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(54) **DRIVE AND METHOD FOR DRIVING GRIPPER CARRIERS**

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Description

[0001] The invention relates to a drive and a method for driving a gripper carrier for a bringer gripper and a gripper carrier for a taker gripper by means of a drive, which comprises a common drive motor for two drive mechanisms and two drive wheels each driven by an associated drive mechanism for a gripper carrier, wherein the gripper carriers are driven so that the bringer gripper and the taker gripper each reciprocate between an outer reversing point situated outside the shed and an inner reversing point situated inside the shed.

[0002] From DE 10346227 A1 a drive mechanism for a gripper carrier is known. A method for driving a gripper carrier and a drive for a gripper carrier according to the preamble of claim 1 and 6 are shown in JP 9-137338 A. In NL 7511122 A, the drive wheel for the gripper carrier for the bringer gripper and the drive wheel for the gripper carrier for the taker gripper carry out a so-called "symmetrical" movement, in which the bringer gripper and the taker gripper move towards one another in the opposite direction, wherein the bringer gripper and the taker gripper meet one another approximately in the center of the shed and wherein the bringer gripper and the taker gripper subsequently move away from one another again in the opposite direction. A gripper carrier may, for example, consist of a gripper band or of a gripper bar.

[0003] In particular when gripper openers are used to open and/or close a gripper clamp of a bringer gripper and/or a gripper clamp of a taker gripper near the center of the shed, it is known to drive the bringer gripper and the taker gripper with a so-called "asymmetrical" movement, in which more time is available for the transfer of a weft thread. In the shed, the taker gripper moves beyond the inner reversing point of the bringer gripper before the bringer gripper has reached its inner reversing point, so that both grippers move in the same direction and along the direction of insertion for a short distance after the taker gripper has reached its inner reversing point. In order to make this "asymmetrical" movement possible, it is known from EP 0526390 A1 to drive a gripper carrier by means of a program-controlled drive motor. This embodiment has the problem that the movement paths of the bringer gripper and the taker gripper are difficult to synchronize, as the variations in speed of the program-controlled drive motor are difficult to control. In addition, the moving of the taker gripper along with the bringer gripper during the transfer of the weft thread, requires that the taker gripper and/or the bringer gripper travel a greater distance in the shed, which is to say they have a higher mean velocity and are subjected to greater accelerations in order to carry out the same number of insertions per unit time.

[0004] The object of the invention is to improve an abovementioned method in such a manner that an "asymmetrical" movement by a bringer gripper and a taker gripper is maintained without independent drive motors having to be provided for this purpose and wherein the bringer gripper and the taker gripper may insert a weft thread at a relatively low speed.

[0005] This object is achieved in that, with respect to the weaving cycle, the outer reversing point of the bringer gripper is ahead of the outer reversing point of the taker gripper. The expression "with respect to the weaving cycle" is intended to mean with respect to the movement path of the weaving machine as a function of time, more particularly with respect to the successive angular positions of the weaving machine which are determined by the successive angular positions of the common drive motor.

[0006] The invention not only has the advantage that a drive is provided with a common drive motor for the bringer gripper and the taker gripper, but also that the bringer gripper can enter the shed slower and that the taker gripper can leave the shed slower. In this case, the movements of the bringer gripper and of the taker gripper are be dephased to such an extent that the outer reversing point of the bringer gripper is ahead of the outer reversing point of the taker gripper by several machine degrees. In this case, the bringer gripper does not necessarily enter the shed sooner and the taker gripper does not necessarily leave the shed later. The invention is particularly advantageous if the weaving machine is set to weave at maximum weaving width, more particularly if weaving takes place at virtually the maximum weaving width. The method according to the invention allows, when the weaving machine weaves at a certain speed, to move the bringer gripper and the taker gripper at a relatively low speed at a certain weaving width when they insert a weft thread, which is particularly advantageous when weaving at relatively large weaving widths.

[0007] According to a preferred embodiment, the object of the invention is achieved in that, at least at a setting for maximum weaving width, with respect to the weaving cycle, the outer reversing point of the bringer gripper is ahead of the outer reversing point of the taker gripper.

[0008] According to one embodiment, the gripper carrier for the bringer gripper and the gripper carrier for the taker gripper are driven at a variable speed by the common drive motor of the drive during their movements into the shed and out of the shed, wherein with respect to the weaving cycle, the bringer gripper is accelerated less after the outer reversing point than after the inner reversing point and wherein, with respect to the weaving cycle, the taker gripper is accelerated more after the outer reversing point than after the inner reversing point. The expression "a movement into the shed" is intended to mean that the bringer gripper and/or the taker gripper move towards the inner reversing point, while the expression "a movement out of the shed" is intended to mean that the bringer gripper and/or the taker gripper move towards the outer reversing point. This method is particularly advantageous since it allows to initially accelerate a bringer gripper less while picking up a weft thread which is held ready outside the shed in order to subsequently move at a higher speed in the shed. In this case, the bringer gripper

moves relatively slowly during picking up of a weft thread and the taker gripper moves relatively slowly during the release of a weft thread.

[0009] According to one embodiment, with respect to the weaving cycle, the inner reversing point of the taker gripper is ahead of the inner reversing point of the bringer gripper. According to one embodiment, the gripper carrier for the bringer gripper and the gripper carrier for the taker gripper are driven at variable speed by a common drive motor of the drive during their movements into the shed and out of the shed, wherein with respect to the weaving cycle, the bringer gripper before its inner reversing point and the taker gripper after its inner reversing point move in the same direction over a distance. Despite the variable speeds of the bringer gripper and the taker gripper, it is ensured in this case that the bringer gripper and the taker gripper meet each other near the center of the shed and move in the same direction over a distance.

[0010] According to one embodiment, the outer reversing point of the bringer gripper is situated several machine degrees before the beat-up and the outer reversing point of the taker gripper is situated several machine degrees after the beat-up. The term "beat-up" in this case is intended to mean the moment during the weaving cycle, more particularly, the angular position of the weaving machine wherein a weft thread is beaten-up by the weaving reed that is driven by the sley. The term "machine degrees" is in this case intended to mean the degrees of the weaving machine which are determined by the drive motor and which, for one weaving cycle, vary successively between 0° and 360°.

[0011] According to one embodiment, the bringer gripper leaves the shed a number of machine degrees before beat-up and the bringer gripper enters the shed a number of, for example the same number of, machine degrees after beat-up, while the outer reversing point of the bringer gripper is situated several machine degrees before beat-up. According to one embodiment, the taker gripper leaves the shed a number of machine degrees before beat-up and the taker gripper enters the shed within a number of, for example the same number of, machine degrees after beat-up, while the outer reversing point of the taker gripper is situated several machine degrees after beat-up. In this way, it is ensured that despite the angular difference between the outer reversing points, the bringer gripper and the taker gripper can enter the shed as early as possible and can also leave the shed as late as possible, wherein a required average speed of the bringer gripper and/or of the taker gripper is relatively low for a given speed of the weaving machine, that is to say at a given number of insertions per unit time.

[0012] The object is further achieved by a drive for a gripper carrier for a bringer gripper and for a gripper carrier for a taker gripper which drive comprises a common drive motor for two drive mechanisms and two drive wheels for a gripper carrier which are each driven by an associated drive mechanism, wherein each drive mechanism comprises a crank which drives a fork element, wherein the fork element and a cross element are mounted rotatably with respect to one another via a shaft, wherein the cross element is connected to a toothed segment which drives a drive wheel for a gripper carrier and which, together with the cross element, is mounted rotatably with respect to a frame of the drive mechanism, wherein the cross element and the frame of the drive mechanism are mounted rotatably with respect to one another via a shaft which is arranged transversely to the shaft by means of which the fork element and the cross element are mounted rotatably with respect to one another, wherein each crank is driven in a rotationally fixed manner by the common drive motor at a certain angular position with respect to the angular position of the common drive motor and wherein, for each drive mechanism associated with a drive wheel, the two shafts assigned to the cross element are arranged at an angle with respect to one another which deviates by a few angular degrees from 90° and/or, for each drive mechanism associated with a drive wheel, the crank is driven in a rotationally fixed manner at a certain angular position with respect to the angular position of the common drive motor, in such a manner that, with respect to the weaving cycle, the outer reversing point of the bringer gripper is ahead of the outer reversing point of the taker gripper.

[0013] The adjusting according to the invention of the angles between each crank and associated fork element, of the angles between the two shafts assigned to each cross element and of the angular positions in which each crank is driven with respect to the common drive motor results in the advantage of an asymmetrical gripper movement being achieved with a common drive motor, wherein the bringer gripper and the taker gripper are still able to insert a weft thread in a shed at a relatively low speed and with relatively low accelerations. This is particularly advantageous when the weaving machine weaves at high speeds and with large weaving widths.

[0014] According to a preferred embodiment, the two shafts assigned to the cross element are fitted on the cross element, more particularly are formed as a single part with the cross element. A drive having a common drive motor for two drive wheels driven by an associated drive mechanism allows both drive wheels to be moved with respect to the weaving cycle as a function of the angular position of the drive motor and as a function of the properties of the drive mechanism according to the invention. The expression "driven in a rotationally fixed manner" is intended to mean that the course of the angular position of the drive mechanism is determined by the course of the angular position of the drive motor.

[0015] According to one embodiment, the two shafts assigned to the cross element are arranged at an angle with respect to one another which deviates by a few angular degrees from 90°, i.e. the shaft by means of which the fork element and the cross element are mounted rotatably with respect to one another forms an angle which deviates from 90° with the shaft, by means of which the cross element and the frame for the drive mechanism

are mounted rotatably with respect to one another, in such a manner that, with respect to the weaving cycle, the bringer gripper is accelerated less after the outer reversing point than after the inner reversing point and that the taker gripper is accelerated more after the outer reversing point than after the inner reversing point. With respect to the weaving cycle, this allows that the bringer gripper and the taker gripper may enter the shed as early as possible and also may leave the shed as late as possible.

[0016] According to one embodiment, the two shafts assigned to the cross element are arranged at an angle with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks of the drive mechanisms are set with respect to the angular position of the drive motor in such a manner that, with respect to the weaving cycle, the gripper carrier for the bringer gripper and the gripper carrier for the taker gripper are driven at variable speed by the drive during their movements into the shed and out of the shed, wherein with respect to the weaving cycle, the bringer gripper before its inner reversing point and the taker gripper after its inner reversing point move over a distance in the same direction.

[0017] According to one embodiment, the two shafts assigned to the cross element are arranged at an angle with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks of the drive mechanisms are set with respect to the angular position of the drive motor in such a manner that, with respect to the weaving cycle, the inner reversing point of the taker gripper is ahead of the inner reversing point of the bringer gripper.

[0018] According to one embodiment, the two shafts assigned to the cross element are arranged at an angle with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks of the drive mechanisms are set with respect to the angular position of the drive motor in such a manner that the outer reversing point of the bringer gripper is situated several machine degrees before beat-up and that the outer reversing point of the taker gripper is situated several machine degrees after beat-up.

[0019] According to one embodiment, the two shafts assigned to the cross element are arranged at an angle of approximately 4° displaced with respect to an angle of 90°.

