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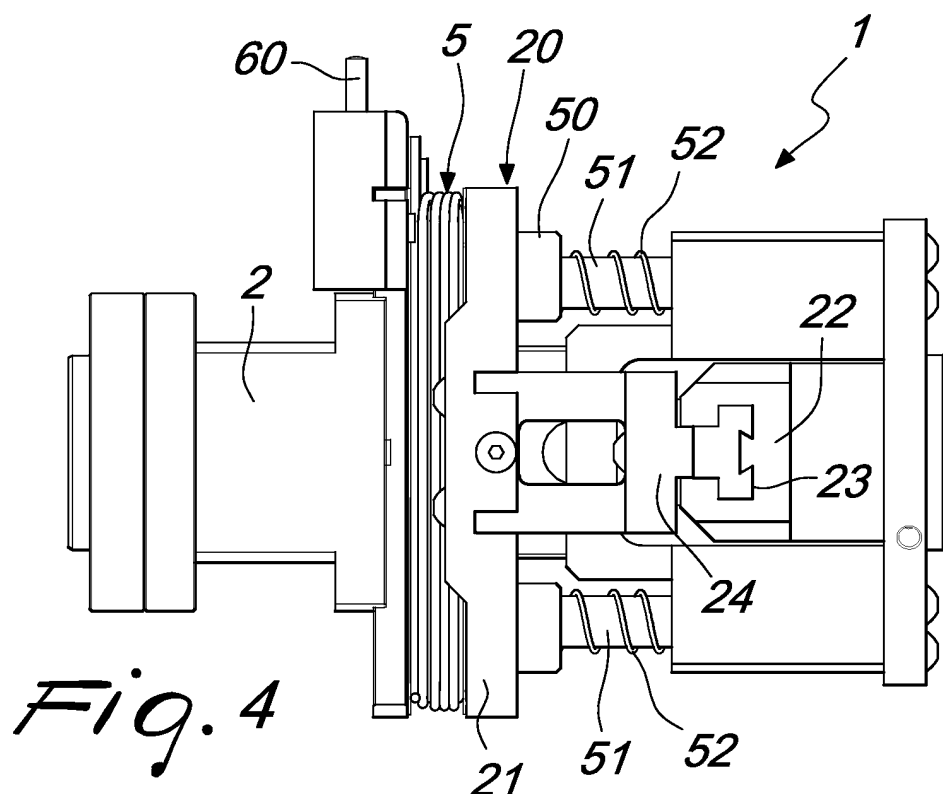
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(54) **Device for the cross-winding of wire on spools in general**

(57) A device (1) for the cross-winding of wire on spools in general comprising a spindle (2) for supporting a spool (5) which has a pair of mutually opposite long sides joined by a pair of mutually opposite short sides, the device further comprising a clamp (20) which can be arranged on the axis of the spool (5) and is provided with a pair of mutually opposite claws (21), which engage the

spool (5) for positioning, on the long side of the spool, a wire fed by a wire guide (70), means (35) being also provided for the translational motion of the clamp (20) along the axis of the spool (5) and means for the translational motion of the pair of claws (21) along a direction that is substantially perpendicular to the axis, the device further comprising means (11, 50) for the synchronous rotation of the spindle (2) and of the clamp (20).



Description

[0001] The present invention relates to a device for the cross-winding of wire on spools in general.

[0002] As is known, for applications on special electric devices, the use of spools that, in transverse section, have an elongated shape with two mutually opposite long sides joined by two likewise mutually opposite short sides is becoming widespread.

[0003] In this kind of spool, the wire is wound with a parallel orientation on the long sides and crossed at the short sides in non-parallel rows.

[0004] Currently, this type of spool is provided by a massive use of manpower, with the obvious negative repercussions on the final costs.

[0005] The aim of the invention is to solve the problem cited above by providing a device for the cross-winding of wire on spools in general that allows automation of the entire operating sequence, thus significantly reducing the operating times.

[0006] Within this aim, an object of the invention is to provide a device in which it is possible to achieve a winding in which the correct positioning of the several turns in all the component layers is always ensured.

[0007] Another object of the present invention is to provide a device that thanks to its particular characteristics of construction is capable of ensuring highest reliability and safety of use.

[0008] Another object of the present invention is to provide a device for the cross-winding of wire on spools in general that can be obtained easily starting from commonly commercially available elements and materials and is also competitive from a merely economical point of view.

