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(54) **CRIMPING MACHINE SYSTEM**

(57) A crimping machine system comprising: a set of jaws (14); a mechanism (16) coupled to the jaws, the mechanism being adapted to force the jaws to move for performing crimping, an actuator (18) effective on the mechanism; and a frame (12). The actuator (18) comprises: a linkage system (64) that couples the frame (12) to the mechanism (16) in such a way that moving the linkage system will cause the mechanism to move; a rotary actuator (28); a screw (26) coupled to the rotary actuator (28); and a first slide block (52) that engages the screw (26) and is coupled to the linkage system (64). The linkage system (64) comprises: a first link (32) pivotally connected to the mechanism (16) and a second link (34) pivotally connected to the frame (12). The first and second links are pivotally connected to each other and define a first angle (A) between them. For carrying out the crimping, the first and second links (32, 34) are configured to pivot with respect to each other.

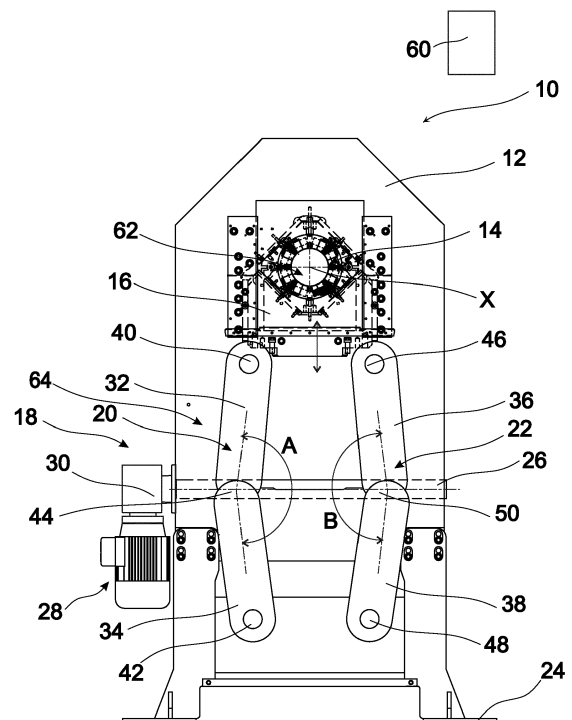


Fig. 1

Description

Field of the invention

[0001] The invention relates to a crimping machine system. In particular, it relates to a crimping machine system which is suitable for connecting hoses and fittings to each other by means of a crimp connection.

Background of the invention

[0002] Crimping machines are used for making various crimp connections and for joining pieces by crimping, in which machines the crimping tool comprises several jaw segments which are placed in a circular array and are radially movable in relation to the work piece to be crimped and the centre of the crimping tool. In this description, the term jaw will also be used for referring to a jaw segment.

[0003] The piece to be machined by said crimping machine is typically a fitting, known as such, which is clamped around a flexible hose to make a tight fitting. Part of the structure of the fitting is also fitted inside the hose.

[0004] For making the crimp connection, the hose and the fitting are joined and placed in an opening in the centre of the crimping machine, after which the jaws are used to perform crimping by applying a desired force from several radial directions simultaneously by moving towards the centre of the crimping tool. The crimp connection is based on a deformation of the work piece.

[0005] The above presented crimping machines can also be used for making corrugations, reductions and other deformations, for example, at the ends of tubes. A crimping machine for making various crimp connections and for joining pieces by crimping is disclosed in document EP 2 241 389 A2. Another crimping device is disclosed in WO 01/33675 A1.

[0006] The operation of the jaws of the crimping machine is based on various devices. The jaws are functionally coupled to a mechanism that forces the jaws to move simultaneously in the radial direction. The jaws and the mechanism or device are moved by one or more actuators which are typically cylinder actuators driven by pressurized medium. The actuator exerts a force on the work piece by means of the jaws and the mechanism.

[0007] The document WO 2007/018649 A1 discloses a crimping device powered by a hydraulic cylinder to actuate jaw segments, such that the required crimping force is directly proportional to the hydraulic pressure within the hydraulic cylinder.

[0008] Crimping machine based on pressurized medium acting on linear actuators are preferred for their high-power intensity. Typically, the hydraulic pressure increases gradually and nonlinearly during a crimping cycle because a high crimping force is required to finish the crimping cycle, for example, to crimp a fitting when compressing the fitting to lock the fitting onto a hose end.

