the second kinematic mechanism 1 and which is brought against the shaft 3 to lock the mobile part 6 of the press in a preestablished point, for example at its top dead centre.

[0025] The mobile piston 9 preferably enters a hole (not visible in Figure 3) formed in the shaft 3, preferably in such a position as to lock the mobile part 6 of the press at its top dead centre.

[0026] Once the shaft 3 has been locked, the first kinematic mechanism 2 is rotated with respect to the shaft 3 and, if the mobile piston 9 does not lock the mobile part 6 of the press at the top dead centre, the kinematic mechanism 2 is operated to return the mobile part 6 of the press to the top dead centre.

[0027] Any further variants with respect to what is described may occur to a person skilled in the art, but it should be noted that said variants, accessible to a person skilled in the art, are understood as coming within the scope of the invention as set forth in the claims.

Claims

1. A device for adjusting the stroke of a mechanical press, **characterized in that** it comprises, in combination with each other:

   - a first kinematic mechanism (2) able to rotate a shaft (3) with a variable angular speed;
   - a second kinematic mechanism (1), driven by the shaft (3) and able to transfer the movement from the shaft (3) to a mobile part (6) of the press;
   - a joint (4) able to uncouple the first kinematic mechanism (2) from the shaft (3);
   - means (5) designed to cause the shaft (3), uncoupled from the first kinematic mechanism (2) by means of the joint (4), to rotate with respect to the first kinematic mechanism (2).

2. A device according to claim 1, **characterized in that** the means (5) cause the shaft (3) to rotate with respect to the first kinematic mechanism (2) with the press at rest.

3. A device according to claim 1, **characterized in that** the shaft (3) is a crankshaft.

4. A device according to claim 1, **characterized in that** the joint (4) is a clutch joint.

5. A device according to claim 1, **characterized in that** the means (5) designed to cause the shaft (3) to rotate with respect to the first kinematic mechanism (2) comprise a geared motor connected to the shaft (3).

6. A device according to claim 5, **characterized in that** the means (5) are connected to the shaft (3)

by means of a worm screw (7) - worm wheel (8) coupling.

7. A device according to claim 1, **characterized in that** the means (5) are connected to the shaft (3) by means situated at one end of the shaft (3).

8. A device according to claim 1, **characterized in that** the means (5) are connected to the shaft (3) by means situated in an intermediate position on the shaft (3).

9. A device according to claim 1, **characterized in that** the means (5) designed to cause the shaft (3) to rotate with respect to the first kinematic mechanism (2) consist of a mobile piston (9) which is carried by a support (10) integral with the first kinematic mechanism (2) and which is brought against the shaft (3) to lock the mobile part (6) of the press in a pre-established point.

10. A device according to claim 9, **characterized in that** the mobile piston (9) locks the mobile part (6) of the press in top dead centre.

11. A device according to claim 9, **characterized in that** the mobile piston (9) is a hydraulic piston.

12. A device according to claim 9, **characterized in that** the mobile piston (9) enters a hole formed in the shaft (3).

13. A device according to claim 12, **characterized in that** the mobile piston (9), when entered in the hole formed in the shaft (3), locks the mobile part (6) of the press at its top dead centre.

14. A method for adjusting the stroke of a mechanical press by means of a device according to at least one of the preceding claims, **characterized in that** it comprises, in combination with each other, at least the steps of:

- uncoupling the shaft (3) from the first kinematic mechanism (2) by means of the joint (4);
- driving the means (5) to make the shaft (3) rotate with respect to the first kinematic mechanism (2);
- acting on the joint (4) to make the shaft (3) integral with the first kinematic mechanism (2) again.

15. A method according to claim 14, **characterized in that** it comprises the further step of uncoupling the shaft (3) from the first kinematic mechanism (2) by means of the joint (4) with the press at rest.

16. A method according to claim 14, **characterized in that** it comprises the further step of acting on the first kinematic mechanism (2) to return the mobile part (6) to the top dead centre.

17. A method according to claim 14, **characterized in that** it comprises the further step of locking the shaft (3) before causing the first kinematic mechanism (2) to rotate with respect to the shaft (3).