[0009] This aim and these and other objects that will become better apparent hereinafter are achieved by a device for the cross-winding of wire on spools in general, according to the invention, which comprises a spindle for supporting a spool which has a pair of mutually opposite long sides joined by a pair of mutually opposite short sides, **characterized in that** it comprises a clamp which can be arranged on the axis of said spool and is provided with a pair of mutually opposite claws, which can engage said spool for positioning, on the long side of said spool, a wire fed by a wire guide, means being also provided for the translational motion of said clamp along the axis of said spool and means for the translational motion of said pair of claws along a direction that is substantially perpendicular to said axis, means being also provided for the synchronous rotation of said spindle and of said clamp.

[0010] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of a device for the cross-winding of wire on spools in general, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic plan view of a winding machine with the device for the cross-winding of wire, according to the invention;

Figure 2 is a perspective view of the device according to the invention;

Figure 3 is a top plan view of the device according to the invention;

Figure 4 is a side elevation view of the device according to the invention;

Figure 5 is a sectional view of the device, taken along the line V-V of Figure 1;

Figure 6 is a sectional view of the device according to the invention, taken along the line VI-VI of Figure 5;

Figure 7 is a view of the spool taken from its short side;

Figure 8 is a sectional view of the device, taken along a line which is parallel to its long sides.

[0011] With reference to the figures, the device for the cross-winding of wire on spools in general according to the invention, generally designated by the reference numeral 1, comprises a spindle 2, which is connected to a supporting frame 3 of a winding machine, generally designated by the reference numeral 4.

[0012] The spindle 2 defines means 10 for retaining the core of the spool 5 on which the wire is wound in order to provide a spool with parallel wires on the long sides and crossed wires on the short sides.

[0013] The means 10, in a preferred but not exclusive embodiment, are provided by way of a rod 11 that extends in an axial direction with respect to the spool.

[0014] A particular feature of the device according to the invention consists in that there is a clamp 20, which is arranged on the axis of the spool 5 and is supported by a movable frame 30, which can slide in a direction that is parallel to the axis of the clamp or the clamps 20, which can be supported by the cross-member 31 of the frame 30. For translational motion, there are means 35 for axial translational motion which are provided, for example, by means of brushless motors that operate on translation joints associated with ball screws, which cause a linear movement.

[0015] The clamp is rotatably supported by a sleeve 40 that is connected to said movable frame 30.

[0016] The clamp, which is of a type known per se, is constituted by a pair of mutually opposite claws 21, which are supported by a supporting block 22 that defines the transverse guides 23 in which the coupling bodies 24 of the claws 21 can slide, so that such claws can perform a translational motion at right angles to the axis of the spool, by way of means for the translational motion of the pair of claws that can be, for example, constituted by a pneumatic piston.

[0017] An engagement body 50 is slidably connected to the supporting block 22 by means of posts 51 on which contrast springs 52 operate and, by means of a seat, is fitted on the rod 11, thus providing means for the synchronous rotation of the spindle 2 and of the clamp 20.

[0018] The means for synchronous rotation can also be optionally provided in a different manner, such as, for example, by way of motors that rotate synchronously, by way of a connection of the electronic type.

[0019] Above the region affected by the rod 11, the spindle is provided with pins 60 to which the ends of the wire that provides the electrical winding of the spool are connected.

[0020] In practical operation, initially the wire is connected to a pin and then the winding of the first turn is performed on the long side of the core, positioning the wire by means of the clamps that are made to advance, at the axial end of the core, and are moved close together so that the wire is guided so as to be arranged correctly with respect to the core without being able to "bulge", i.e., protrude from the edge of the core.

[0021] Once the first turn has been provided, the claws 21, which extend substantially parallel with respect to the long side of the core, are opened and moved axially so as to create the space for providing the second turn and are closed when the winding is provided.

[0022] This series of operations continues until the first layer of turns is completed.

[0023] At this point, the wire guide 70 that introduces the wire is moved in an axial direction so as to perform the cross-winding of the wire on the short side of the spool and the clamps are made to advance and close again on the first turn provided, performing in succession the operations described earlier, until the other axial end is reached with a new crossing of the wire on the short side.

[0024] During the translational motion of the wire in order to perform the crossing on the short side, the claws in practice retain the wire, allowing to provide the crossing of the wire on the short side and then said claws are made to advance in order to reposition themselves so as to create a constant guide for obtaining turns with a parallel arrangement of the wire on the long sides and crossing on the short sides.

