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(54) **Tool coupling device, particularly for press machines**

Werkzeugkupplungsvorrichtung, insbesondere für Pressen

Dispositif d'accouplement d'un outil, en particulier pour des presses

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(56) References cited:
**FR-A- 2 791 590 JP-A- 5 337 553
JP-A- 6 142 767 JP-A- 6 262 263**

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Description

[0001] The present invention refers to a tool coupling device, particularly for press machines, of the type indicated in the precharacterising portion of claim 1. Such a device described in the precharacterising portion of claim 1 is known from JP-A-05337553.

[0002] Generally, a press has a structure comprising a lower fixed table, having the matrixes, and an upper vertically moving table, on which one or more tools, also called punches or counter-V, are secured.

[0003] Tool coupling devices are known that provide for locking a tool end inside a press housing.

[0004] Such coupling devices allow replacing the tools and are traditionally made through hydraulic, pneumatic, mechanical or mixed systems, anyway adapted to lock the tool position, by abutment in horizontal movements and by friction in vertical movements.

[0005] The above coupling devices comprise holding means to avoid the accidental tool drop, once the tool has been previously freed from the locking action of the device.

[0006] Such holding means generally provide for a mechanical coupling between one holding tooth and a groove; this latter one can be obtained on the tool, if the holding tooth is assembled on the press table, or on the tool housing, if the holding tooth is assembled on the tool itself.

[0007] The tool replacement can thereby occur through lateral withdrawal or through vertical withdrawal, by operating on the tool itself to remove the coupling between holding tooth and groove. Also the holding device is generally kept tightened by means of hydraulic, pneumatic, mechanical or mixed systems.

[0008] The above briefly-described coupling devices have some inconveniences.

[0009] First of all, the use of hydraulic or pneumatic systems, that provide for the use of pressurised mechanical members, can impair an operator's safety, due to risks connected with possible breakage and/or explosions.

[0010] Secondly, the locking devices that force the lateral withdrawal of tools require long replacement times, not being it possible to individually operate on every single tool.

[0011] From Italian Patent Application N. PR99A000050 of the same Applicant, a tool coupling device is known that provides for the use of a first permanent magnet internally arranged with respect to a tool housing, the action of said first permanent magnet operating on the tool end and being controlled by a corresponding first electromagnet.

[0012] In such a way, the tool supporting action performed by the first magnet is divided by the unlocking control action performed by the first electromagnet.

[0013] The above locking device further comprises a second permanent magnet placed between an holding device and the press in order to perform the tool tighten-

ing. In particular, the action of the second permanent magnet is controlled by a second electromagnet.

[0014] The main inconvenience of such locking device is that the absence of electric current prevents the removal and/or replacement of a previously-installed tool.

[0015] Object of the present invention is solving the above inconveniences, providing a tool coupling device, particularly for press machines, that is able to limit accident risks for operators due to mechanical failures or breakage.

[0016] Another object of the present invention is providing a coupling device that allows a quick tool replacement.

[0017] A further object of the present invention is realising a coupling device that is simple and inexpensive to manufacture and can be easily maintained.

[0018] Said objects are fully reached by the tool coupling device, particularly for press machines, having the features of claim 1.

[0019] These and other features will be better pointed out by the following description of a preferred embodiment shown, purely as a non-limiting example, in the enclosed drawing, in which the only figure shows a front view of a tool coupling device, particularly for press machines, with some parts removed in order to better point out other parts.

[0020] With reference to the figure, the coupling device of the invention is globally designated by number 1 and is of the type comprising: a magnet 2 arranged next to a tool-holder housing 3 and operatively active on a ferromagnetic abutment surface of a tool (not shown), in order to keep it inside said housing; locking means 4 operatively active on the tool, in order to prevent an accidental disengagement thereof from the housing. In particular, the magnet 2 can be a magnet of the permanent type or alternatively an electromagnet.

[0021] The locking means 4 originally comprise a jaw 5 secured next to the tool-holder housing 3 through an hinge 6 and having a portion 5a adapted to be pressed against the tool. The locking means 4 are further provided with resilient means 7 connected to the hinge 5 on the opposite part to the portion 5a with respect to the hinge 6, in order to rotate the jaw and press said portion against the tool, and with means 8 to adjust a pre-loading of the resilient means.

[0022] In an alternative embodiment not shown, it is provided that the tool is equipped with a magnetic abutment surface or an abutment surface equipped with a magnet and that the coupling device 1 is equipped, as replacement for the magnet 2, with a ferromagnetic element interacting with the tool abutment surface.

[0023] Substantially, the magnet would be applied to the tool instead of the press.