Furthermore, the linear actuators may require high input flow at low pressure for rapid movement of the jaws controlled by the linear actuators, followed by a low input flow at high pressure for the crimping cycle. This can be accomplished by using two different hydraulic pumps.

[0009] However, despite the good properties of the crimping machines based on pressurized medium, they are not always suitable for every industry or environment.

Summary of the invention

[0010] The solution for a crimping machine system according to the invention is presented in claim 1.

[0011] The presented solution provides several advantages to previous crimping machine systems. In particular but not solely, the presented solution relates to a crimping machine system which is suitable for connecting hoses and fittings to each other by means of a crimp connection, or for tasks implementing a corresponding deformation.

[0012] The crimping machine system according to the presented solution comprises a set of jaws positioned in a circular array, defining an opening formed between the jaws and intended for a work piece to be crimped, and, for performing crimping, configured to move radially with respect to a central axis defined by the jaws and the opening; a mechanism coupled to the jaws, the mechanism being adapted to force the jaws to move simultaneously; an actuator effective on the mechanism and producing a force moving the mechanism and the jaws for carrying out the crimping; and a frame coupled to the actuator and accommodating the jaws, the mechanism and the actuator.

[0013] The actuator comprises a linkage system that couples the frame to the mechanism in such a way that moving the linkage system will cause the mechanism to move with respect to the frame; a rotary actuator in the form of an electric motor, the rotary actuator being capable of moving the linkage system; a screw coupled to the rotary actuator, the rotary actuator being capable of rotating the screw to move the linkage system; and a first slide block that engages the screw in such a way that the first slide block moves along the screw when the screw is rotated by the rotary actuator, the first slide block being coupled to the linkage system in such a way that the linkage system moves as the first slide block moves along the screw.

[0014] The linkage system comprises a first link pivotally connected to the mechanism; and a second link pivotally connected to the frame. The first and second links are transversal and pivotally connected to each other.

[0015] In the present solution, for carrying out the crimping, the first and second links are configured to pivot with respect to each other.

[0016] In an example of the present solution, the first and second links define a first angle between them. To carry out the crimping, the first and second links are configured to move from a first position in which the first angle

is less than 180°, towards a second position for increasing the first angle to complete the crimping, in which second position the first angle is greater than in the first position.

[0017] The crimping machine system of the presented solution employs an example of a linkage system that is especially applicable in crimping applications.

[0018] By means of the presented solution, a compact structure is obtained, thus improving usability.

[0019] The presented solution provides high power intensity which is especially necessary for completing a crimping process.

[0020] The presented solution provides a solution usable in environments in which hydraulic oil as a pressure medium is not acceptable. Furthermore, the presented solution applies fewer components than systems based on hydraulic systems that may include several hydraulic motors, a tank, control valves, a linear actuator and several lines for connecting the components. Therefore, saving space and reducing weight is possible.

Brief description of the drawings

[0021] In the following, the presented solution will be described in more detail with reference to the appended drawings, in which:

Fig. 1 shows a front view of an example of a crimping machine system applying the presented solution.

Fig. 2 shows a detail of the example of Fig. 1.

More detailed description of the invention

[0022] Figure 1 shows an example of a crimping machine system and a crimping machine in which the solution presented in this description is applied.

[0023] In the figures, similar parts, or parts intended for similar functions, are denoted with the same reference numeral.

[0024] The crimping machine 10 system according to the solution comprises a set of jaws 14 for performing crimping, a mechanism 16 coupled to the jaws 14, at least one actuator 18 effective on the mechanism 16, and a frame 12 coupled to the at least one actuator 18.

[0025] The crimping machine 10 may further comprise a control system 60.

[0026] The various parts of the crimping machine system may be mounted to the frame 12. The frame 12 may comprise fastening members 24 for fastening the crimping machine system 10 to a suitable support or a base which may also constitute a part of the crimping machine. According to an example, the frame 12 comprises a C or O shaped structure.