[0025] Once the winding has been completed, for being able to remove the spool provided, the movable frame 30 is made to slide so that the engagement body 50 moves away from the spindle and the spool can be extracted manually or by way of automatic means.

[0026] From what has been described above it is thus evident that the invention achieves the intended aim and objects, and in particular the fact is stressed that a device is provided which makes it possible to automate the provision of a particular winding with wires which are arranged mutually parallel on the long sides and crossed on the short sides.

[0027] It should be noted that the presence of the clamp is particularly important, which clamp with its claws makes it possible to create in each instance the space suitable for inserting the wire, which is always arranged correctly and retained correctly when the crossed portion has to be provided at the short sides.

[0028] The invention thus conceived is susceptible of

numerous modifications and variations, all of which are within the scope of the appended claims.

[0029] All the details may further be replaced with other technically equivalent elements.

[0030] In practice, the materials used, as long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements.

[0031] The disclosures in Italian Patent Application No. MI2009A000737 from which this application claims priority are incorporated herein by reference.

[0032] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A device for the cross-winding of wire on spools in general, comprising a spindle (2) for supporting a spool (5) which has a pair of mutually opposite long sides joined by a pair of mutually opposite short sides, **characterized in that** it comprises a clamp (20) which can be arranged on the axis of said spool (5) and is provided with a pair of mutually opposite claws (21), which can engage said spool (5) for positioning, on the long side of said spool, a wire fed by a wire guide (70), means (35) being also provided for the translational motion of said clamp (20) along the axis of said spool (5) and means for the translational motion of said pair of claws (21) along a direction that is substantially perpendicular to said axis, means (11, 50) being also provided for the synchronous rotation of said spindle (2) and of said clamp (20).
2. The device according to claim 1, **characterized in that** it comprises, on said spindle (2), means (11) for the detachable retention of the core of said spool.
3. The device according to one or more of the preceding claims, **characterized in that** said means for the translational motion of said clamp (20) along the axis of said spool (5) comprise a movable frame (30), which defines a cross-member (31) for supporting said clamp, said movable frame (30) being able to perform a translational motion along a direction that is substantially parallel to the axis of said clamp (20).
4. The device according to one or more of the preceding claims, **characterized in that** said means for the synchronous rotation of said spindle (2) and of said clamp (20) comprise a rod (11), which protrudes from said spindle (2) and can engage a seat defined cor-

respondingly on an engagement body (50) that is associated with a supporting block (22) of said clamp (20).