[0020] According to one embodiment, the shaft, by means of which the fork element and the associated crank are mounted rotatably with respect to one another, forms an angle which deviates by a few angular degrees from 45°, for example an angle of approximately 48°, with the shaft by means of which the cross element and the fork element are mounted rotatably with respect to one another. This allows the bringer gripper and the taker gripper to be moved, with respect to a weaving cycle, over a desired distance in the shed.

[0021] With such a drive mechanism, the shaft which connects the crank and the fork element and the two shafts assigned to the cross element preferably pass through a common point.

[0022] According to one embodiment, the cranks of the two drive mechanisms are driven in a rotationally fixed manner by a common drive shaft, wherein the crank of the drive mechanism for the bringer gripper is arranged, in the drive direction of the drive shaft, so that it is ahead of the crank of the drive mechanism for the taker gripper by a few machine degrees. According to one embodiment, the drive mechanism for the bringer gripper and the drive mechanism for the taker gripper are of identical design. This makes an easy assembly of a drive for a weaving machine possible.

[0023] The object is furthermore achieved by a weaving machine which comprises a drive according to the invention.

[0024] Further features and advantages of the invention will become clear from the following description of the exemplary embodiments which are illustrated in the drawings. The illustrated exemplary embodiments are only intended to explain the invention. Variants and combinations of the illustrated exemplary embodiments which are covered by the scope of protection of the claims are likewise possible.

[0025]

- Figure 1 shows a perspective view of a drive for a gripper band for a bringer gripper and for a gripper band for a taker gripper,
- Figure 2 shows an enlarged view of a drive mechanism for a drive wheel for a gripper band according to Figure 1 with a crank, a fork element, a cross element and a toothed segment,
- Figure 3 shows a top view along arrow A from Figure 1 of the drive mechanism according to Figure 2,
- Figure 4 shows a top view along arrow D from Figure 1 of the other drive mechanism from Figure 1,
- Figure 5 shows a side view along arrow B from Figure 1 of the drive mechanism according to Figure 2,
- Figure 6 shows another perspective view along arrow C from Figure 1 of the drive mechanism according to Figure 2,
- Figure 7 shows a perspective view of the cross element according to Figures 1 to 6,
- Figure 8 shows a top view of the cross element along arrow E from Figure 7,
- Figure 9 shows a side view of the fork element according to Figures 1 to 6,
- Figure 10 shows a top view of the drive shaft with gear wheels along arrow F from Figure 1,
- Figure 11 shows a diagram of the movement path of the bringer gripper and the taker gripper between the outer reversing points which are

situated outside a shed, and the inner reversing points which are situated inside a shed,

Figure 12 shows a part of a diagram of the movement path of the bringer gripper and the taker gripper in the vicinity of the outer reversing points,

Figure 13 shows a variant of Figure 11, in which weaving takes place at a more limited weaving width than in Figure 11.

[0026] Figure 1 shows a drive 1 for a gripper carrier 2 for a bringer gripper 3 and for a gripper carrier 4 for a taker gripper 5. Such a drive 1 may be used in a weaving machine, in particular in a gripper weaving machine. The drive 1 comprises a common drive motor 6 which drives two gear wheels 8 and 9 via a drive shaft 7. The drive mechanism 10 which drives the drive wheel 14 for the gripper carrier 2 is driven by the drive motor 6 via the gear wheel 8, while the drive mechanism 11 which drives the drive wheel 15 for the gripper carrier 4 is driven by the drive motor 6 via the gear wheel 9.

[0027] Figures 1, 2, 3, 5 and 6 show the drive mechanism 10 which comprises a gear wheel 12 which can be driven by the gear wheel 8, a crank 13 connected to the gear wheel 12, a fork element 16 assigned to the crank 13 and a cross element 17 assigned to the fork element 16. The cross element 17 is connected to a toothed segment 22 which can drive the drive wheel 14 for the bringer gripper 3 via a gear wheel transmission 18. Such a crank 13 and gear wheel transmission 18 are known, for example, from DE 10346227 A1. The crank 13 can be connected to the gear wheel 12 via a bearing half 19, illustrated in Figure 6, in an adjustable position, in such a manner that the crank 13 is arranged rotatably to the gear wheel 12. Via a shaft 23 with an axis 43, illustrated in Figure 5, the crank 13 drives the fork element 16, wherein the crank 13 and the fork element 16 are mounted rotatably with respect to one another via the shaft 23. The cross element 17 is driven by the fork element 16 via a shaft 20 with an axis 44, illustrated in Figures 3 and 5, which is mounted in the fork element 16, wherein the fork element 16 and the cross element 17 are mounted rotatably with respect to one another via the shaft 20. The cross element 17 is together with the toothed segment 22 mounted rotatably about a shaft 21 with an axis 45, illustrated in Figure 3, which shaft 21 is arranged transversely with respect to the shaft 20. The shaft 21 is mounted rotatably with respect to a frame 42, wherein the cross element 17 and the frame 42 are mounted rotatably with respect to one another via the shaft 21.

[0028] In the illustrated embodiment, the frame 42 can be fixedly attached to the frame (not shown) of the drive mechanism 10 of the weaving machine. In the drive mechanism 10, the axes 43, 44 and 45 of the respective shafts 23, 20 and 21 pass through a common point 36, as is illustrated in Figures 3 and 5.

[0029] As is illustrated in Figures 7 and 8, the shaft 21 is formed by two axle stubs 56 and 57 which are fitted on the cross element 17 and which can be mounted with respect to the frame 42 via bearings 58, 59, which are illustrated in Figures 3, 5 and 6. In this case, the shaft 20 is formed by two axle stubs 24 and 25 which are fitted on the cross element 17 and which can be mounted with respect to the fork element 16 via bearings. As is illustrated in Figures 3, 5, 6 and 9, the fork element 16 comprises two legs 60 and 61, in which an axle stub 24 or 25 can be mounted, respectively.

[0030] As can be seen in Figures 5 and 9, the shaft 23 with axis 43 by means of which the fork element 16 and the crank 13 are mounted rotatably with respect to one another forms an angle 53 which deviates by a few angular degrees from 45°, for example an angle of approximately 48°, with respect to the shaft 20 with axis 44 by means of which the cross element 17 and the fork element 16 are mounted rotatably with respect to one another.

[0031] Figure 4 shows a top view along arrow D from Figure 1 of the drive mechanism 11 which is of identical design to the drive mechanism 10, but is arranged angularly offset about 180° with respect to the drive mechanism 10. As can be seen in Figures 1, 3 and 4, the drive mechanisms 10 and 11 are arranged in such a manner that the axis 44 of the shaft 20 of the drive mechanism 10 and the axis 50 of the shaft 48 of the drive mechanism 11 are arranged virtually parallel to one another, in a top view. The gear wheel 26 of the drive mechanism 11 is driven via the gear wheel 9 and the toothed segment 47 of the drive mechanism 11 drives the drive wheel 15 for the taker gripper 5 via a gear wheel transmission 27. Analogously to what is illustrated in Figure 5 and as indicated in Figure 1, the axis 62 of the shaft 55 by means of which the fork element 54 and the crank 28 are mounted rotatably with respect to one another forms an angle 63 of approximately 48° with respect to the axis 50 of the shaft 48 by means of which the cross element 52 and the fork element 54 are mounted rotatably with respect to one another.

[0032] According to the invention and as indicated in Figures 1, 3, 4, 7 and 8, the shafts 20 and 21 with axes 44 and 45 and the shafts 48 and 49 with axes 50 and 51 of each cross element 17 and 52 for each drive mechanism 10 and 11 are arranged at an angle 37, 64 with respect to one another which deviates by a few angular degrees from 90°. The perpendicular 82, 83 to the shafts 45 and 51 is illustrated in the Figures 3, 4, 7 and 8 as a dot-dashed line. In the illustrated embodiment, the shafts 20 and 21 and the shafts 48 and 49 of each cross element 17, 52 are arranged at an angle 37 and 64, respectively, of approximately 4° displaced with respect to an angle of 90°.

[0033] By adjusting the mutual angular position of the drive mechanism 10 with respect to the drive motor 6, for example by mutual adjustment of the gear wheels 8 and 12 and the mutual adjustment of the gear wheel 8 and the drive shaft 7, the crank 13 can be driven by the

drive motor 6 in a certain angular position with respect to the angular position of the drive motor 6. During weaving, the gear wheels 12 and 26 are driven by the drive motor 6 in the drive direction R.

[0034] The gear wheel 12 to which the crank 13 of the drive mechanism 10 is attached and the gear wheel 26 to which the crank 28 of the drive mechanism 11 is attached are set angularly displaced by angles 67 and 68 with respect to a reference position, for example a reference position determined by an angular position wherein the crank 13, 28 is attached to a gear wheel 12, 26 and thus set at a certain angular position with respect to the angular position of the drive motor 6, as is illustrated in Figure 1, so that the cranks 13 and 28 of the two drive mechanisms 10 and 11 are driven in associated angular positions by the drive motor 6 via the drive shaft 7 in a rotationally fixed manner and dephased with respect to one another.

[0035] As is illustrated in Figure 1 and 10, the gear wheel 8 can be fitted to this end to the drive shaft 7 via a clamping connection 65 and the gear wheel 9 via a clamping connection 66. Each clamping connection 65, 66 allows the gear wheel 8, 9 to be fixedly attached in a certain angular position with respect to the drive shaft 7, so that both gear wheels 8, 9 can be attached in a certain mutual angular position with respect to the drive shaft 7. According to a variant (not shown), one of the abovementioned gear wheels can be formed as a single part with the drive shaft 7, while the other gear wheel can be connected to the drive shaft 7 via an abovementioned clamping connection. As a result thereof, the angular positions of the cranks 13, 28 of the drive mechanisms 10, 11 can be set with respect to the angular position of the drive motor 6, so that the mutual angular position between the cranks 13, 28 can be set.

[0036] According to a variant, the drive shaft 7 can be formed by two shaft ends which are arranged in line with one another and which can be connected to one another by a clamping connection 84, as indicated schematically by a dashed line in Figure 10, in different mutual angular positions, wherein each time one of the gear wheels 8, 9 is fitted on one of the shaft ends, so that the mutual angular position between the gear wheels 8, 9 and thus also between the cranks 13, 28 can be set.

[0037] According to a variant as indicated by a dashed line in Figure 1, a drive shaft 85 may be provided on which the gear wheels 12 and 26 are fitted. In this case, the gear wheel 12 may, for example, be formed as a single part with the drive shaft 85, and the gear wheel 26 may be connected to the drive shaft 85 via a clamping connection. The gear wheel 12 is in this case driven by the drive motor 6 via the gear wheel 8, while the gear wheel 26 is driven by the drive motor 6 via the gear wheel 8, the gear wheel 12 and the drive shaft 85. In this variant, the gear wheel 9, the clamping connection 66 and the part of the drive shaft 7 situated between the gear wheel 8 and the gear wheel 9 may be omitted.

[0038] As is illustrated in Figure 1, the bringer gripper 3 and the taker gripper 5 are intended to move into and out of a shed 29. A shed 29 is formed by planes of warp threads 30 and 31 which converge at the location of the beat-up line 32 of the fabric 33. The drive mechanisms 10 and 11 allow the bringer gripper 3 and the taker gripper 4 each to reciprocate between an outer reversing point situated outside the shed 29 and an inner reversing point situated inside the shed 29. By the design of the drive mechanisms 10 and 11, the gripper carrier 2 for the bringer gripper 3 and the gripper carrier 4 for the taker gripper 5 move at a variable speed with respect to the weaving cycle when these are driven by the drive motor 6 of the drive 1 in the drive direction R. As a result thereof, the bringer gripper 3 and the taker gripper 5 move at a variable speed during their movements into the shed 29 and out of the shed 29.