[0027] The jaws 14 are used to perform crimping of a work piece by applying a desired force from several radial directions simultaneously by moving towards the centre of the jaws 14. The jaws are typically placed two by two

on opposite sides of the work piece. The jaws 14 normally cover an equal share of their circular shape, and they are normally placed at substantially even intervals. The crimp connection is based on a deformation of the work piece, whereby the diameter of the outermost part, for example a collar, of the fitting placed around, for example, a flexible hose is reduced, pressing the hose tightly between the inner part and the outermost part of the fitting.

[0028] The jaws 14 delimit the minimum and maximum diameter of the opening 62 left between them.

[0029] The position of the jaws 14 or the size of the opening 62 may be measured by one or more sensor devices either directly or indirectly, to know the size of the opening 62 in each situation and at different stages of crimping. The measurement can be taken from the jaws 14, the mechanism 16 or the actuator 18. This is typically the measurement of the position by means of the sensor devices. During crimping, the size of the opening 62 may be monitored by the control system 60 that is connected to the sensor devices, and the crimping is stopped after a predetermined opening size or measurement has been achieved. Said predetermined opening size or measurement is selected according to the type of the work piece, the size of the work piece, the materials, or other parameters relating to the work piece or objectives for the crimping process or the desired deformation.

[0030] The operation of the jaws 14 of the crimping machine is based on the mechanism 16. The jaws 14 are functionally coupled to the mechanism 16 that forces the jaws 14 to move simultaneously in the radial direction. The set of jaws 14 may include six to ten jaws, preferably eight jaws. Preferably, the jaws 14 are replaceable, wherein various jaws are available for various work pieces.

[0031] The jaws 14 are placed in a circular array so that they define the opening 62 formed between the jaws 14 and designed for the work piece to be crimped. The jaws 14 move radially with respect to an imaginary central axis X that is preferably horizontal when in use and defined by the jaws 14. In the example shown in the figures, the jaws 14 move radially in relation to the central axis X, towards the central axis X, for reducing the opening 62 and crimping the work piece. The jaws 14 move radially in the opposite direction, away from the central axis X, for enlarging the opening 62, for stopping the crimping and for removing the work piece from the crimping machine system 10.

[0032] The set of the jaws 14 may comprise fastening elements which are responsible for holding the jaws 14 in the crimping machine system 10 and for their engagement to each other, and for moving the jaws 14 simultaneously and in the desired direction. The fastening elements are, for example, spring elements placed between the jaws, which spring elements simultaneously tend to move the jaws 14 away from the central axis X.

[0033] The mechanism 16 controls the movement of the jaws 14 which exert a force on the work piece. The mechanism 16 may consist of a single piece or several

pieces. The mechanism 16 may comprise wedge-like counter surfaces or guide surfaces that may be oblique and moving in a direction perpendicular to the central axis X. In the example shown in the figures, the mechanism 16 moves in a direction perpendicular to the central axis X, preferably radially. Alternatively, the mechanism 16 may comprise an annular or circumferential wedge mechanism based on, for example, guide surfaces that may be oblique, or one or two cones moving in a direction parallel with the central axis X in such a way that the mechanism 16 is movable in a direction parallel with the central axis X.

[0034] The mechanism 16 is coupled to the jaws 14 and adapted to force the jaws 14 to move simultaneously. A force generated by the actuator 18 is transmitted to the work piece. The force is transmitted to the work piece by means of the mechanism 16 and the jaws 14 connected to the same.

[0035] According to an example and Fig.1, the crimping machine system 10 comprises the single actuator 18. The crimping machine system 10 may comprise further actuators effective on the mechanism 16 and similar to the actuator 18 of the present solution described in the examples of this description.

[0036] The actuator 18 is effective on the mechanism 16 and produces the force moving the mechanism 16 and the jaws 14, for carrying out the crimping. The actuator 18 is coupled to the frame 12 that accommodates the jaws 14, the mechanism 16 and the actuator 18.

[0037] The actuator 18 comprises a linkage system 64 that moves the mechanism 16, a rotary actuator 28, a screw 26 coupled to the rotary actuator 28, and at least one slide block 52, 54 that engages the screw 26 and is coupled to the linkage system 64 for moving the linkage system 64.

[0038] The control system 60 may be coupled to the rotary actuator 28 and be capable of providing the rotary actuator 28 with a control signal for moving the linkage system 64 to varying positions.