5. The device according to one or more of the preceding claims, **characterized in that** said engagement body (50) is supported slidingly by said supporting block by means of posts (51) on which a contrast spring (52) operates. 5
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6. The device according to one or more of the preceding claims, **characterized in that** said means for the translational motion of said pair of claws (21) along a direction that is substantially perpendicular to said axis comprise transverse guides (23), which slidingly accommodate coupling bodies (24) of said claws (21). 15
7. The device according to one or more of the preceding claims, **characterized in that** said claws (21) extend substantially parallel to the long side of said spool (5). 20
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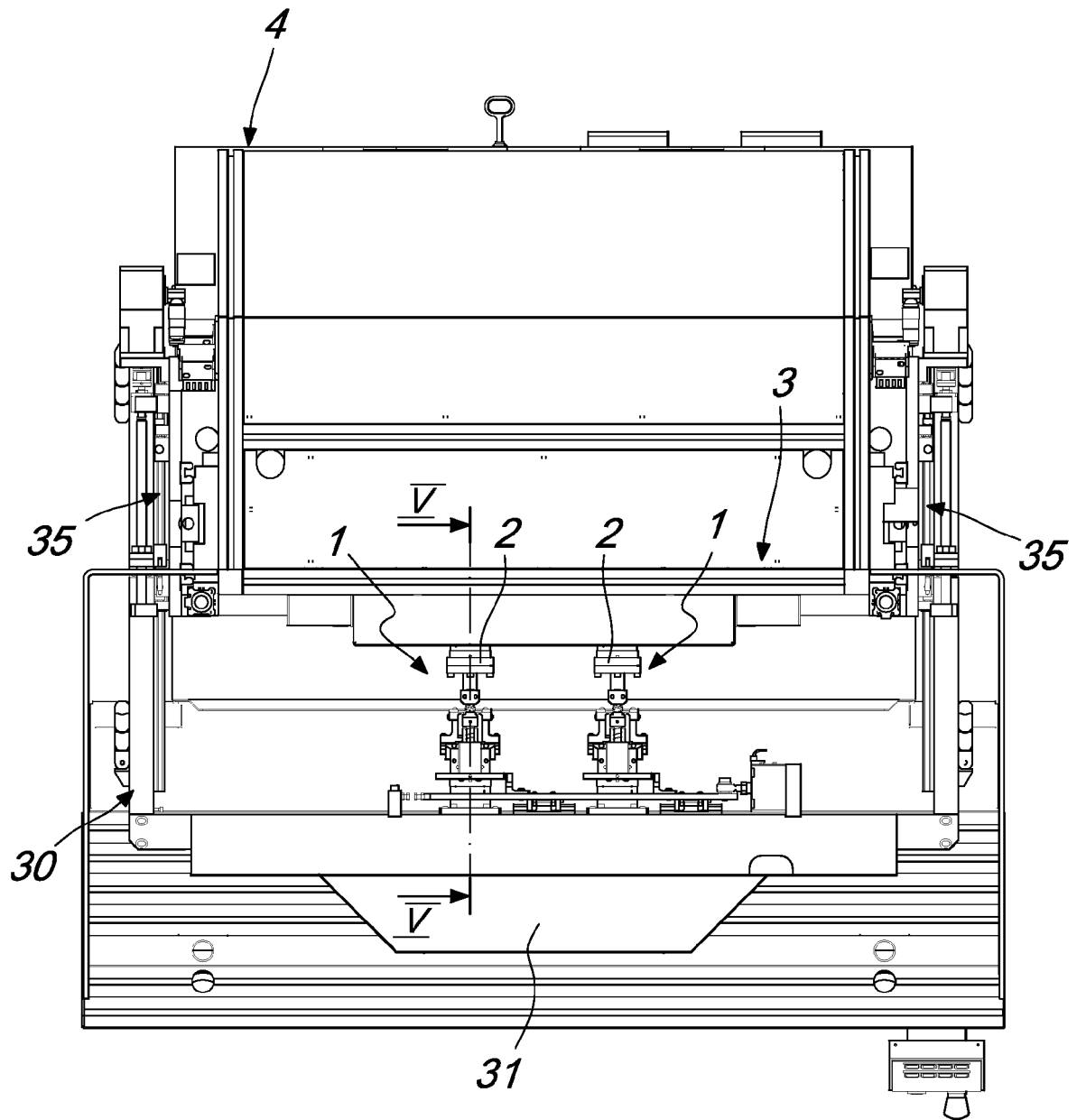
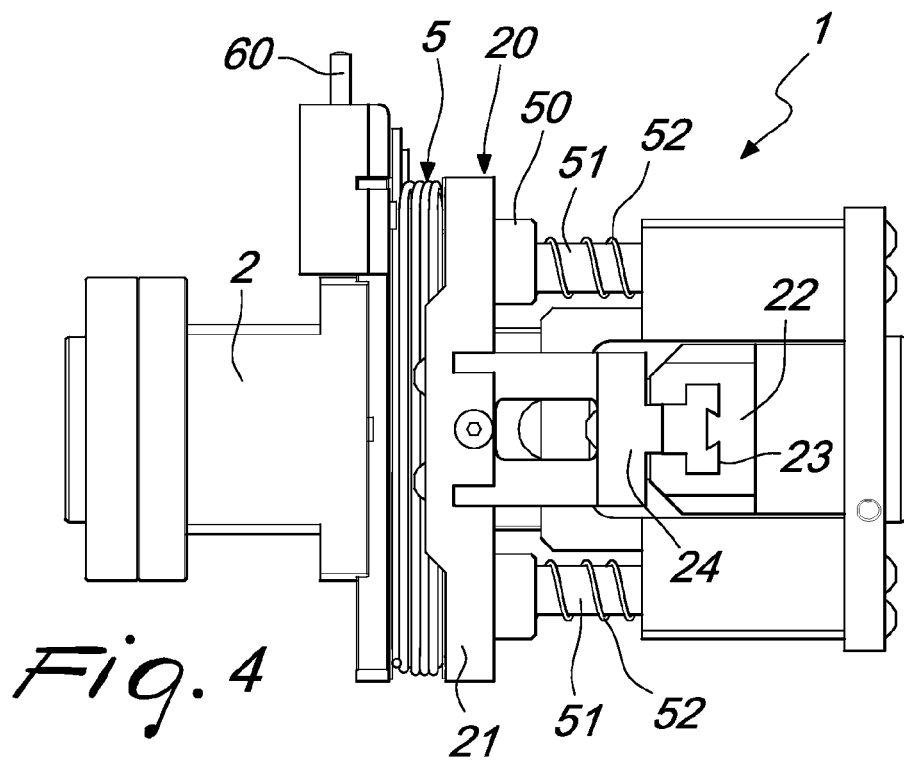
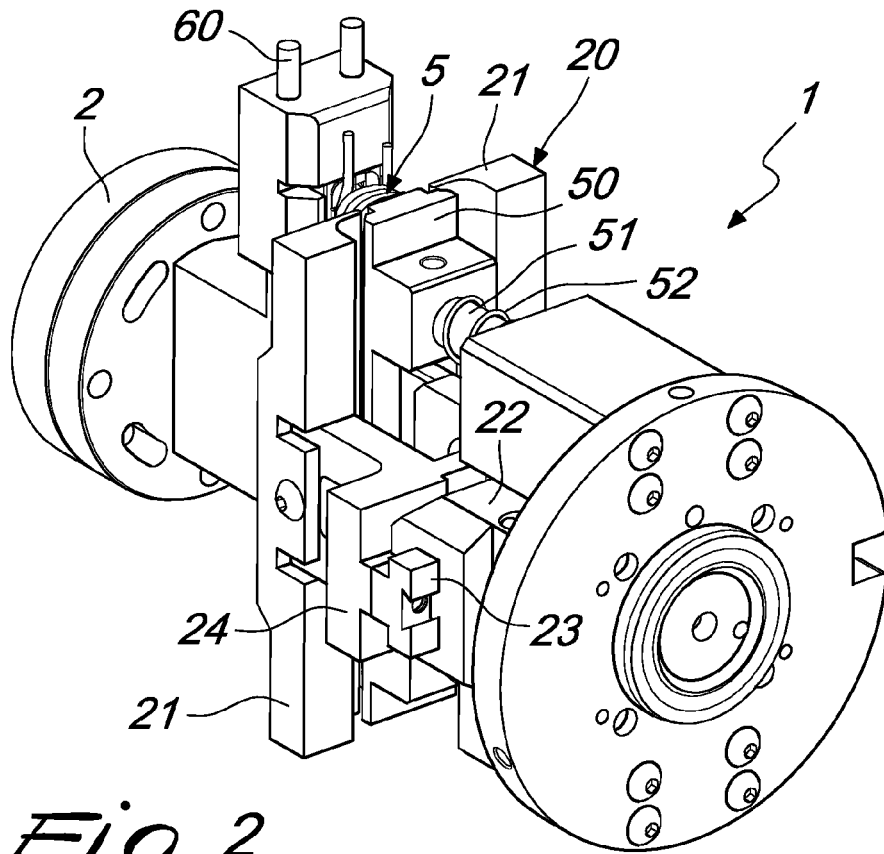


