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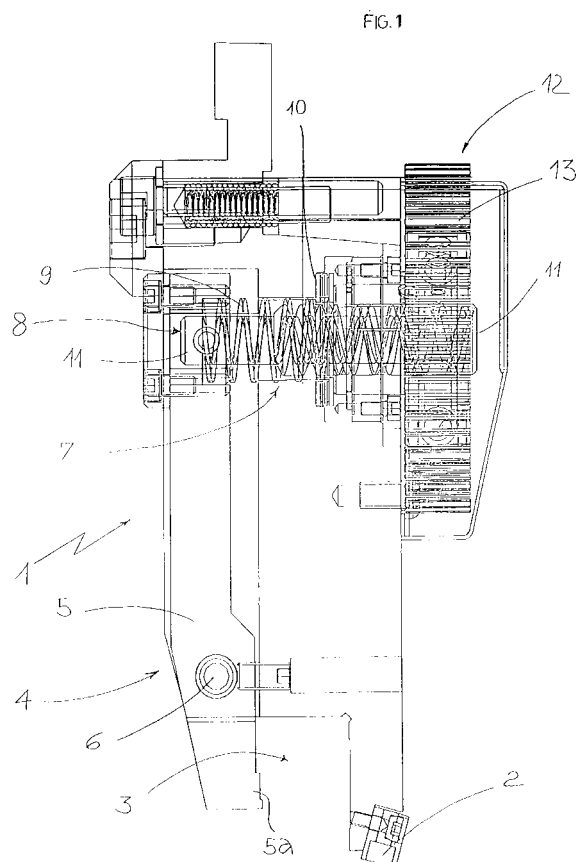
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(54) **Tool coupling device, particularly for press machines**

(57) Tool coupling device (1), particularly for press machines, of the type comprising: 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); locking means (4) operatively active on the tool, to prevent its accidental disengagement from the housing (3). The locking means (4) originally 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 active 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).



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Description

[0001] The present invention refers to a tool coupling device, particularly for press machines, of the type comprising at least one magnet arranged next to a tool-holder housing of the machine and operatively active on a ferromagnetic abutment surface of a tool, in order to keep it inside said housing and locking means operatively active on the tool, to prevent its accidental disengagement from the housing.

[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 tightening. 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, object of the present invention, that is characterised by what is contained in the below-listed claims and in particular in that the locking means comprise:

- at least one jaw secured next to the tool-holder housing through an hinge and having an operatively active portion on the tool;
- resilient means connected to the jaw on the opposite part to the active portion with respect to the hinge, to rotate the jaw and press said active portion against the tool;
- means for adjusting a pre-loading of the resilient means.

[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);

characterised in that the 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 active 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).

2. 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).

3. 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).

4. Device according to claim 1, **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).

5. Device according to claim 4, **characterised in that** the 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).

6. Device according to claim 5, **characterised in that** it comprises means (12) for moving the screw (11).

7. Device according to claim 6, **characterised in that** the 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.

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8. Device according to claim 1, **characterised in that** the magnet (2) is a permanent magnet.

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9. Device according to claim 1, **characterised in that** the magnet (2) is an electromagnet.

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10. 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.

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FIG. 1