[0039] According to an example and Figs. 1 and 2, the crimping machine system 10 comprises two slide blocks 52, 54, both of which engage the same screw 26. The slide block 52, 54 may be threaded or includes a thread element that engages the screw 26. The slide block 52, 54 may be compatible with a ball screw and be of ball nut type.

[0040] The linkage system 64 couples the frame 12 to the mechanism 16 in such a way that moving the linkage system 64 will cause the mechanism 16 to move with respect to the frame 12. Preferably, the linkage system 64 is connected between the frame 12 and the mechanism 16. According to an example and Fig. 1, the linkage system 64 is adapted to move the mechanism 16 away from and towards that section of the frame 12 to which the linkage system 64 is coupled. In the example of Fig. 1, the mechanism 16 and the linkage system 64 move in a direction perpendicular to the central axis X.

[0041] The rotary actuator 28 is an electric motor and

is capable of moving the linkage system 64. The electric motor may be a stepper motor or preferably a servo motor. The rotary actuator 28 may include a gear 30 coupled between the electric motor and the screw 26.

[0042] The screw 26 is coupled to the rotary actuator 28 and to the linkage system 64. The rotary actuator 28 can rotate the screw 26 to move the linkage system 64. Preferably, the screw is in the form of a rod with a straight thread around the rod. The screw 26 may be of ball screw type.

[0043] The slide block 52 engages the screw 26 in such a way that the slide block 52 will move along the screw 26 when the screw 26 is rotated by the rotary actuator 28. The slide block 52 is coupled to the linkage system 64 in such a way that the linkage system 64 will move as the slide block 52 moves along the screw 26.

[0044] In the examples above, the rotary actuator 28 and the screw 26 may stationary and be coupled to the frame 12 in such a way that, during crimping, movement of the rotary actuator 28 and the screw 26 in vertical and horizontal directions is prevented. Alternatively, the rotary actuator 28 and the screw 26 may be coupled to the frame 12 in such a way that, during crimping and for moving the linkage system 64, movement of the rotary actuator 28 and the screw 26 is prevented in some directions and allowed in others.

[0045] The actuator 18 or the linkage system 64 presented in this description may be replicated one or more times to provide stability in the linkage between the frame 12 and the mechanism 16 and to increase the strength of the linkage. If multiple actuators 18 or linkage systems 64 are used, they preferably will function simultaneously and in unison.

[0046] The screw 26 may comprise a screw portion with either a left-hand thread or a right-hand thread that engages the slide block 52. When the screw 26 is rotated in a first direction, for example clockwise, the slide block 52 is adapted to move in a first direction and when the screw 26 is rotated in an opposing second direction, for example counter clockwise, the slide block 52 is adapted to move in an opposite, second direction.

[0047] The linkage system 64 may comprise a link pair 20 including a first link 32 pivotally connected to the mechanism 16 and a second link 34 pivotally connected to the frame 12. The first and second links 32, 34 are pivotally connected to each other in such a way that they pivot with respect to each other during crimping. The rotary actuator 28 is adapted to move the first and second links 32, 34. Preferably, at least one of the two links 32, 34 presented above is connected to the slide block 52. The two links 32, 34 may employ joint elements, for example a joint element 44, for connecting to the slide block 52 and/or each other. The two links 32, 34 may have a common joint element via which the links 32, 34 are connected to the slide block 52. The two links 32, 34 may employ joint elements, for example joint elements 40, 42, for connecting to the mechanism 16 and/or the frame 12.

[0048] According to an example, the two links 32, 34

are in the form of solid bars or arms connected by joint elements.

[0049] Preferably, as shown in Fig. 1, the two links 32, 34 extend, with respect to the slide block 52, in directions that are transversal or opposite with respect to each other. An angle less than 180° is formed between the two links 32, 34, which angle increases when moving the linkage system 64 to shift the mechanism 16 for performing crimping. The same angle decreases when the linkage system 64 is moved to shift the mechanism 16 to the opposite direction for retracting the mechanism 16 to stop crimping. Preferably, the angle is 180° or less at its maximum. Alternatively, the angle is 180° or more at its maximum. The angle is denoted by the angle A in Figure 1.

[0050] The linkage system 64 in the examples above is configured to be such that the force applied on a first point, the force being applied by the rotary actuator 28 via the screw 26 and the slide block 52, creates an amplified force on another point. The amplified force is effective on the mechanism 16. The amplified force depends on the force applied by the rotary actuator 28 and the angle between the two links 32, 34 of the linkage system 64. The amplified force is at its maximum when the above-mentioned angle is about 180° .