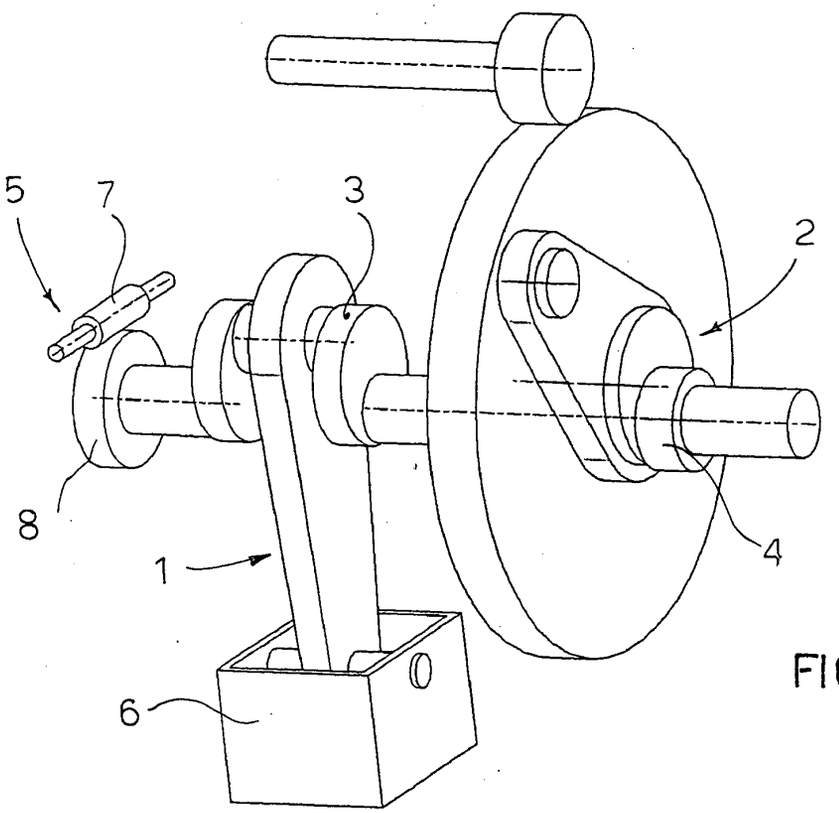

FIG. 1

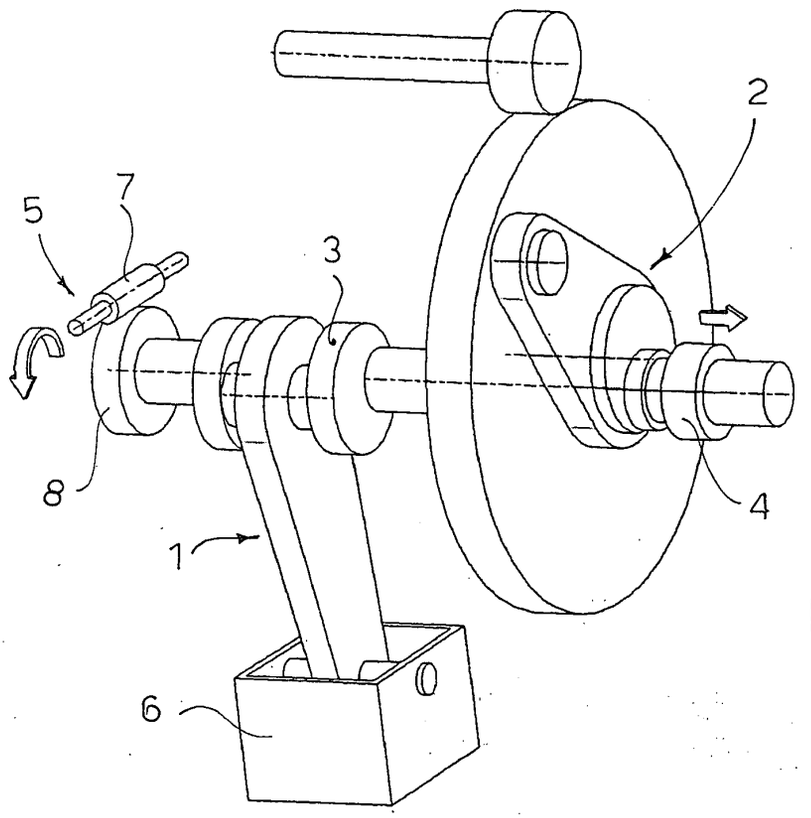