[0024] The resilient means 7 comprise at least one pre-compressed spring 9 housed in a transverse machine recess and placed between jaw 5 and an abutment surface 10, this latter one being movable at least between a first operating position corresponding to the maximum

compression of the spring 9 (open jaw) and a second operating position corresponding to at least a partial spring extension (jaw closed onto the tool).

[0025] The means 8 for adjusting a pre-loading of the spring 9 comprise at least one screw 11 coaxial with the spring and integrally connected with the abutment surface 10. The device 1 further comprises screw moving means 12. In the example shown, such means 12 comprise a toothed wheel 13 integrally connected with the screw 11, a rack (not shown) kinematically connected with the toothed wheel 13 to activate its rotation and rack moving means (not shown).

[0026] The rack, engaging with the toothed wheel 13, makes it rotate, advancing or retracting the screw 11 by a prefixed pitch and consequently moving the abutment surface 10. In such a way, it is possible to adjust the amount of pre-loading for the spring 9 and therefore to lock and/or unlock the portion 5a of the jaw 5 that presses onto the tool.

[0027] This is particularly important because with such original solution, it is possible to simultaneously free all press tools.

[0028] The rack with the toothed wheel 13 are thereby uncoupling means shaped in such a way as to free the tool kept by the device and simultaneously also free the tools of the other coupling devices that are part of the machine.

[0029] The invention obtains further important advantages.

[0030] First of all, such coupling device, being free from pressurised mechanical members, highly reduces the risks of explosions and/or fluid outflows that can impair an operator's safety.

[0031] Secondly, the presence of the jaw 5 together with the magnet 2 arranged next to the housing 3, allows a quick tool replacement, since it allows an operator to vertically operate on the tool itself.

[0032] A further advantage is given by the fact that the device 1, once installed, allows reducing maintenance times and costs.

Claims

1. Tool coupling device (1), particularly for press machines, of the type comprising:

at least one magnetic coupling between tool and machine in order to keep the tool next to a tool-holder housing (3);
locking means (4) operatively active on the tool, to prevent its accidental disengagement from the housing (3);
said locking means (4) comprise:

at least one jaw (5) secured next to the tool-holder housing (3) through an hinge (6) and having a portion (5a) that is operatively ac-

tive on the tool;

resilient means (7) connected to the jaw (5) on the opposite part to the active portion (5a) with respect to the hinge (6), to rotate the jaw (5) and press said active portion (5a) against the tool;

means (8) to adjust a pre-loading of the resilient means (7),

characterised in that the resilient means (7) comprise at least one pre-compressed spring (9) housed in a machine recess and placed between jaw (5) and a moving abutment surface (10) between at least a first operating position with maximum compression of the spring (9) and a second operating position with an at least partial extension of the spring (9); said means (8) for adjusting a pre-loading of the resilient means (7) comprise at least one screw (11) coaxial with the spring (9) and integrally connected with the abutment surface (10) and comprises means (12) for moving the screw (11); said means (12) for moving the screw (11) comprise:

a toothed wheel (13) integrally connected with the screw (11);

a rack kinematically connected with the toothed wheel (13) to activate its rotation;

means for moving the rack.

2. Device according to claim 1, **characterised in that** it comprises uncoupling means shaped in such a way as to free the tool kept by the device (1) and simultaneously also free the tools of the other coupling devices (1) that are part of the machine.
3. Device according to claim 1, wherein the magnetic coupling comprises at least one magnet (2) arranged next to a tool-holder housing (3) of the machine and operatively active on a ferromagnetic abutment surface of a tool, in order to keep it inside said housing (3).
4. Device according to claim 1, wherein the magnetic coupling comprises at least one magnet (2) associated with a tool arranged in such a way as to be operatively active on a ferromagnetic element arranged next to a tool-holder housing (3), to keep the tool inside said housing (3).

Patentansprüche

1. Werkzeugkupplungsvorrichtung (1), insbesondere für Pressmaschinen, der Art umfassend:

zumindest eine magnetische Kupplung zwischen dem Werkzeug und der Maschine, um das Werkzeug in Höhe einer Werkzeugaufnahme (3) zu halten;

Spannmittel (4), die bei Betätigung auf das Werkzeug einwirken, um dessen unbeabsichtigtes Lösen aus der Aufnahme (3) zu verhindern;

wobei diese Spannmittel (4) umfassen:

zumindest eine Klemmbacke (5), die über ein Gelenk (6) in Höhe der Werkzeugaufnahme (3) befestigt ist und einen bei Betätigung auf das Werkzeug wirkenden Bereich (5a) aufweist;

elastische Mittel (7), die in Bezug auf das Gelenk (6) in dem dem Bereich (5a) gegenüberliegenden Teil mit der Klemmbacke (5) verbunden sind, um die Klemmbacke (5) zu drehen und den genannten Bereich (5a) gegen das Werkzeug zu pressen;