[0051] According to an example and Fig. 1, the first link 32 has a first end, and an opposite second end pivotally connected to the mechanism 16 by the joint element 40. The second link 34 has a first end and an opposite second end, the second end being pivotally connected to the frame 12 by the joint element 42. The first end of the second link 34 is pivotally connected to the first end of the first link 32, or the slide block 52, by the joint element 44. The first end of the first link 32 is pivotally connected to the first end of the second link 34, or the slide block 52, by the joint element 44.

[0052] For carrying out the crimping, the first and second links 32, 34 are configured to move from a first position in which the angle (i.e. angle A) is less than 180° towards a second position for increasing the angle to complete the crimping. In the second position the angle is greater than in the first position.

[0053] Additionally, the linkage system 64 is configured to provide a reduction of the velocity of the mechanism 16. The velocity of the mechanism 16 decreases when the first and second links 32, 34 move from the first position towards the second position and the slide block 52 moves at a constant velocity along the screw 26.

[0054] According to an example and Figs. 1 and 2, the actuator 18 further comprises another, second slide block 54 that engages the screw 26 in such a way that both slide blocks 52, 54 will move simultaneously along the screw 26 when the screw 26 is rotated by the rotary actuator 28. The slide blocks 52, 54 are coupled to the linkage system 64 in such a way that the linkage system 64 will move as the slide blocks 52, 54 move along the screw 26.

[0055] According to an example, the slide blocks 52, 54 move in the same direction when the screw 26 is ro-

tated. According to another example and Figs. 1 and 2, the slide blocks 52, 54 move in opposite directions when the screw 26 is rotated.

[0056] According to an example and Figs. 1 and 2, the screw 26 comprises both a first screw portion 56 that engages one of the two slide blocks 52, 54, for example the slide block 52, and a second screw portion 58 that engages the other one of the two slide blocks 52, 54, for example the slide block 54. When the screw 26 is rotated in a first direction, for example clockwise, the slide blocks 52, 54 are adapted to move towards each other, and when the screw 26 is rotated in the opposing second direction, for example counter clockwise, the slide blocks 52, 54 are adapted to move away from each other. Preferably, the first and second screw portions 56, 58 are placed consecutively on the screw 26. According to an example, the first screw portion 56 comprises a right-handed thread and the second screw portion 58 comprises a left-handed thread, or vice versa.

[0057] According to an example and Fig. 1 and 2, in which the two slide blocks 52, 54 described above are applied, the linkage system 64 may have a further link pair 22 connected to the second slide block 54, the second link pair 20 applying the construction and principles of the first link pair 20 as described in the examples above.

[0058] Therefore, the linkage system 64 may comprise the second link pair 22 including a third link 36 pivotally connected to the mechanism 16 and a fourth link 38 pivotally connected to the frame 12. The third and fourth links 36, 38 are transversal and pivotally connected to each other in such a way that they pivot with respect to each other during crimping. The third and fourth links 36, 38 define an angle between them. The angle is denoted by the angle B in Figure 1.

[0059] The rotary actuator 28 is adapted to move the third and second links 36, 38. Preferably, at least one of the two links 36, 38 is connected to the second slide block 54. The two links 36, 38 may employ joint elements, for example a joint element 50, for connecting to the second slide block 54 and/or each other. The two links 36, 38 may employ joint elements, for example joint elements 46, 48, for connecting to the mechanism 16 and/or the frame 12. According to an example and Fig. 1, the third link 36 has a first end, and an opposite second end pivotally connected to the mechanism 16 by the joint element 46. The fourth link 38 has a first end and an opposite second end, the second end being pivotally connected to the frame 12 by the joint element 48. The first end of the fourth link 38 is pivotally connected to the first end of the third link 36, or the second slide block 54, by the joint element 50. The first end of the third link 36 is pivotally connected to the first end of the fourth end 38, or the second slide block 54, by the joint element 44.

[0060] For carrying out the crimping, the third and fourth links 36, 38 are configured to move from a third position, in which the angle B is less than 180° towards a fourth position for increasing the angle B to complete the crimping, in which fourth position the angle B is great-

er than in the third position.