FIG. 2

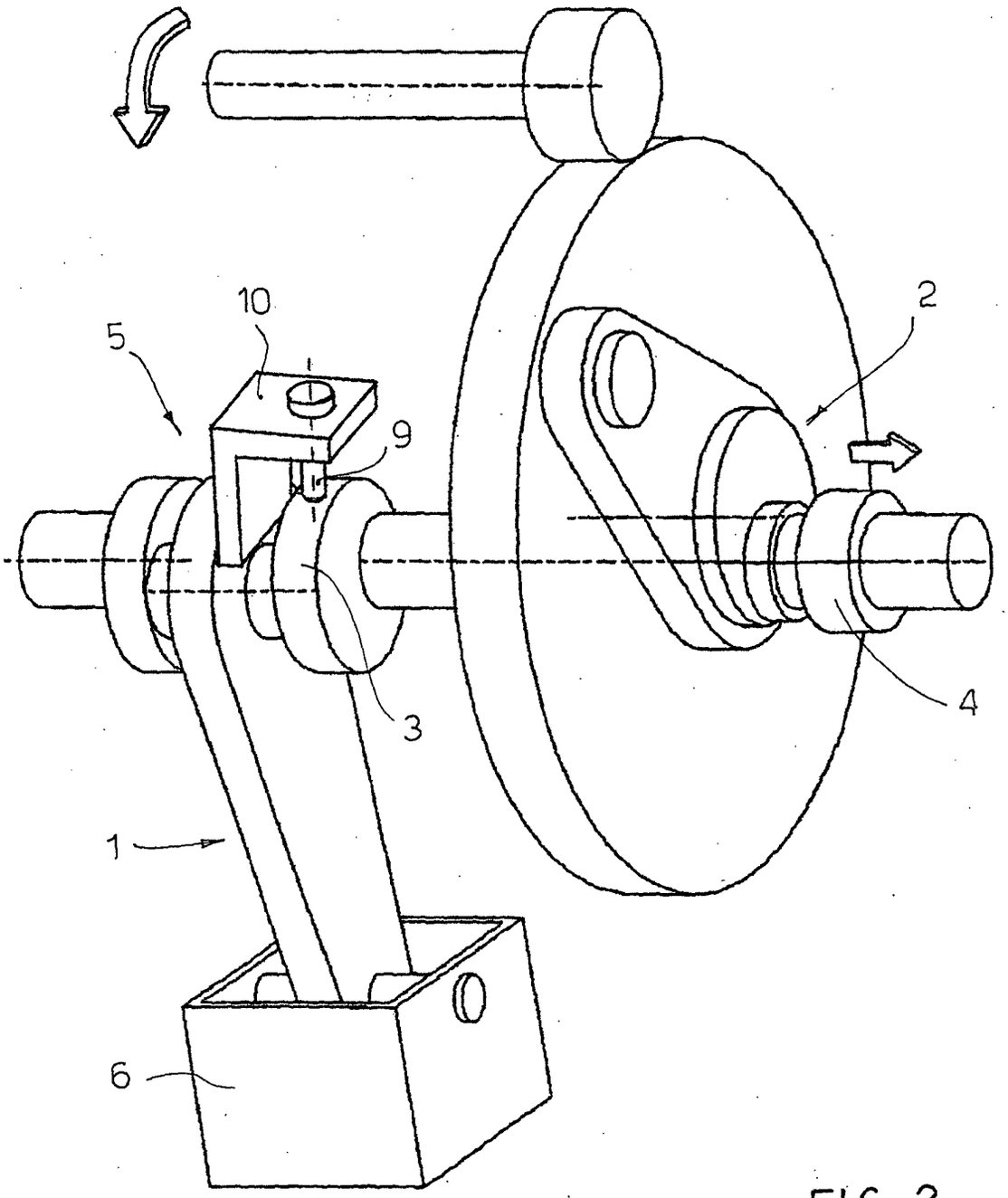

FIG.3