[0039] In Figure 11, a diagram of a movement path 38 of a bringer gripper 3 and a movement path 39 of a taker gripper 5 is shown. In Figure 12, the movement path 38 of the bringer gripper 3 and the movement path 39 of the taker gripper 4 are shown, in the vicinity of the outer reversing points I, III.

[0040] These movement paths 38 and 39 can be achieved with the drive mechanisms 10 and 11, as illustrated in Figures 1 to 10. The arrangement of the shafts 20 and 21, the shafts 48 and 49 and/or the setting of the mutual angular position between the gear wheels 12 and 26 with respect to the drive motor 6, allow to achieve a movement path 38 or 39 wherein with respect to the weaving cycle, i.e. according to the drive direction R of the drive motor 6, the outer reversing point I of the bringer gripper 3 is ahead of the outer reversing point III of the taker gripper 5. In this exemplary embodiment, the reversing point I is ahead of the reversing point III by an angular difference 40, wherein this angular difference is for example approximately 18°. At a constant driving speed of the drive motor 6, this angular difference 40 corresponds to a certain time difference. In the example illustrated in Figure 1, in relation to the drive shaft 7, the crank 13 of the drive mechanism, 10 for the bringer gripper 3, which is driven via the gear wheels 8 and 12, is fitted so that it is ahead with respect to the crank 28 of the drive mechanism 11 for the taker gripper 5 by some machine degrees, which is driven via the gear wheels 9 and 26. The being ahead of the outer reversing point I of the bringer gripper 3 with respect to the outer reversing point III of the taker gripper 5 is also achieved by the drive mechanisms 10 and 11, more particularly by the angle 37 between both shafts 20 and 21 of the cross element 17 of the drive mechanism 10 and/or the angle 64 between both shafts 48 and 49 of the cross element 52 of the drive mechanism 11.

[0041] As is illustrated in Figures 11 and 12, the outer reversing point I of the bringer gripper 3 is situated several machine degrees, for example 8°, before beat-up 34 and the outer reversing point III of the taker gripper 5 is situated several machine degrees, for example 10°, after beat-up 34. In this case, the beat-up 34 corresponds to

the angular position 0° or 360° of the weaving machine or the moment in the weaving cycle wherein a weft thread is beaten up. As is shown in Figures 11 and 12, with respect to the weaving cycle, the bringer gripper 3 is accelerated less after the outer reversing point I than after the inner reversing point II and the taker gripper 5 is accelerated more after the outer reversing point III than after the inner reversing point IV. As a result thereof, the bringer gripper 3 near the outer reversing point I and the taker gripper 5 near the inner reversing point IV are accelerated less, when they interact with the weft thread, which is advantageous for inserting a weft thread into a shed 29 by means of a bringer gripper 3 and a taker gripper 5.

[0042] Figure 11 also shows that, with respect to the weaving cycle, the inner reversing point IV of the taker gripper 5 is ahead of the inner reversing point II of the bringer gripper 3. In this exemplary embodiment, the reversing point IV is ahead of the reversing point II by an angular difference 41, wherein this angular difference is, for example, approximately 10°. In this case, with respect to the weaving cycle, the bringer gripper 3 before its inner reversing point II and the taker gripper 5 after its inner reversing point IV move in the same direction over a distance 35, more particularly along the direction of insertion of the weft thread, which distance 35 is determined by the angular difference 41.

[0043] In Figure 12, the hatched area 69 is determined by the angular positions in machine degrees in the weaving cycle and the longitudinal positions, i.e. positions with respect to the weaving width, in which a weaving reed 86 which is schematically illustrated in Figure 1 moves near the beat-up 34 up to a beat-up line 32 and beyond the movement path 87, indicated in Figure 1 by a dot-dashed line, of the bringer gripper 3 and/or of the taker gripper 4. During weaving, the weaving reed 85 moves between the beat-up line 32 and a rearmost position. In Figure 1, the weaving reed 85 is illustrated in the rearmost position. During the weaving cycle, the bringer gripper 3 and the taker gripper 4, from the angular position 70 to the angular position 71, may not be situated between the longitudinal positions 76 and 77 in the shed 29, as these could otherwise come into contact with the weaving reed 86 or with the warp threads 30, 31. Although the outer reversing point I of the bringer gripper 3 is several machine degrees ahead of the beat-up 34, in this embodiment, the bringer gripper 3 and the taker gripper 4 leave the area 69 at the angular position 70 and they enter the area 69 at the angular position 71, wherein the angular positions 70 and 71 are each situated, for example, an identical number of machine degrees away from the beat-up 34. Although the number of machine degrees 72 and 73, and 74 and 75, respectively, are different, the number of machine degrees 78 and 79, and 80 and 81, respectively, are identical. According to this embodiment, the available machine degrees are used in an optimum manner in order to achieve a relatively low average speed of the bringer gripper 3 and/or the taker gripper 4 for a certain number of insertions per unit time, while a weft thread can be inserted into a shed 29 by the bringer gripper 3 and the taker gripper 4 at a relatively low speed and acceleration.

[0044] If weaving is carried out with a limited weaving width, the setting of the crank 13 with respect to the gear wheel 12 and/or the setting of the crank 28 with respect to the gear wheel 26 can be changed slightly. In this case, the setting of the gear wheel 8 with respect to the drive shaft 7 and/or the setting of the gear wheel 9 with respect to the drive shaft 7 can also be changed. Alternatively or in addition, it is also possible to change the meshing position of the teeth of the gear wheel 8 and/or the meshing position of the teeth of the gear wheel 9 with respect to the teeth of the associated gear wheel 12 or 26. Such a meshing position may, for example, be changed by displacing a gear wheel 8, 9 axially with respect to the drive shaft 7 until the teeth of the gear wheel 8, 9 no longer mesh with teeth of a gear wheel 12, 26, and by subsequently allowing the teeth of the gear wheel 8, 9 to mesh with other teeth of a gear wheel 12, 26. Such adjustments can be carried out in such a manner that the features of the claims are met.

[0045] Figure 13 shows a variant for weaving at a more limited weaving width. In this case, for example in the drive mechanism 11, the position of the crank 28 with respect to the bearing half 19 is adjusted in such a way that, with respect to the movement course according to the setting of Figure 11, the movement course 46 along which the taker gripper 5 is moved is reduced. With the illustrated drive mechanism 11, this results in the fact that, with respect to the weaving cycle, the outer reversing point I of the bringer gripper 3 is less ahead of the outer reversing point III of the taker gripper 5 than in the embodiment according to Figure 11. In the embodiment of Figure 13, the angle by which the outer reversing point I of the bringer gripper 3 is ahead of the outer reversing point III of the taker gripper 5 can be increased again by suitably setting the angular positions of at least one of the cranks 13, 28 with respect to the angular position of the drive motor 6, for example by attaching the gear wheels 8 or 9 on the drive shaft 7 at a suitable angular position.

[0046] It is clear that the fork element 16, 54 and the cross element 17, 52 of both drive mechanisms 10, 11 do not necessarily have to be of identical design. Of course, the crank 13 and the crank 28 do not have to be of identical design either and the same is true for the angles 37 and 64 and for the angles 53 and 63. The angles 67 and 68 can also be suitably chosen. In addition, the gear wheels 8 and 9 and the gear wheels 12 and 26 do not necessarily have to be of identical design. According to a variant (not shown), these can also be designed to be slightly different in order to satisfy the features of the claims.

[0047] The invention is particularly suitable for use with relatively wide weaving machines and with weaving machines wherein the bringer gripper 3 and/or the taker grip-

per 4 are opened positively during gripping, changeover or release of the weft thread. This positive opening can be carried out with devices which act on the clamp of a respective bringer gripper 3 or taker gripper 5. Such devices are known, inter alia, from GB 2059455 and EP 0526390 A1.

[0048] The drive 1 according to the invention has the particular advantage that the speed and the acceleration of the bringer gripper 3 are relatively limited during gripping of a weft thread. In addition, the speed and the acceleration of the taker gripper 5 can be relatively limited during the release of the weft thread. As the drive 1 according to the invention allows the bringer gripper 3 and the taker gripper 5 to move in the same direction and at virtually the same speed for a certain period of time during the changeover, more particularly allows them to perform an overlapping movement, there is sufficient time available to changeover a weft thread in a satisfactory manner from the bringer gripper 3 to the taker gripper 5. By means of a drive 1 according to the invention, the bringer gripper 3 and the taker gripper 5 are more accelerated and/or slowed down when they do not cooperate with the weft thread than when they do cooperate with the weft thread, which allows to insert weft threads into a shed 29 at a reduced tension.

[0049] If the taker gripper 5 has smaller dimensions than the bringer gripper 3, the taker gripper 5 can enter the shed 29, for example, sooner than the bringer gripper 3 and during opening of the shed 29. In this case, the taker gripper 5 can also leave the shed 29 later than the bringer gripper 3 and during the closing of the shed 29. If the taker gripper 5 has smaller dimensions than the bringer gripper 3, the taker gripper 5 can enter the shed 29, for example, sooner than the bringer gripper 3 and while the weaving reed is moving away from the beat-up line 32. In this case, the taker gripper 5 can also leave the shed 29 later than the bringer gripper 3 and while the weaving reed is moving towards the beat-up line 32.

[0050] A weaving machine according to the invention allows that, at a certain speed of the weaving machine, the taker gripper 5 moves through the shed 29 over a larger movement course than the movement course with which the bringer gripper 3 moves through the shed 29, while both the bringer gripper 3 and the taker gripper 5, on average, move at a lower speed through the shed 29 when they are inserting a weft thread into the shed 29 than when they move through the shed 29 without a weft thread.

Claims

1. A method for driving a gripper carrier (2) for a bringer gripper (3) and a gripper carrier (4) for a taker gripper (5) by means of a drive (1), which drive (1) comprises a common drive motor (6) for two drive mechanisms (10,11) and two drive wheels (14,15) each driven by an associated drive mechanism (10, 11) for a gripper carrier (2, 4), wherein the gripper carriers (2, 4) are driven so that the bringer gripper (3) and the taker gripper (5) each reciprocate between an outer reversing point (I, III) situated outside the shed (29) and an inner reversing point (II, IV) situated inside the shed (29), **characterized in that**, with respect to a weaving cycle, the outer reversing point (I) of the bringer gripper (3) is ahead of the outer reversing point (III) of the taker gripper (5).

2. The method as claimed in claim 1, **characterized in that** the gripper carrier (2) for the bringer gripper (3) and the gripper carrier (4) for the taker gripper (5) are driven at variable speed by the drive (1) during their movements into the shed (29) and out of the shed (29), wherein with respect to the weaving cycle, the bringer gripper (3) is accelerated less after the outer reversing point (I) than after the inner reversing point (II), and the taker gripper (5) is accelerated more after the outer reversing point (III) than after the inner reversing point (IV).

3. The method as claimed in claim 1 or 2, **characterized in that**, with respect to the weaving cycle, the inner reversing point (IV) of the taker gripper (5) is ahead of the inner reversing point (II) of the bringer gripper (3).