[0061] Preferably, the angle B of the link pair 22 follows the angle A of the link pair 20 when the link pairs 20, 22 move simultaneously and in unison.

[0062] In the examples above, the actuator 18 is with the help of the linkage system 64, adapted to provide the amplified force especially when completing the crimping at the end of the crimping cycle.

[0063] In the examples above, the actuator 18 is with the help of the linkage system 64 adapted to provide the reduction of velocity, especially when completing the crimping at the end of the crimping cycle. Additionally, the actuator 18 is with the help of the linkage system 64, adapted to provide an increased velocity at the start of the crimping cycle in such a way that the jaws 14 can approach the work piece quickly.

[0064] In the examples above, the rotary actuator 28, the screw 26, and/or one slide block 52, 54 or both slide blocks 52, 54 may be adapted to move in some directions, for example in a vertical direction, in such a way that the end of the link 34, 38 or the ends of the links 34, 38, together with the respective joint element 44, 50, can follow a curved path when the link 34, 38 pivots. For example, the rotary actuator 28, the screw 26, and either one or both slide blocks 52, 54 move together as one unit. Alternatively, or additionally, the slide block 52, 54 and/or the respective joint element may be adapted to allow the link 34, 38 to follow a curved path when the link 34, 38 pivots and the slide block 52, 54 moves along the screw 26. In this case the rotary actuator 28 and the screw 26 may be stationary. The slide block 52, 54 and/or the respective joint element may have devices, for example sliding surfaces, to match their differing motions.

[0065] The presented solution is not limited to the above presented alternatives and examples only. The above presented functions, structures and features can be combined in a desired way in a crimping machine system applying the above presented solution. Consequently, the invention is not restricted solely to the alternatives and examples presented above, but it may vary in accordance with the appended claims.

Claims

1. A crimping machine system comprising:

a set of jaws positioned in a circular array, defining an opening formed between the jaws and intended for a work piece to be crimped and, for performing crimping, configured to move radially with respect to a central axis defined by the jaws and the opening;
a mechanism coupled to the jaws, the mechanism being adapted to force the jaws to move simultaneously;
an actuator effective on the mechanism and producing a force moving the mechanism and the

jaws for carrying out the crimping; and
a frame coupled to the actuator and accommodating the jaws, the mechanism and the actuator;

wherein the actuator comprises:

a linkage system that couples the frame to the mechanism in such a way that moving the linkage system will cause the mechanism to move with respect to the frame;
a rotary actuator in the form of an electric motor, the rotary actuator being capable of moving the linkage system;
a screw coupled to the rotary actuator, the rotary actuator being capable of rotating the screw to move the linkage system; and
a first slide block that engages the screw in such a way that the first slide block moves along the screw when the screw is rotated by the rotary actuator, the first slide block being coupled to the linkage system in such a way that the linkage system moves as the first slide block moves along the screw;
wherein the linkage system comprises:

a first link pivotally connected to the mechanism; and
a second link pivotally connected to the frame, wherein the first and second links are transversal and pivotally connected to each other;
wherein, for carrying out the crimping, the first and second links are configured to pivot with respect to each other.

2. The crimping machine system according to claim 1,

wherein the first and second links define a first angle between them; and
wherein, for carrying out the crimping, the first and second links are configured to move from a first position in which the first angle is less than 180°, towards a second position for increasing the first angle to complete the crimping, in which second position the first angle is greater than in the first position.

3. The crimping machine system according to claim 2, wherein the linkage system provides amplification of a force generated by the rotary actuator and the first slide block in such a way that an amplified force effective on the mechanism and produced by the linkage system increases when the first and second links move towards the second position.

4. The crimping machine system according to claim 2 or 3, wherein the linkage system provides a reduction of the velocity of the mechanism in such a way that the velocity of the mechanism decreases when the

first and second links move towards the second position and the first slide block moves at a constant velocity along the screw.

5. The crimping machine system according to any one of claims 1 to 4, wherein

the first link has a first end and an opposing second end, the second end being pivotally connected to the mechanism, and
the second link has a third end and an opposite fourth end, the fourth end being pivotally connected to the frame, wherein the third end is pivotally connected to the first end or the first slide block, and wherein the first end is pivotally connected to the third end or the first slide block.