Mittel (8) zum Einstellen der Vorspannung der elastischen Mittel (7),

dadurch gekennzeichnet, dass die elastischen Mittel (7) zumindest eine vorgespannte Feder (9) umfassen, die in einer Ausnehmung der Maschine aufgenommen und zwischen der Klemmbacke (5) und einer Anschlagfläche (10) angeordnet ist, die sich zwischen zumindest einer ersten Betriebsstellung bei maximaler Kompression der Feder (9) und einer zweiten Betriebsstellung bei zumindest teilweiser Dehnung der Feder (9) bewegt;

wobei die genannten Mittel (8) zum Einstellen einer Vorspannung der elastischen Mittel (7) zumindest eine koaxial zu der Feder (9) angeordnete Schraube (11) umfassen, die einstückig mit der Anschlagfläche (10) verbunden ist und Mittel (12) zum Bewegen der Schraube (11) umfasst;

wobei die genannten Mittel (12) zum Bewegen der Schraube (11) umfassen:

ein einstückig mit der Schraube (11) verbundenes Zahnrad (13);

eine kinematisch mit dem Zahnrad (13) verbundene Zahnstange, die dessen Drehung bewirkt; Mittel zum Bewegen der Zahnstange.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** sie Kupplungsfreigabemittel umfasst, die derart ausgebildet sind, dass sie das von der Vorrichtung (1) gehaltene Werkzeug und gleichzeitig auch die Werkzeuge der anderen zur Maschine gehörenden Kupplungsvorrichtungen (1) freigeben.

3. Vorrichtung nach Anspruch 1, bei der die magnetische Kupplung zumindest einen Magneten (2) umfasst, der in Höhe einer Werkzeugaufnahme (3) der Maschine angeordnet ist und bei Betätigung auf eine ferromagnetische Anschlagfläche eines Werkzeugs einwirkt, um dieses in der Aufnahme (3) zu halten.

4. Vorrichtung nach Anspruch 1, bei der die magnetische Kupplung zumindest einen, dem Werkzeug derart zugeordneten Magneten (2) umfasst, dass er bei Betätigung auf ein in der Nähe einer Werkzeugaufnahme (3) angeordnetes ferromagnetisches Element einwirkt, um das Werkzeug in dieser Aufnahme (3) zu halten.

Revendications

1. Dispositif d'accouplement d'outils (1), en particulier pour des presses, du type comprenant:

au moins un accouplement magnétique entre l'outil et la machine de manière à maintenir l'outil à proximité d'un logement porte-outil (3);

des moyens de blocage (4) opérationnellement actifs sur l'outil, pour prévenir son désengagement accidentel du logement (3);

lesdits moyens de blocage (4) comprenant:

au moins une mâchoire (5) fixée à proximité du logement porte-outil (3) par l'intermédiaire d'une articulation (6) et présentant une portion (5a) opérationnellement active sur l'outil;

des moyens élastiques (7) connectés à la mâchoire (5) sur la partie opposée à la portion active (5a) par rapport à l'articulation (6), pour faire pivoter la mâchoire (5) et comprimer ladite portion active (5a) contre l'outil;

des moyens (8) pour régler une précontrainte des moyens élastiques (7),

caractérisé en ce que les moyens élastiques (7) comprennent au moins un ressort précontraint (9) logé dans un renforcement de la machine et placé entre la mâchoire (5) et une surface de butée mobile (10) entre au moins une première position opérationnelle avec compression maximum du ressort (9) et une seconde position opérationnelle avec une extension au moins partielle du ressort (9); lesdits moyens (8) de réglage d'une précontrainte des moyens élastiques (7) comprennent au moins une vis (11) coaxiale au ressort (9) et intégralement connectée à la surface de butée (10) et comprennent des moyens (12) de mise en mouvement de la vis (11);

lesdits moyens (12) de mise en mouvement de la vis (11) comprennent:

une roue dentée (13) intégralement connectée à la vis (11); 5
une crémaillère cinématiquement connectée à la roue dentée (13) pour activer sa rotation;
des moyens pour mettre en mouvement la crémaillère. 10