4. The method as claimed in one of claims 1 to 3, **characterized in that** the gripper carrier (2) for the bringer gripper (3) and the gripper carrier (4) for the taker gripper (5) are driven at variable speed by the drive (1) during their movements into the shed (29) and out of the
shed (29), wherein with respect to the weaving cycle, the bringer gripper (3) before its inner reversing point (II) and the taker gripper (5) after its inner reversing point (IV) move in the same direction over a distance.

5. The method as claimed in one of claims 1 to 4, **characterized in that** the outer reversing point (I) of the bringer gripper (3) is situated several machine degrees before beat-up (34) and **in that** the outer reversing point (III) of the taker gripper (5) is situated several machine degrees after beat-up (34).

6. A drive for a gripper carrier (2) for a bringer gripper (3) and for a gripper carrier (4) for a taker gripper (5) which drive comprises a common drive motor (6) for two drive mechanisms (10, 11) and two drive wheels (14, 15) for a gripper carrier (2, 4) which are each driven by an associated drive mechanism (10, 11), wherein each drive mechanism (10, 11) comprises a crank (13, 28) which drives a fork element (16, 54), wherein the fork element (16, 54) and a cross element (17, 52) are mounted rotatably with respect to one another via a shaft (20, 48), wherein the cross element (17, 52) is connected to a toothed segment

(22, 47) which drives a drive wheel (14, 15) for a gripper carrier (2, 4) and which, together with the cross element (17, 52), is mounted rotatably with respect to a frame (42), wherein the cross element (17, 52) and the frame (42) are mounted rotatably with respect to one another via a shaft (21, 49) which is arranged transversely to the shaft (20, 48) by means of which the fork element (16, 54) and the cross element (17, 52) are mounted rotatably with respect to one another, wherein each crank (13, 28) is driven in a rotationally fixed manner by the common drive motor (6) at a certain angular position with respect to the angular position of the common drive motor (6), **characterized in that**, for each drive mechanism (10, 11) associated with a drive wheel (14, 15), the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle (37, 64) with respect to one another which deviates by a few angular degrees from 90° and/or **in that**, for each drive mechanism (10, 11) associated with a drive wheel (14, 15), the crank (13, 28) is driven in a rotationally fixed manner at a certain angular position with respect to the angular position of the common drive motor (6), in such a manner that, with respect to a weaving cycle, the outer reversing point (I) of the bringer gripper (3) is ahead of the outer reversing point (III) of the taker gripper (5).

7. The drive as claimed in claim 6, **characterized in that** the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle (37, 64) with respect to one another which deviates by a few angular degrees from 90°, in such a manner that, with respect to the weaving cycle, the bringer gripper (3) is accelerated less after the outer reversing point (I) than after the inner reversing point (II) and that the taker gripper (5) is accelerated more after the outer reversing point (III) than after the inner reversing point (IV).

8. The drive as claimed in claim 6 or 7, **characterized in that** the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle (37, 64) with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks (13, 28) of the drive mechanisms (10, 11) are set with respect to the angular position of the drive motor (6) in such a manner that, with respect to the weaving cycle, the gripper carrier (2) of the bringer gripper (3) and the gripper carrier (4) of the taker gripper (5) are driven at variable speed by the drive (1) during their movements into a shed (29) and out of the shed (29), wherein with respect to the weaving cycle, the bringer gripper (3) before its inner reversing point (II) and the taker gripper (5) after its inner reversing point (IV) move over a distance (35) in the same direction.

9. The drive as claimed in one of claims 6 to 8, **characterized in that** the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle (37, 64) with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks (13, 28) of the drive mechanisms (10, 11) are set with respect to the angular position of the drive motor (6) in such a manner that, with respect to the weaving cycle, the inner reversing point (IV) of the taker gripper (5) is ahead of the inner reversing point (II) of the bringer gripper (3).

10. The drive as claimed in one of claims 6 to 9, **characterized in that** the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle with respect to one another which deviates by a few angular degrees from 90° and/or the angular positions of the cranks (13, 28) of the drive mechanisms (10, 11) are set with respect to the angular position of the drive motor (6) in such a manner that the outer reversing point (I) of the bringer gripper (3) is situated several machine degrees before beat-up (34) and that the outer reversing point (III) of the taker gripper (5) is situated several machine degrees after beat-up (34).

11. The drive as claimed in one of claims 6 to 10, **characterized in that** the two shafts (20, 21; 48, 49) assigned to the cross element (17, 52) are arranged at an angle of approximately 4° displaced with respect to an angle of 90°.

12. The drive as claimed in one of claims 6 to 11, **characterized in that** the shaft (23, 55), by means of which the fork element (16, 54) and the associated crank (13, 28) are connected rotatably with respect to one another, forms an angle which deviates by a few angular degrees from 45°, more particularly an angle of approximately 48°, with the shaft (20, 48) by means of which the cross element (17, 52) and the fork element (16, 54) are connected rotatably with respect to one another.

13. The drive as claimed in one of claims 6 to 12, **characterized in that** the cranks (13, 28) of the two drive mechanisms (10,11) are driven in a rotationally fixed manner by a common drive shaft (7), wherein with respect to the weaving cycle, the crank (13) of the drive mechanism (10) for the bringer gripper (3) is fitted in such a manner that it is ahead of the crank (28) of the drive mechanism (11) for the taker gripper (3) by a few machine degrees.

14. The drive as claimed in one of claims 6 to 13, **characterized in that** the drive mechanism (10) for the bringer gripper (3) and the drive mechanism (11) for the taker gripper (5) are of identical design.

15. A weaving machine, **characterized in that** the weaving machine comprises a drive (1) as claimed in one of claims 6 to 14.

Patentansprüche

1. Ein Verfahren zum Antreiben eines Greiferträgers (2) für einen Gebergreifer (3) und eines Greiferträgers (4) für einen Nehmergreifer (5) mittels eines Antriebs (1), welcher Antrieb (1) einen gemeinsamen Antriebsmotor (6) für zwei Antriebsmechanismen (10, 11) und zwei Antriebsräder (14, 15) enthält, die jeweils durch einen zugehörigen Antriebsmechanismus (10, 11) für einen Greiferträger (2, 4) angetrieben werden, wobei die Greiferträger (2, 4) so angetrieben werden, dass der Gebergreifer (3) und der Nehmergreifer (5) sich jeweils zwischen einem äußeren Umkehrpunkt (I, III), der außerhalb des Webfachs (29) gelegen ist, und einem inneren Umkehrpunkt (II, IV), der innerhalb des Webfachs (29) gelegen ist, hin und her bewegen, **dadurch gekennzeichnet, dass** bezüglich eines Webzyklus der äußere Umkehrpunkt (I) des Gebergreifers (3) vor dem äußeren Umkehrpunkt (III) des Nehmergreifers (5) ist.

2. Das Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Greiferträger (2) für den Gebergreifer (3) und der Greiferträger (4) für den Nehmergreifer (5) bei ihren Bewegungen in das Webfach (29) und aus dem Webfach (29) durch den Antrieb (1) mit variabler Geschwindigkeit angetrieben werden, wobei bezüglich des Webzyklus der Gebergreifer (3) nach dem äußeren Umkehrpunkt (I) weniger beschleunigt wird als nach dem inneren Umkehrpunkt (II) und der Nehmergreifer (5) nach dem äußeren Umkehrpunkt (III) mehr beschleunigt wird als nach dem inneren Umkehrpunkt (IV).

3. Das Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** bezüglich des Webzyklus der innere Umkehrpunkt (IV) des Nehmergreifers (5) vor dem inneren Umkehrpunkt (II) des Gebergreifers (3) ist.

4. Das Verfahren nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der Greiferträger (2) für den Gebergreifer (3) und der Greiferträger (4) für den Nehmergreifer (5) bei ihren Bewegungen in das Webfach (29) und aus dem Webfach (29) durch den Antrieb (1) mit variabler Geschwindigkeit angetrieben werden, wobei bezüglich des Webzyklus der Gebergreifer (3) vor seinem inneren Umkehrpunkt (II) und der Nehmergreifer (5) nach seinem inneren Umkehrpunkt (IV) sich über eine Strecke in die gleiche Richtung bewegen.

5. Das Verfahren nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der äußere Umkehrpunkt (I) des Gebergreifers (3) mehrere Maschinengrad vor einem Anschlag (34) gelegen ist und dass der äußere Umkehrpunkt (III) des Nehmergreifers (5) mehrere Maschinengrad nach einem Anschlag (34) gelegen ist.

6. Ein Antrieb für einen Greiferträger (2) für einen Gebergreifer (3) und für einen Greiferträger (4) für einen Nehmergreifer (5), welcher Antrieb einen gemeinsamen Antriebsmotor (6) für zwei Antriebsmechanismen (10, 11) und zwei Antriebsräder (14, 15) für einen Greiferträger (2, 4) enthält, die jeweils durch einen zugehörigen Antriebsmechanismus (10, 11) angetrieben werden, wobei jeder Antriebsmechanismus (10, 11) eine Kurbel (13, 28) enthält, die ein Gabelelement (16, 54) antreibt, wobei das Gabelelement (16, 54) und ein Querelement (17, 52) über eine Welle (20, 48) drehbar zueinander montiert sind, wobei das Querelement (17, 52) mit einem Zahnsegment (22, 47) verbunden ist, das ein Antriebsrad (14, 15) für einen Greiferträger (2, 4) antreibt, und das zusammen mit dem Querelement (17, 52) zu einem Rahmen (42) drehbar montiert ist, wobei das Querelement (17, 52) und der Rahmen (42) über eine Welle (21, 49) drehbar zueinander montiert sind, die quer zur Welle (20, 48) angeordnet ist, mittels derer das Gabelelement (16, 54) und das Querelement (17, 52) zueinander drehbar montiert sind, wobei jede Kurbel (13, 28) drehfest vom gemeinsamen Antriebsmotor (6) in einer gewissen Winkelposition zur Winkelposition des gemeinsamen Antriebsmotors (6) angetrieben wird, **dadurch gekennzeichnet, dass** für jeden Antriebsmechanismus (10, 11), dem ein Antriebsrad (14, 15) zugeordnet ist, die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel (37, 64) zueinander montiert sind, der um einige wenige Winkelgrad von 90° abweicht, und/oder dadurch, dass für jeden Antriebsmechanismus (10, 11), dem ein Antriebsrad (14, 15) zugeordnet ist, die Kurbel (13, 28) drehfest in einer gewissen Winkelposition zur Winkelposition des gemeinsamen Antriebsmotors (6) derart angetrieben wird, dass bezüglich des Webzyklus der äußere Umkehrpunkt (I) des Gebergreifers (3) vor dem äußeren Umkehrpunkt (III) des Nehmergreifers (5) ist.

7. Der Antrieb nach Anspruch 6, **dadurch gekennzeichnet, dass** die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel (37, 64) zueinander angeordnet sind, der um einige wenige Winkelgrad von 90° derart abweicht, dass bezüglich des Webzyklus der Gebergreifer (3) nach dem äußeren Umkehrpunkt (I) weniger beschleunigt wird als nach dem inneren Umkehrpunkt (II) und dass der Nehmergreifer (5) nach dem äuße-

ren Umkehrpunkt (III) mehr beschleunigt wird als nach dem inneren Umkehrpunkt (IV).