Fig. 1



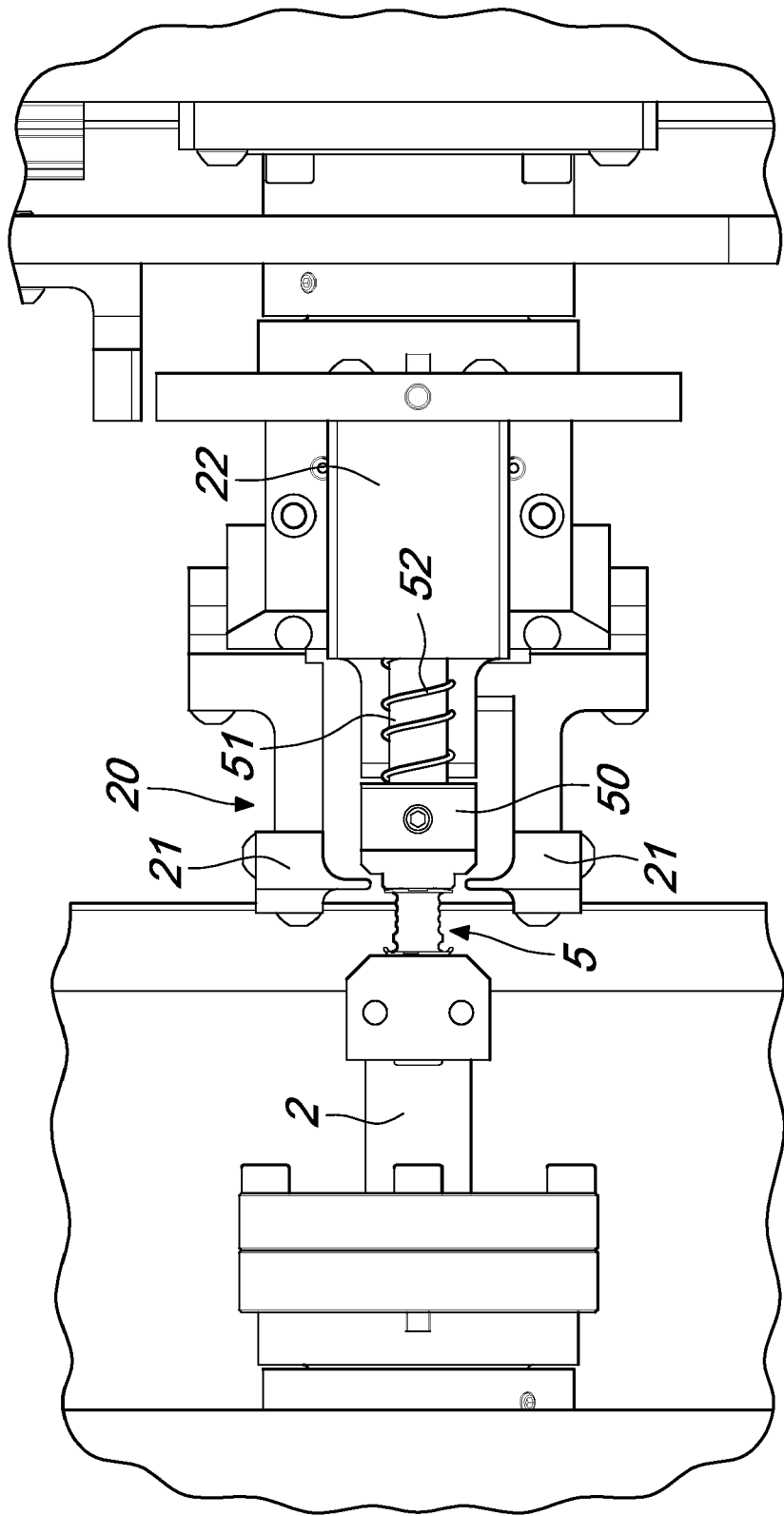
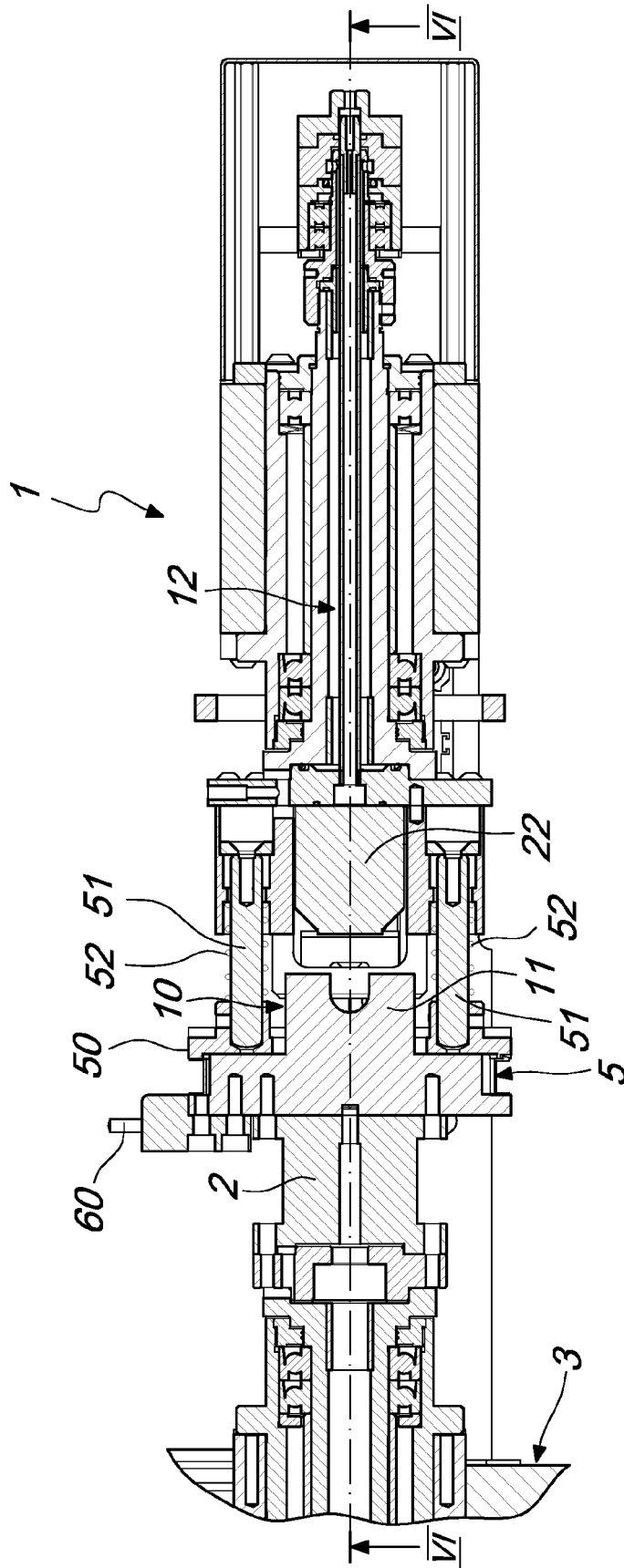