2. Dispositif selon la revendication 1, **caractérisé en ce qu'il** comprend des moyens de désaccouplement conformés de manière à libérer l'outil maintenu par le dispositif (1) et également à libérer simultanément les outils des autres dispositifs d'accouplement (1) faisant partie de la machine. 15
3. Dispositif selon la revendication 1, dans lequel l'accouplement magnétique comprend au moins un aimant (2) disposé à proximité d'un logement porte-outil (3) de la machine et opérationnellement actif sur une surface de butée ferromagnétique d'un outil, de manière à le maintenir à l'intérieur dudit logement (3). 20 25
4. Dispositif selon la revendication 1, dans lequel l'accouplement ferromagnétique comprend au moins un aimant (2) associé à un outil disposé de manière à être opérationnellement actif sur un élément ferromagnétique disposé à proximité d'un logement porte-outil (3), pour maintenir l'outil à l'intérieur dudit logement (3). 30

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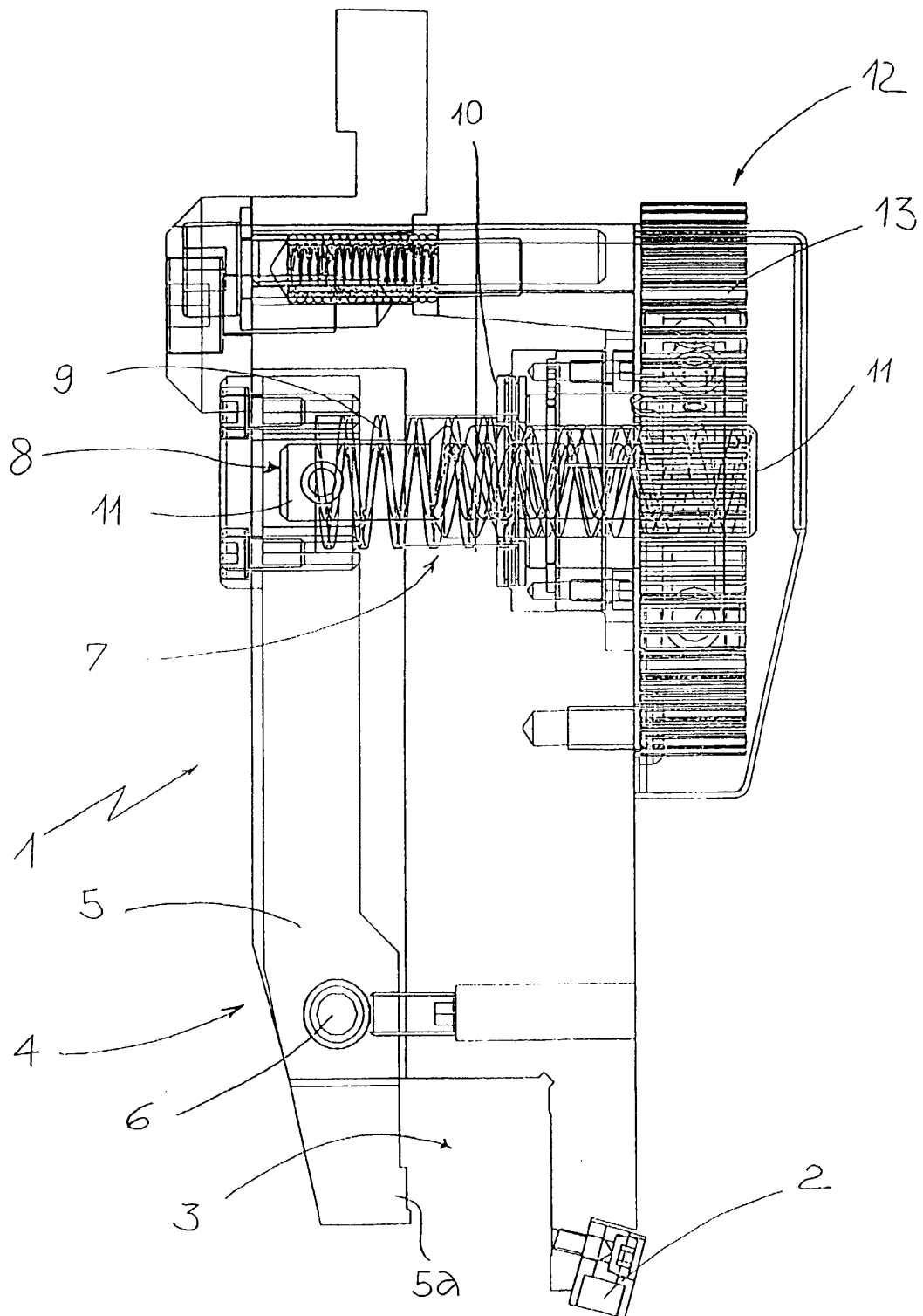
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FIG. 1



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 05337553 A [0001]
- IT PR990050 A [0011]