8. Der Antrieb nach Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel (37, 64) zueinander angeordnet sind, der um einige wenige Winkelgrad von 90° abweicht, und/oder die Winkelpositionen der Kurbeln (13, 28) der Antriebsmechanismen (10, 11) zur Winkelposition des Antriebsmotors (6) derart eingestellt sind, dass bezüglich des Webzyklus der Greiferträger (2) des Gebergreifers (3) und der Greiferträger (4) des Nehmergreifers (5) bei ihren Bewegungen in ein Webfach (29) und aus dem Webfach (29) durch den Antrieb (1) mit variabler Geschwindigkeit angetrieben werden, wobei bezüglich des Webzyklus der Gebergreifer (3) vor seinem inneren Umkehrpunkt (II) und der Nehmergreifer (5) nach seinem inneren Umkehrpunkt (IV) sich über eine Strecke (35) in die gleiche Richtung bewegen.

9. Der Antrieb nach einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass** die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel (37, 64) zueinander angeordnet sind, der um einige wenige Winkelgrad von 90° abweicht, und/oder die Winkelpositionen der Kurbeln (13, 28) der Antriebsmechanismen (10, 11) zur Winkelposition des Antriebsmotors (6) derart eingestellt sind, dass bezüglich des Webzyklus der innere Umkehrpunkt (IV) des Nehmergreifers (5) vor dem inneren Umkehrpunkt (II) des Gebergreifers (3) ist.

10. Der Antrieb nach einem der Ansprüche 6 bis 9, **dadurch gekennzeichnet, dass** die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel zueinander angeordnet sind, der um einige wenige Winkelgrad von 90° abweicht, und/oder die Winkelpositionen der Kurbeln (13, 28) der Antriebsmechanismen (10, 11) zur Winkelposition des Antriebsmotors (6) derart eingestellt sind, dass der äußere Umkehrpunkt (I) des Gebergreifers (3) mehrere Maschinengrad vor einem Anschlag (34) gelegen ist und dass der äußere Umkehrpunkt (III) des Nehmergreifers (5) mehrere Maschinengrad nach einem Anschlag (34) gelegen ist.

11. Der Antrieb nach einem der Ansprüche 6 bis 10, **dadurch gekennzeichnet, dass** die dem Querelement (17, 52) zugeordneten zwei Wellen (20, 21; 48, 49) in einem Winkel von ungefähr 4° versetzt zu einem Winkel von 90° angeordnet sind.

12. Der Antrieb nach einem der Ansprüche 6 bis 11, **dadurch gekennzeichnet, dass** die Welle (23, 55), mittels derer das Gabelelement (16, 54) und die zugeordnete Kurbel (13, 28) zueinander drehbar verbunden sind, einen Winkel, der um einige wenige Winkelgrad von 45°, insbesondere einem Winkel von ungefähr 48° abweicht, mit der Welle (20, 48) bildet, mittels derer das Querelement (17, 52) und das Gabelelement (16, 54) zueinander drehbar verbunden sind.

13. Der Antrieb nach einem der Ansprüche 6 bis 12, **dadurch gekennzeichnet, dass** die Kurbeln (13, 28) der zwei Antriebsmechanismen (10, 11) drehfest von einer gemeinsamen Antriebswelle (7) angetrieben werden, wobei bezüglich des Webzyklus die Kurbel (13) des Antriebsmechanismus (10) für den Gebergreifer (3) derart angebracht ist, dass sie um einige Maschinengrad vor der Kurbel (28) des Antriebsmechanismus (11) für den Nehmergreifer (5) ist.

14. Der Antrieb nach einem der Ansprüche 6 bis 13, **dadurch gekennzeichnet, dass** der Antriebsmechanismus (10) für den Gebergreifer (3) und der Antriebsmechanismus (11) für den Nehmergreifer (5) identisch ausgebildet sind.

15. Eine Webmaschine, **dadurch gekennzeichnet, dass** die Webmaschine einen Antrieb (1) nach einem der Ansprüche 6 bis 14 enthält.

Revendications

1. Un procédé pour entraîner une porte-pince (2) pour une pince d'amenée (3) et une porte-pince (4) pour une pince preneuse (5) au moyen d'un entraînement (1), lequel entraînement (1) comprend un moteur d'entraînement commun (6) pour deux mécanismes d'entraînement (10, 11) et deux roues d'entraînement (14, 15), entraînées chacune par un mécanisme d'entraînement associé (10, 11) pour une porte-pince (2, 4), dans lequel les porte-pinces (2, 4) étant entraînées de telle sorte que la pince d'amenée (3) et la pince preneuse (5) se déplacent en avant et en arrière chacune d'un mouvement alternatif entre un point d'inversion extérieur (I, III) situé à l'extérieur de la foule (29) et un point d'inversion intérieur (II, IV) situé à l'intérieur de la foule (29), **caractérisé en ce que**, par rapport à un cycle de tissage, le point d'inversion extérieur (I) de la pince d'amenée (3) est en avant du point d'inversion extérieur (III) de la pince preneuse (5).

2. Le procédé selon la revendication 1, **caractérisé en ce que** la porte-pince (2) pour la pince d'amenée (3) et la porte-pince (4) pour la pince preneuse (5) sont entraînées à une vitesse variable par l'entraînement (1) au cours de leurs mouvements dans la foule (29) et hors de la foule (29), dans lequel par rapport au cycle de tissage, la pince d'amenée (3) est moins

accélérée après le point d'inversion extérieur (I) qu'après le point d'inversion intérieur (II), et la pince preneuse (5) est plus accélérée après le point d'inversion extérieur (III) qu'après le point d'inversion intérieur (IV).

3. Le procédé selon la revendication 1 ou 2, **caractérisé en ce que** par rapport au cycle de tissage, le point d'inversion intérieur (IV) de la pince preneuse (5) est en avant du point d'inversion intérieur (II) de la pince d'amenée (3).

4. Le procédé selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** la porte-pince (2) pour la pince d'amenée (3) et la porte-pince (4) pour la pince preneuse (5) sont entraînées à vitesse variable par l'entraînement (1) au cours de leurs mouvements dans la foule (29) et hors de la foule (29), dans lequel par rapport au cycle de tissage, la pince d'amenée (3), avant son point d'inversion intérieur (II) et la pince preneuse (5), après son point d'inversion intérieur (IV), se déplacent dans la même direction sur une distance.

5. Le procédé selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** le point d'inversion extérieur (I) de la pince d'amenée (3) est situé à plusieurs degrés de machine avant la frappe (34) et **en ce que** le point d'inversion extérieur (III) de la pince preneuse (5) est situé plusieurs degrés de machine après la frappe (34).

6. Un entraînement pour une porte-pince (2) pour une pince d'amenée (3) et pour une porte-pince (4) pour une pince preneuse (5), lequel entraînement comprend un moteur d'entraînement commun (6) pour deux mécanismes d'entraînement (10, 11) et deux roues d'entraînement (14, 15) pour une porte-pince (2, 4), qui sont chacune entraînées par un mécanisme d'entraînement associé (10, 11), dans lequel chaque mécanisme d'entraînement (10, 11) comprend une bielle (13, 28) qui entraîne un élément de fourche (16, 54), dans lequel l'élément de fourche (16, 54) et un élément croisé (17, 52) sont montés de façon rotative l'un par rapport à l'autre par un arbre (20, 48), dans lequel l'élément croisé (17, 52) est connecté à un segment denté (22, 47) qui entraîne une roue d'entraînement (14, 15) pour une porte-pince (2, 4) et qui, conjointement avec l'élément croisé (17, 52), est monté de façon rotative par rapport à un cadre (42), dans lequel l'élément croisé (17, 52) et le cadre (42) sont montés de façon rotative l'un par rapport à l'autre par un arbre (21, 49) qui est disposé transversalement à l'arbre (20, 48) au moyen duquel l'élément de fourche (16, 54) et l'élément croisé (17, 52) sont montés de façon rotative l'un par rapport à l'autre, dans lequel chaque bielle (13, 28) est entraînée de manière fixe en rotation par le moteur d'entraînement commun (6) à une certaine position angulaire par rapport à la position angulaire du moteur d'entraînement commun (6), **caractérisé en ce que**, pour chaque mécanisme d'entraînement (10, 11) associé à une roue d'entraînement (14, 15), les deux arbres (20, 21; 48, 49) affectés à l'élément croisé (17, 52) sont disposés l'un par rapport à l'autre selon un angle (37, 64) qui dévie de quelques degrés angulaires de 90° et/ou **en ce que** pour chaque mécanisme d'entraînement (10, 11) associé à une roue d'entraînement (14, 15), la bielle (13, 28) est entraînée de manière fixe en rotation à une certaine position angulaire par rapport à la position angulaire du moteur d'entraînement commun (6) de telle sorte que par rapport à un cycle de tissage, le point d'inversion extérieur (I) de la pince d'amenée (3) soit en avant du point d'inversion extérieur (III) de la pince preneuse (5).

7. L'entraînement selon la revendication 6, **caractérisé en ce que** les deux arbres (22, 21; 48, 49) affectés à l'élément croisé (17, 52) sont disposés l'un par rapport à l'autre selon un angle (37, 64) qui dévie de quelques degrés angulaires de 90°, de telle sorte que par rapport au cycle de tissage, la pince d'amenée (3) soit moins accélérée après le point d'inversion extérieur (I) qu'après le point d'inversion intérieur (II) et que la pince preneuse (5) soit plus accélérée après le point d'inversion extérieur (III) qu'après le point d'inversion intérieur (IV).

8. L'entraînement selon la revendication 6 ou 7, **caractérisé en ce que** les deux arbres (20, 21 ; 48, 49) affectés à l'élément croisé (17, 52) sont disposés l'un par rapport à l'autre selon un angle (37, 64) qui dévie de quelques degrés angulaires de 90° et/ou les positions angulaires des bielles (13, 28) des mécanismes d'entraînement (10, 11) sont réglées par rapport à la position angulaire du moteur d'entraînement (6) de telle sorte que, par rapport au cycle de tissage, la porte-pince (2) de la pince d'amenée (3) et la porte-pince (4) de la pince preneuse (5) soient entraînés à une vitesse variable par l'entraînement (1) au cours de leurs mouvements dans une foule (29) et hors de la foule (29), dans lequel par rapport au cycle de tissage, la pince d'amenée (3), avant son point d'inversion intérieur (II) et la pince preneuse (5), après son point d'inversion intérieur (IV), se déplacent sur une distance (35) dans la même direction.

9. L'entraînement selon l'une quelconque des revendications 6 à 8, **caractérisé en ce que** les deux arbres (20, 21; 48, 49) affectés à l'élément croisé (17, 52) sont disposés l'un par rapport à l'autre selon un angle (37, 64) qui dévie de quelques degrés angulaires de 90° et/ou les positions angulaires des bielles (13, 28) des mécanismes d'entraînement (10,

11) sont réglées par rapport à la position angulaire du moteur d'entraînement (6) de telle sorte que, par rapport au cycle de tissage, le point d'inversion intérieur (IV) de la pince preneuse (5) soit en avant du point d'inversion intérieur (II) de la pince d'amenée (3).