Fig. 3



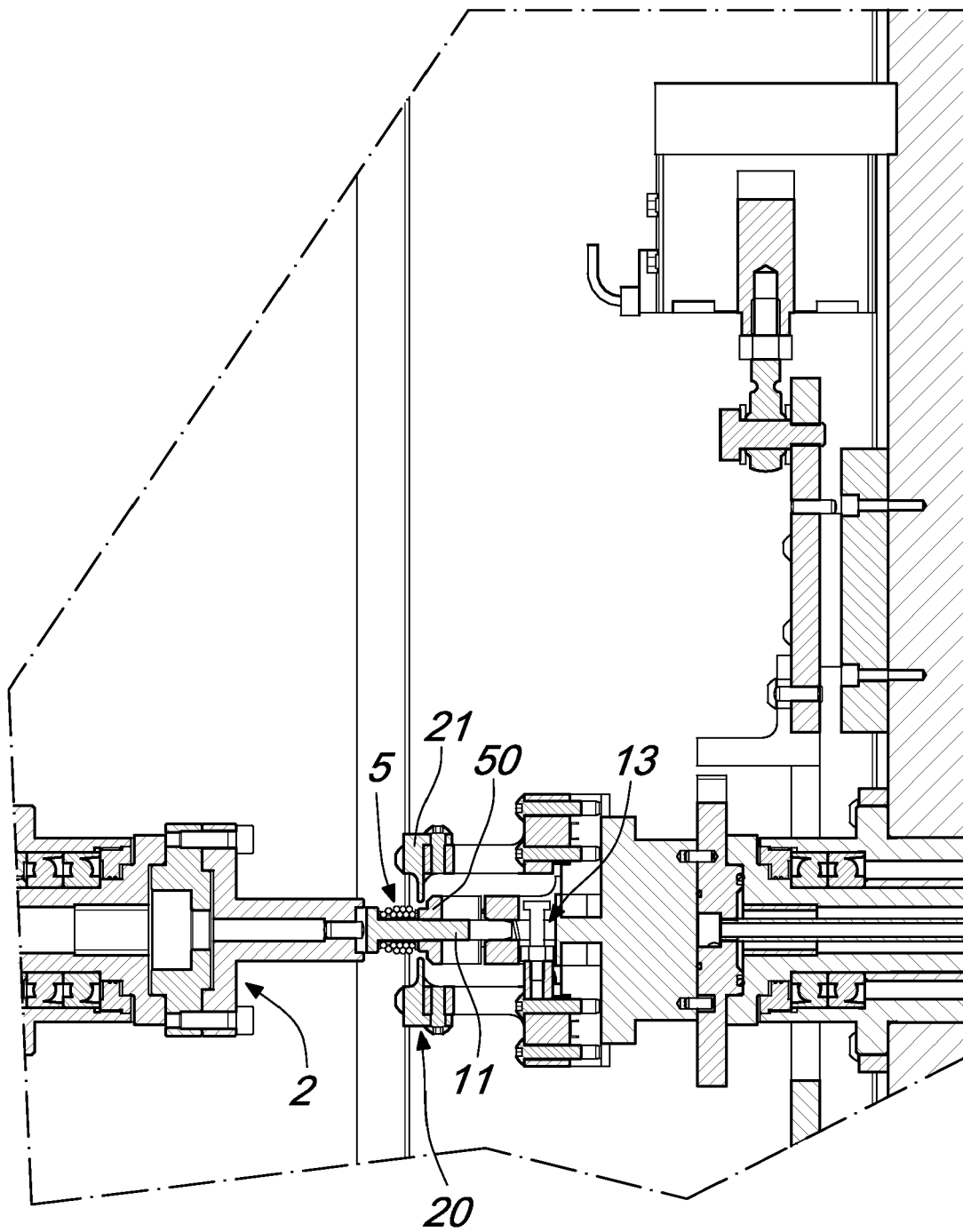


Fig. 6

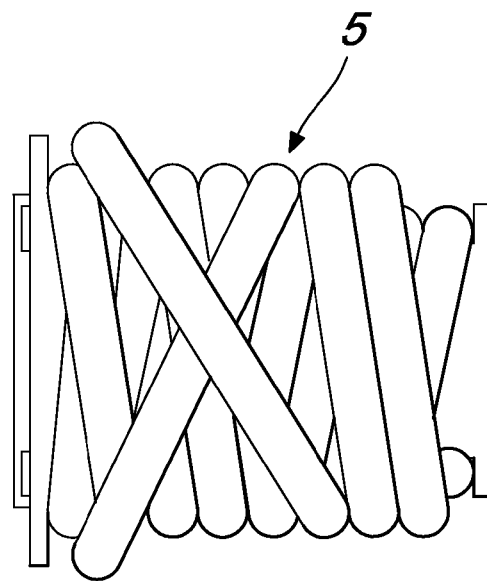
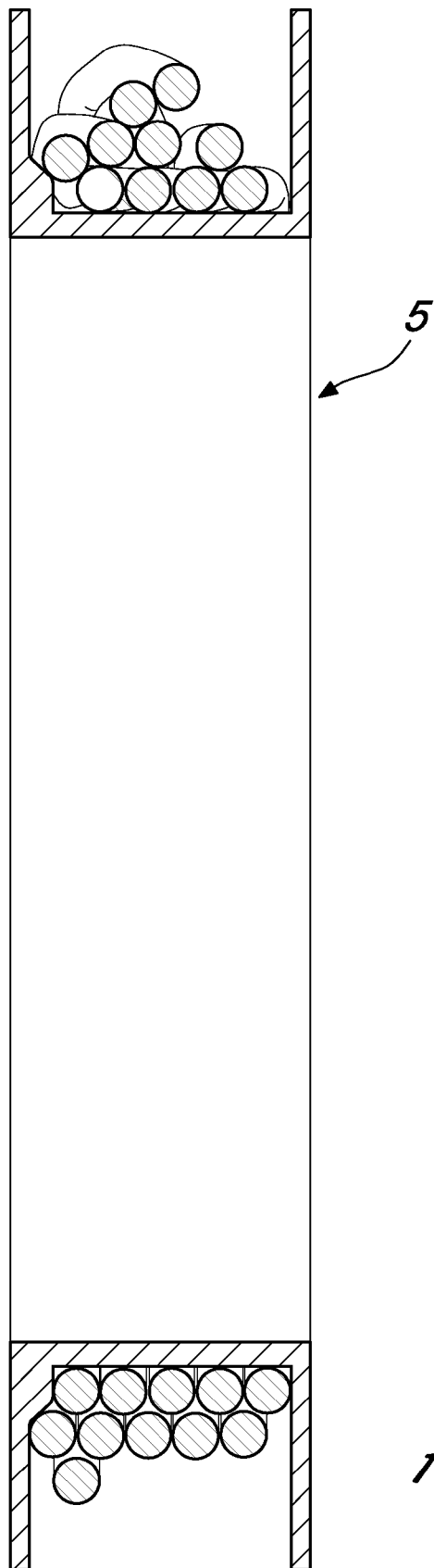


Fig. 7

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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