6. The crimping machine system according to any one of claims 1 to 5, wherein the actuator further comprises:

a second slide block that engages the screw in such a way that the second slide block moves along the screw when the screw is rotated by the rotary actuator, the second slide block being coupled to the linkage system in such a way that the linkage system moves as the first and second slide blocks move along the screw.

7. The crimping machine system according to claim 6, wherein the linkage system further comprises:

a third link pivotally connected to the mechanism; and
a fourth link pivotally connected to the frame, wherein the third and fourth links are transversal and pivotally connected to each other;
the third link has a fifth end and an opposite sixth end, the sixth end being pivotally connected to the mechanism; and
the fourth link has a seventh end and an opposite eighth end, the eighth end being pivotally connected to the frame, wherein the seventh end is pivotally connected to the fifth end or the second slide block, and wherein the fifth end is pivotally connected to the seventh end or the second slide block;
wherein, for carrying out the crimping, the third and fourth links are configured to pivot with respect to each other.

8. The crimping machine system according to claim 7,

wherein the third and fourth links define a second angle between them; and
wherein, for carrying out the crimping, the third and fourth links are configured to move from a third position, in which the second angle is less

than 180°, towards a fourth position for increasing the second angle to complete the crimping, in which fourth position the second angle is greater than in the third position.

9. The crimping machine system according to any one of claims 6 to 8,

wherein the screw comprises a first screw portion engaging the first slide block, and a second screw portion engaging the second slide block; and
wherein the first and second slide blocks are adapted to move towards each other when the screw is rotated in a first direction, and away from each other when the screw is rotated in an opposite second direction.

10. The crimping machine system according to any one of the preceding claims 1 to 9, wherein the electric motor is a stepper motor.

11. The crimping machine system according to any of the preceding claims 1 to 10, wherein the electric motor is a servo motor.

12. The crimping machine system according to any of the preceding claims 1 to 11, wherein the rotary actuator includes a gear coupled between the electric motor and the screw.

13. The crimping machine system according to any of the preceding claims 1 to 12, wherein the screw is of ball screw type.

14. The crimping machine system according to any of the preceding claims 1 to 13, wherein the screw comprises a screw portion that includes a left-hand thread or a right-hand thread.

15. The crimping machine system according to any of the preceding claims 1 to 14, wherein the crimping machine system further comprises:

a control system coupled to the rotary actuator, the control system being capable of providing a control signal to the rotary actuator to move the linkage system to varying positions.