10. L'entraînement selon l'une quelconque des revendications 6 à 9, **caractérisé en ce que** les deux arbres (20, 21; 48, 49) affectés à l'élément croisé (17, 52) sont disposés l'un par rapport à l'autre selon un angle qui dévie de quelques degrés angulaires de 90° et/ou les positions angulaires des bielles (13, 28) des mécanismes d'entraînement (10, 11) sont réglées par rapport à la position angulaire du moteur d'entraînement (6) de telle sorte que le point d'inversion extérieur (I) de la pince d'amenée (3) soit situé à plusieurs degrés de machine avant la frappe (34) et que le point d'inversion extérieur (III) de la pince preneuse (5) soit situé plusieurs degrés de machine après la frappe (34).

11. L'entraînement selon l'une quelconque des revendications 6 à 10, **caractérisé en ce que** les deux arbres (20, 21; 48, 49) affectés à l'élément croisé (17, 52) sont disposés selon un angle d'environ 4° déplacé par rapport d'un angle de 90°.

12. L'entraînement selon l'une quelconque des revendications 6 à 11, **caractérisé en ce que** l'arbre (23, 55) au moyen duquel l'élément de fourche (16, 54) et la bielle associée (13, 28) sont connectés de façon rotative l'un par rapport à l'autre, forme un angle qui dévie de quelques degrés angulaires de 45°, plus particulièrement un angle d'environ 48°, avec l'arbre (20, 48) au moyen duquel l'élément croisé (17, 52) et l'élément de fourche (16, 54) sont connectés de façon rotative l'un par rapport à l'autre.

13. L'entraînement selon l'une quelconque des revendications 6 à 12, **caractérisé en ce que** les bielles (13, 28) des deux mécanismes d'entraînement (10, 11) sont entraînées de manière fixe en rotation par un arbre d'entraînement commun (7), dans lequel par rapport au cycle de tissage, la bielle (13) du mécanisme d'entraînement (10) pour la pince d'amenée (3) est intégrée de telle sorte qu'elle soit en avant de quelques degrés de machine de la bielle (28) du mécanisme d'entraînement (11) pour la pince preneuse (5).

14. L'entraînement selon l'une quelconque des revendications 6 à 13, **caractérisé en ce que** le mécanisme d'entraînement (10) pour la pince d'amenée (3) et le mécanisme d'entraînement (11) pour la pince preneuse (5) sont réalisés de manière identique.

15. Une machine à tisser, **caractérisée en ce que** la machine à tisser comprend un entraînement (1) selon l'une quelconque des revendications 6 à 14.

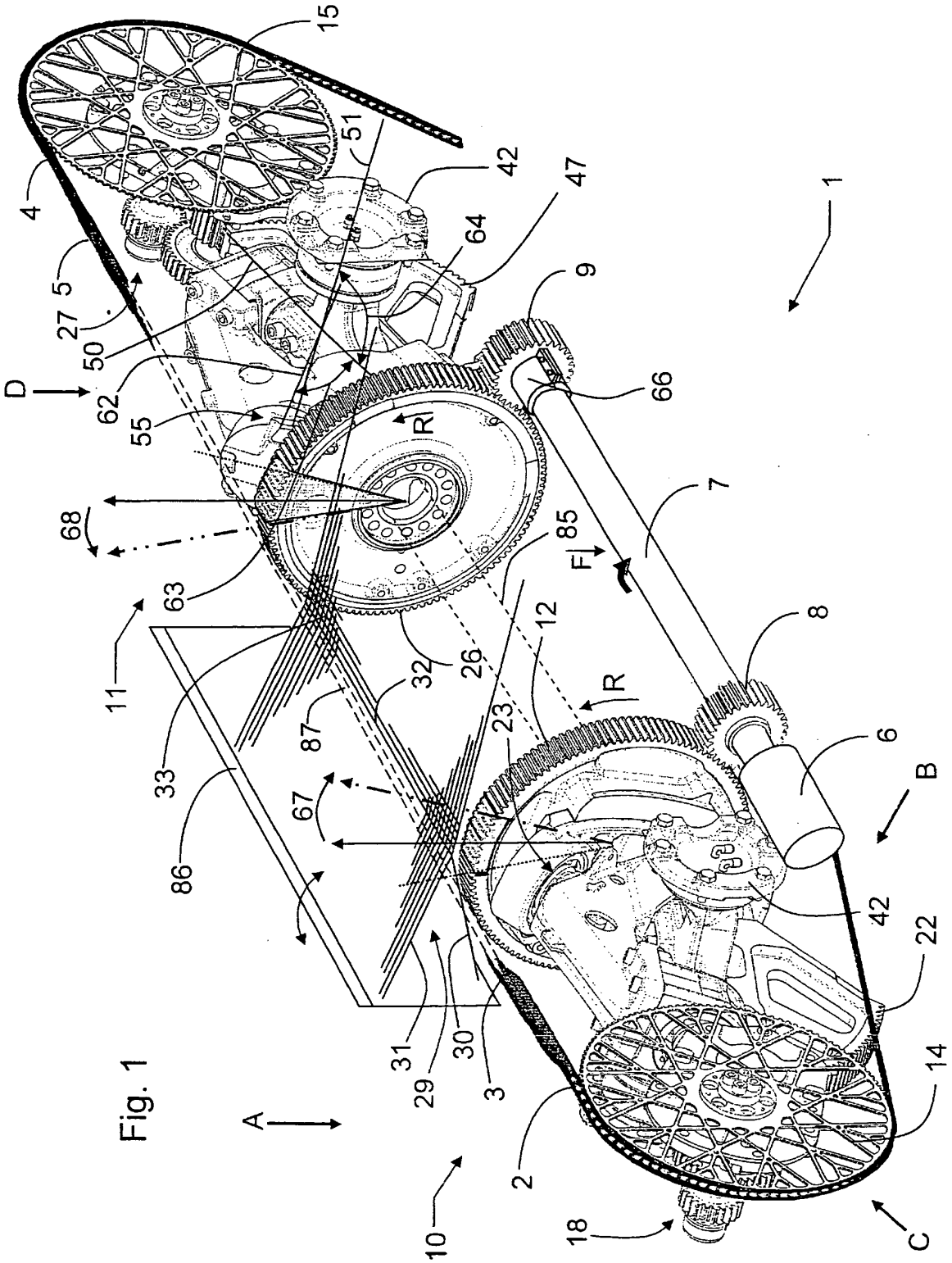

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Fig. 1

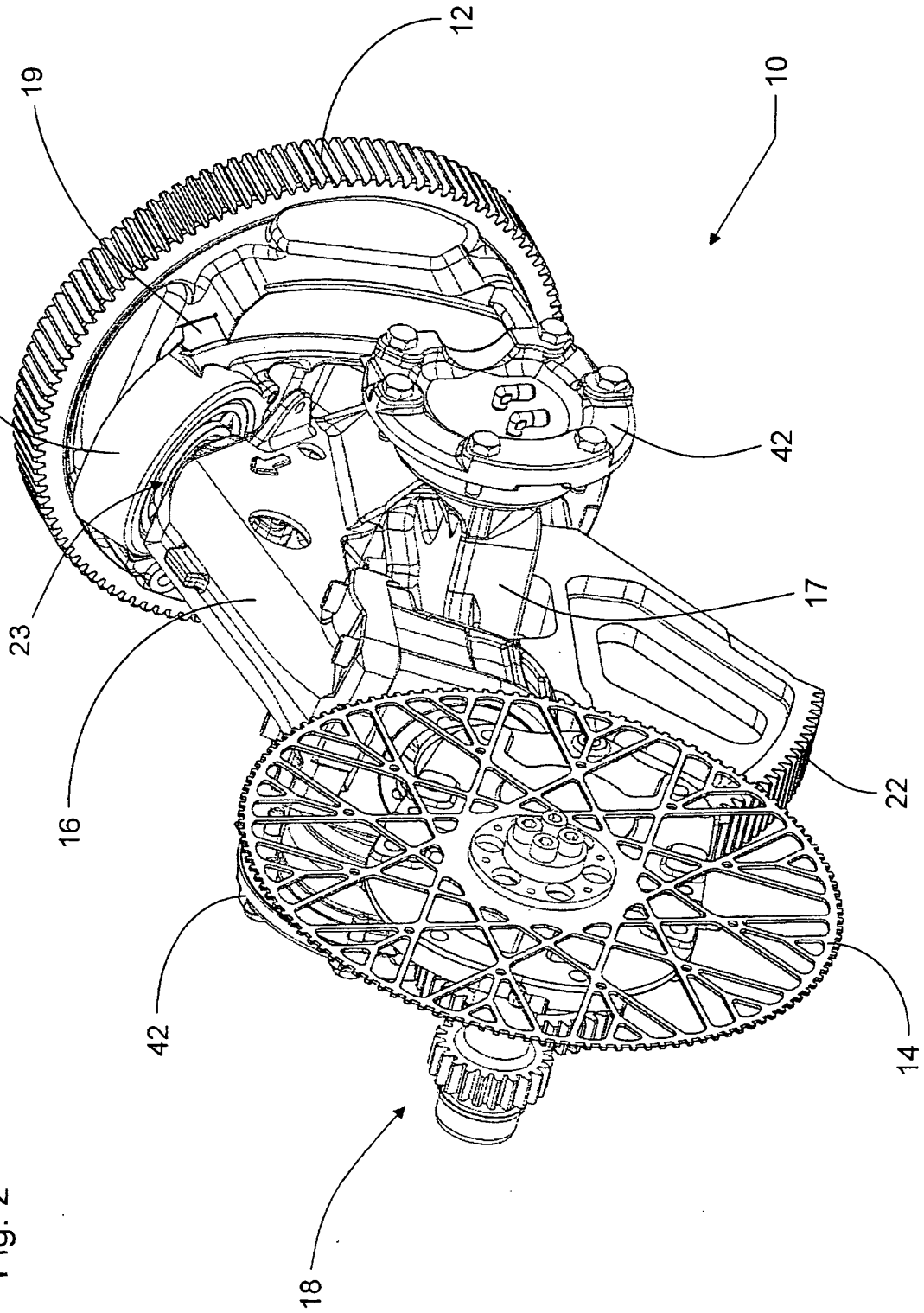


Fig. 2

Fig. 4

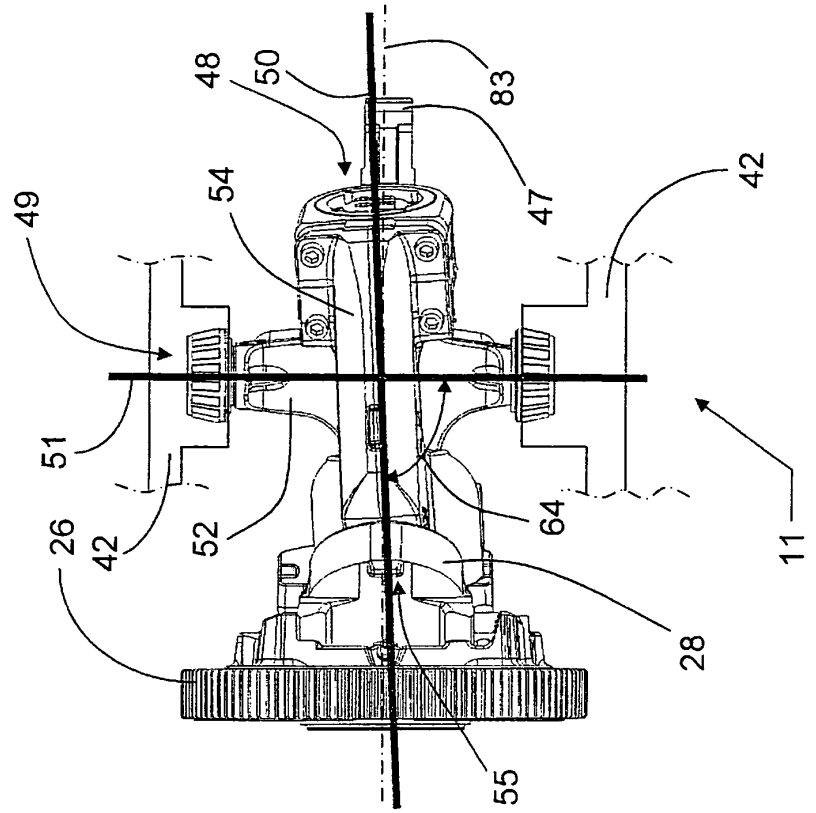
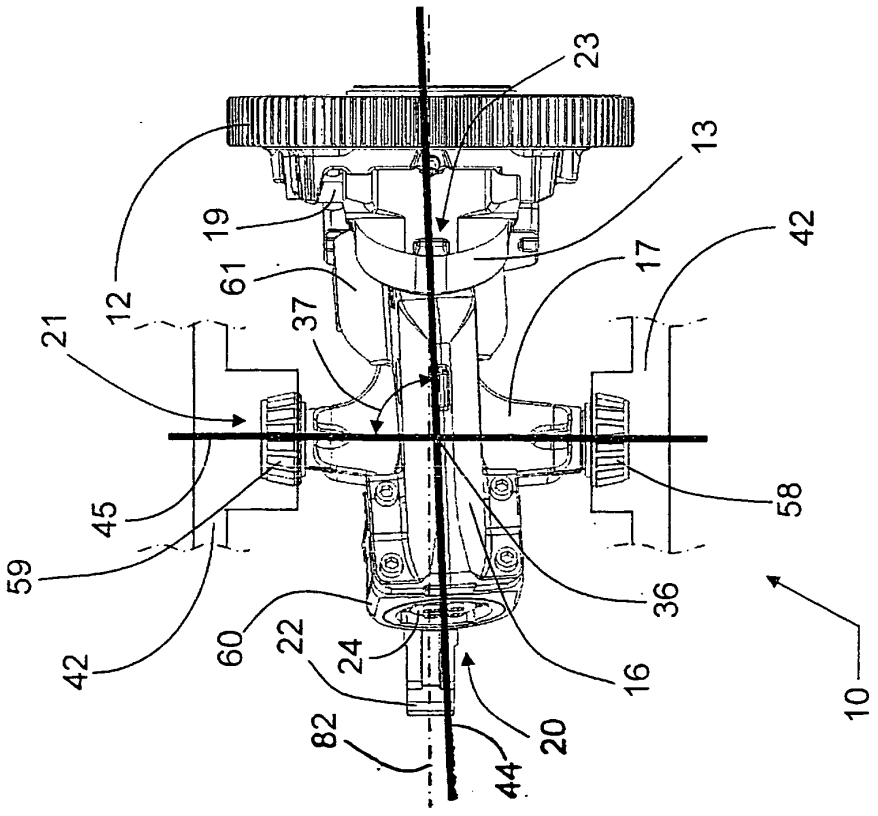

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Fig. 3


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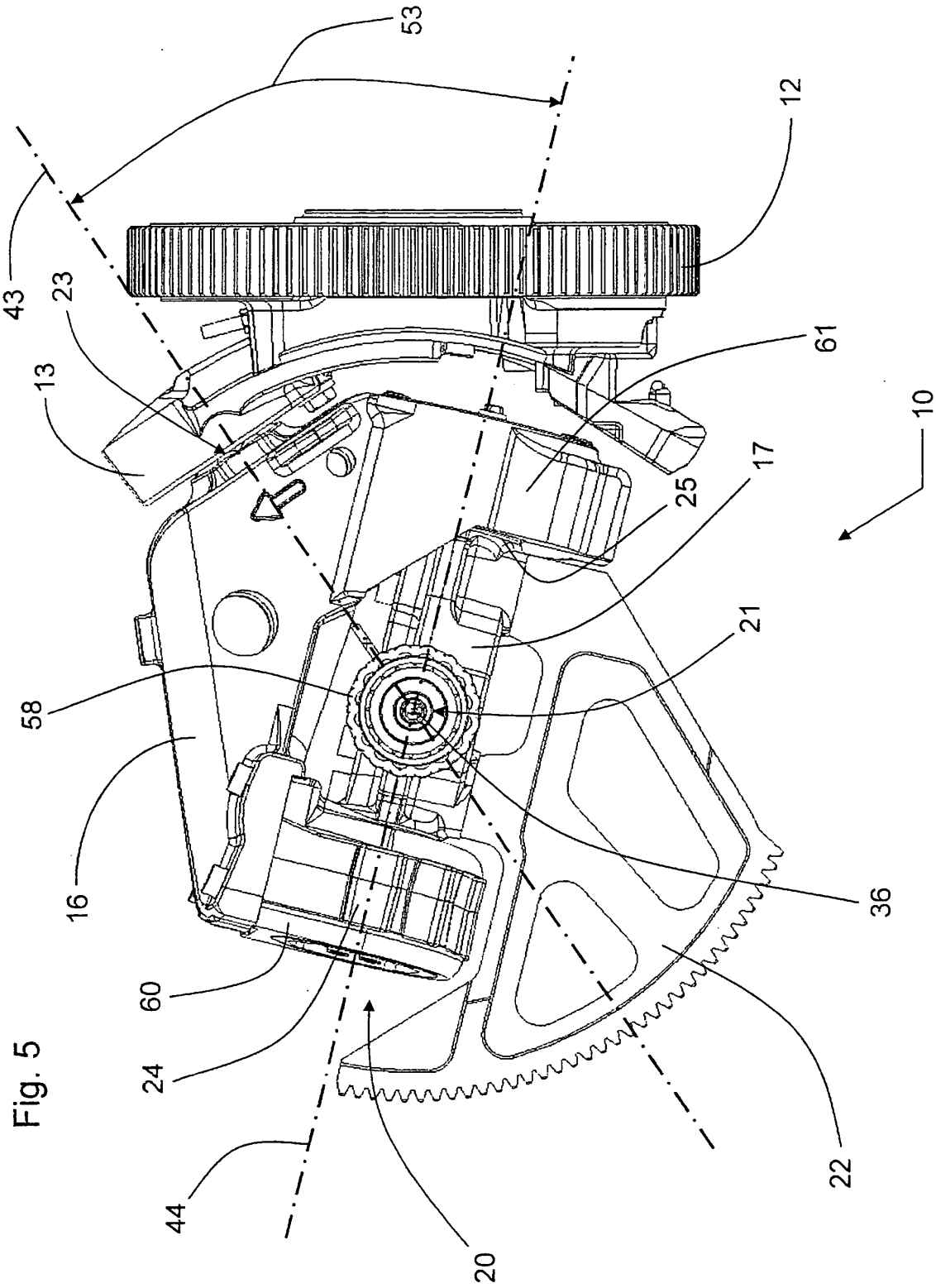