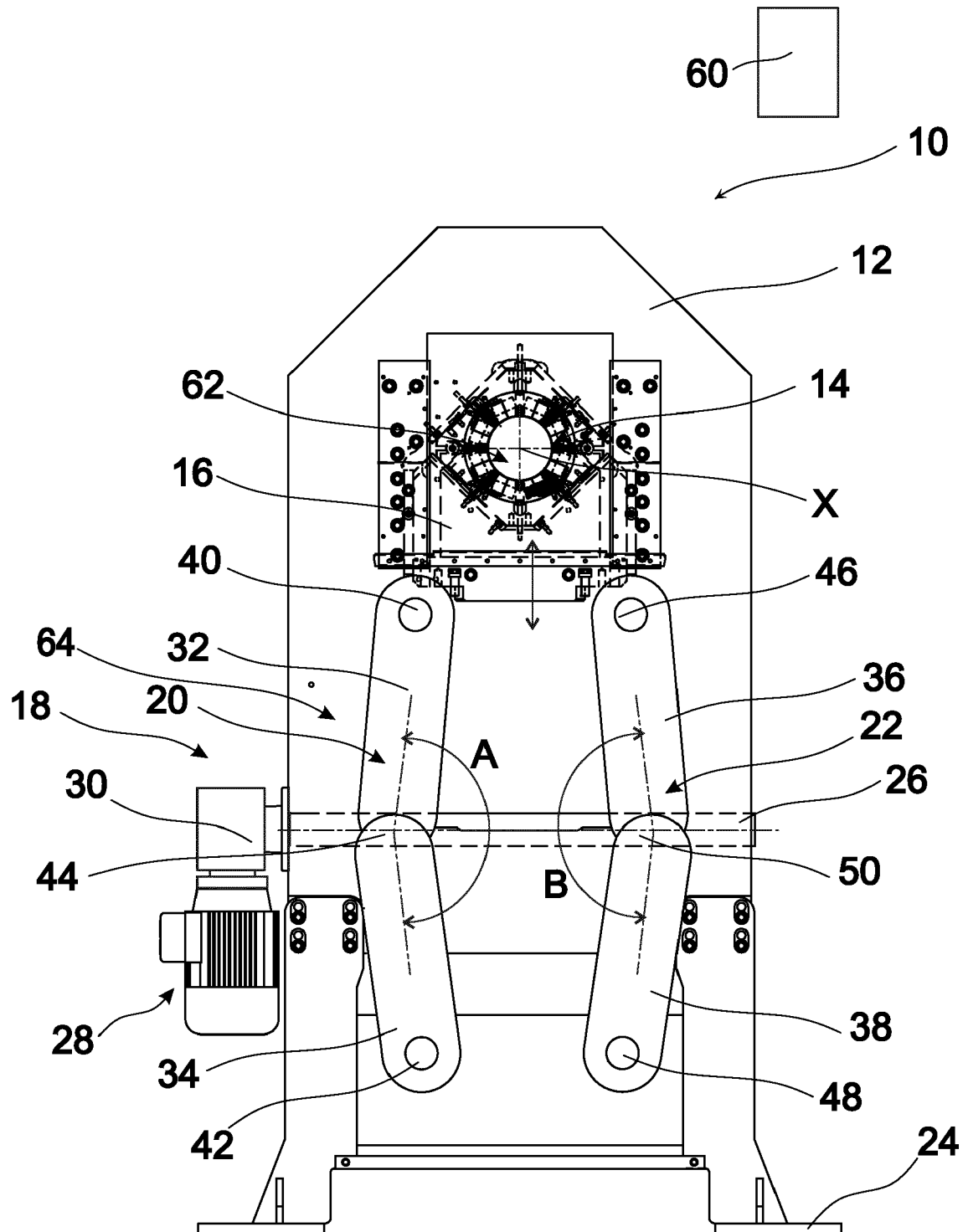


Fig. 1

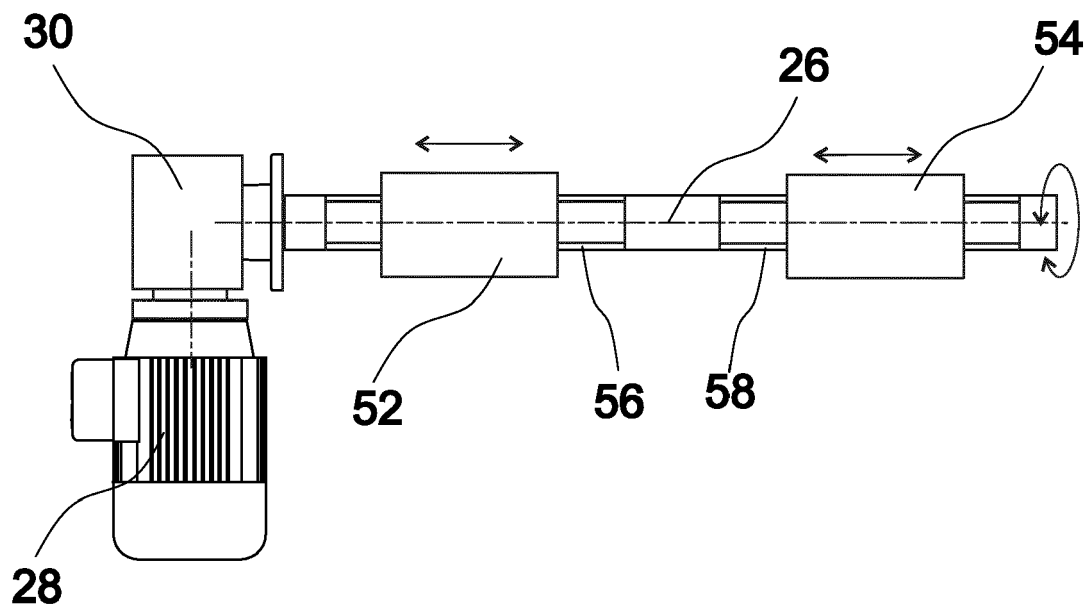


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 18 39 7525

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 11 March 2019	Examiner Knecht, Frank
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