Fig. 5

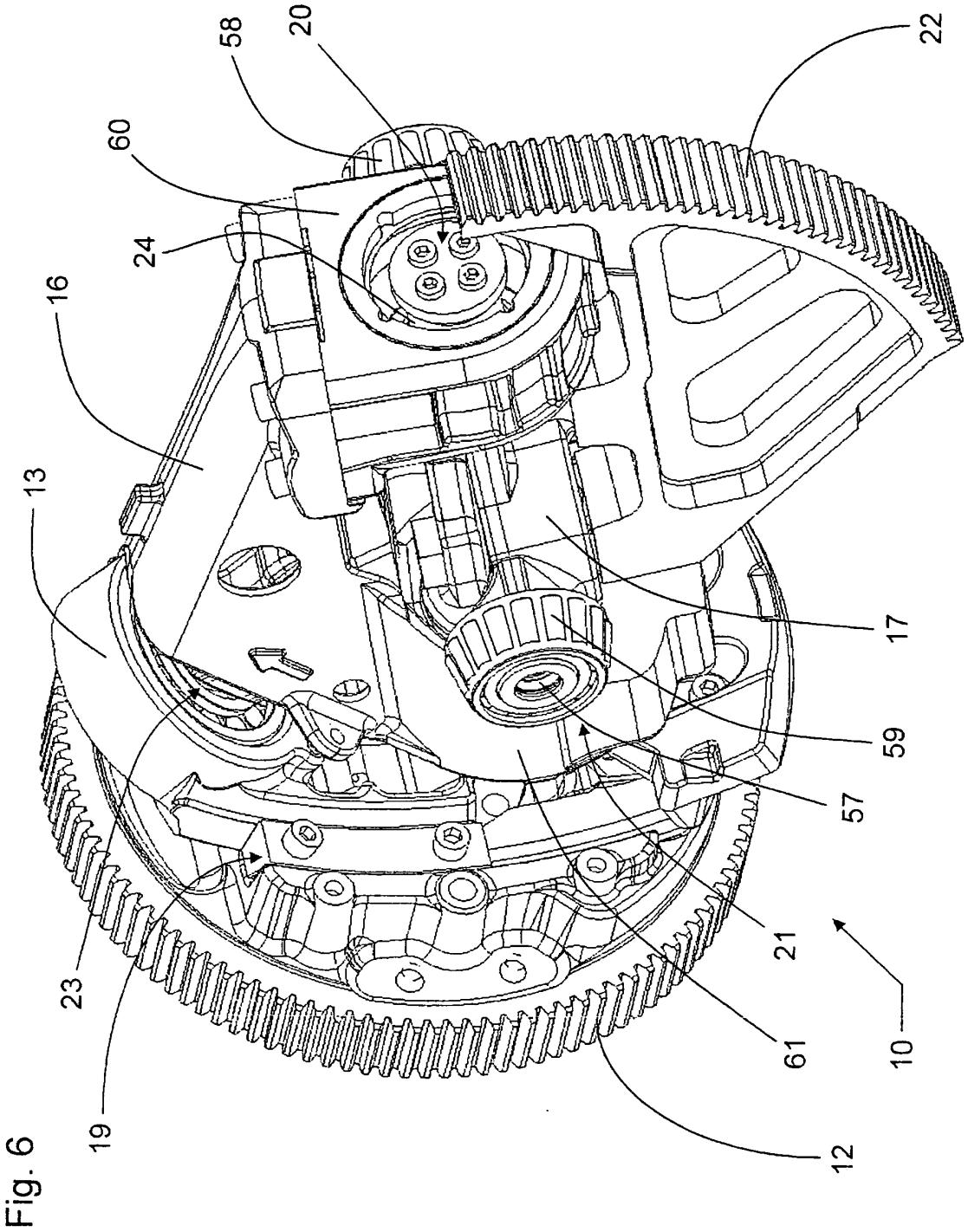


Fig. 6

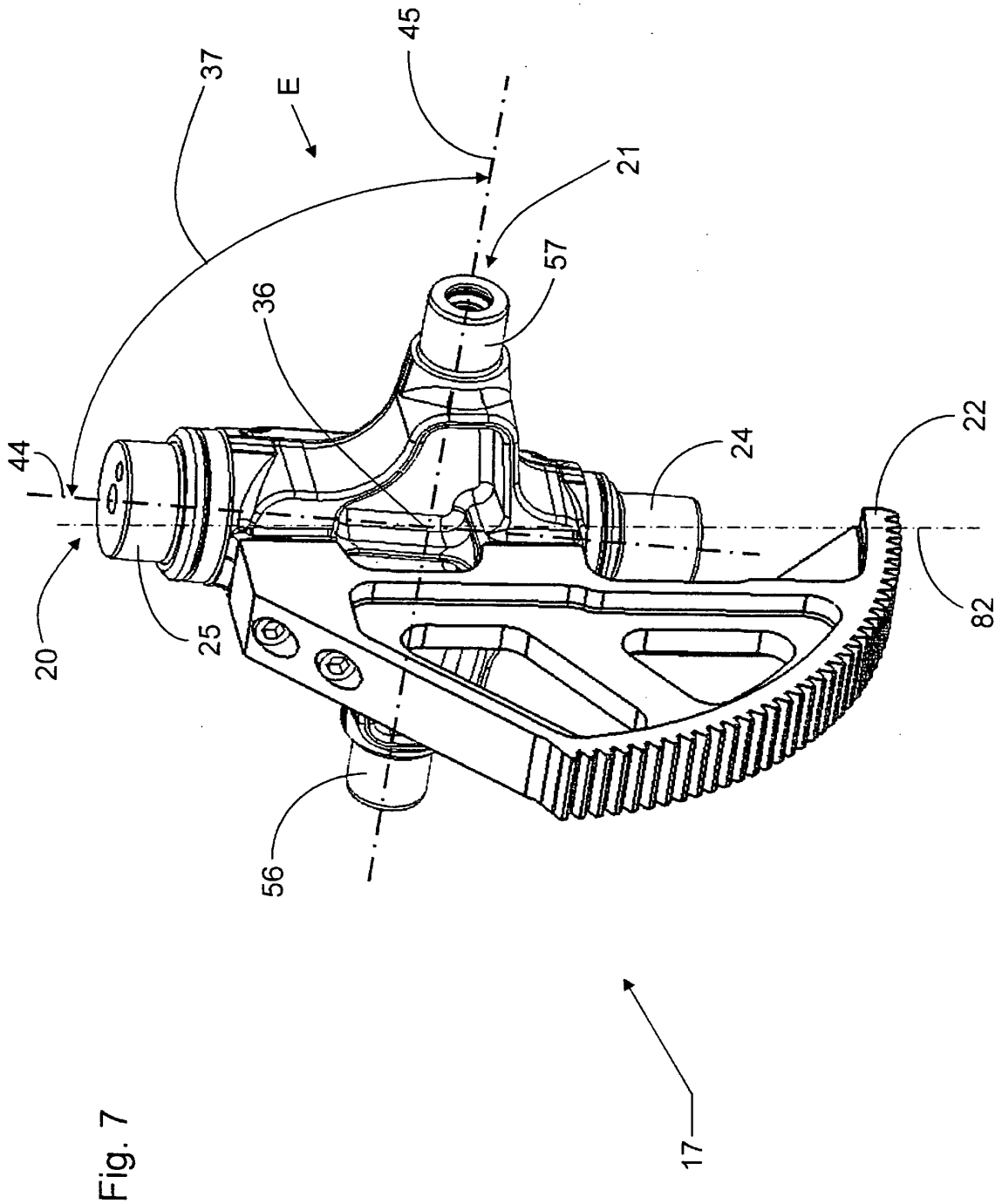


Fig. 7

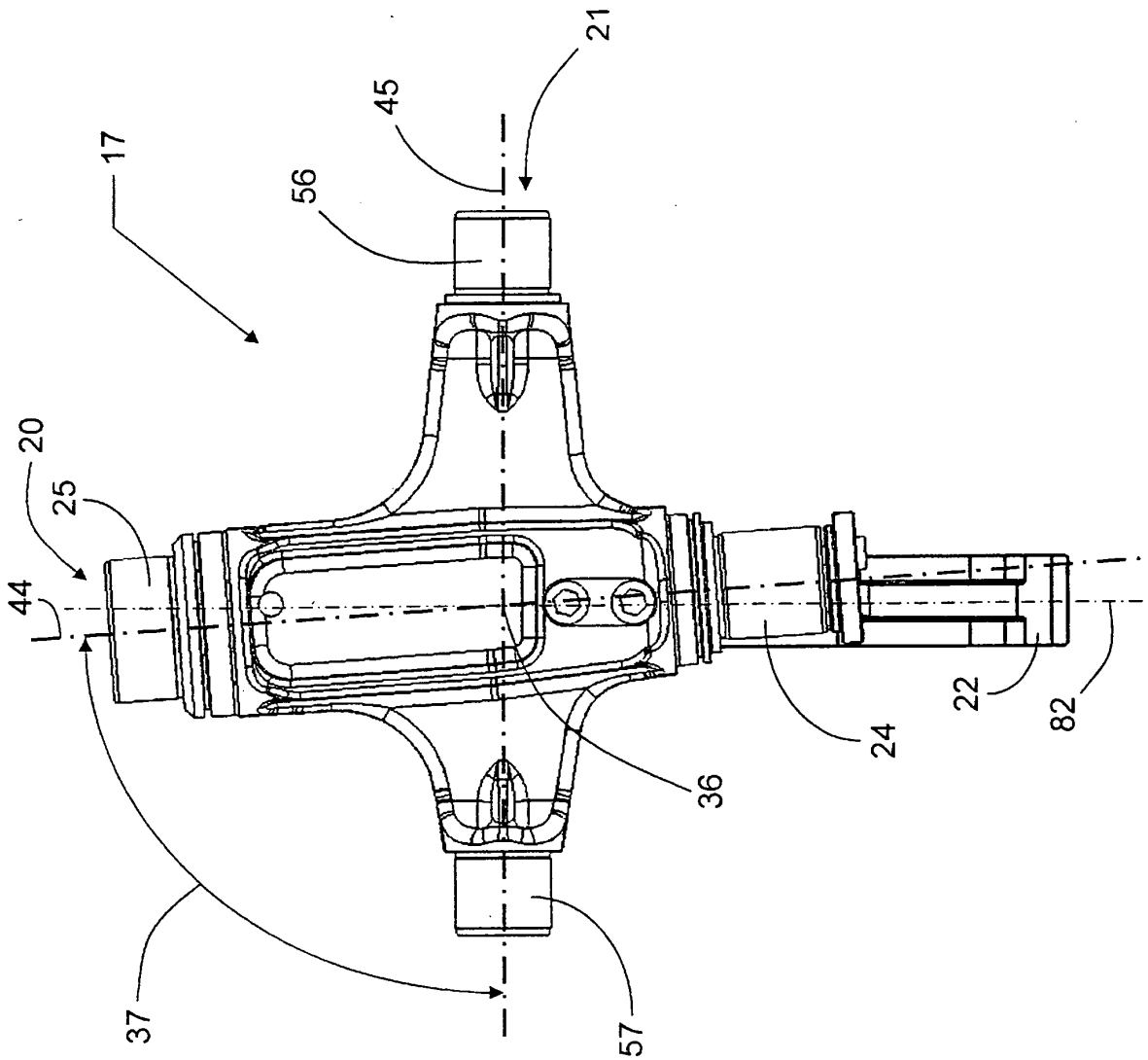


Fig. 8

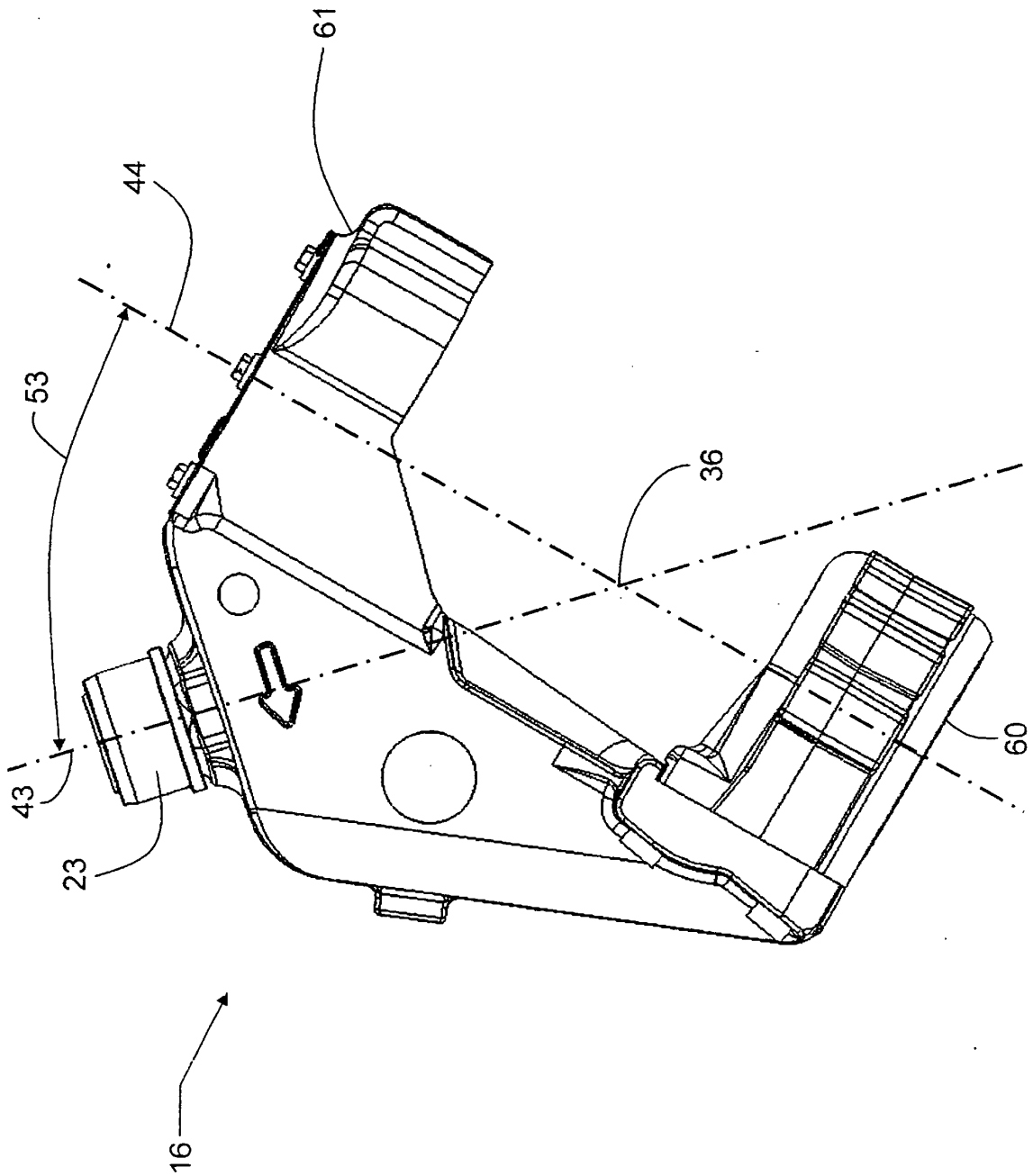


Fig. 9

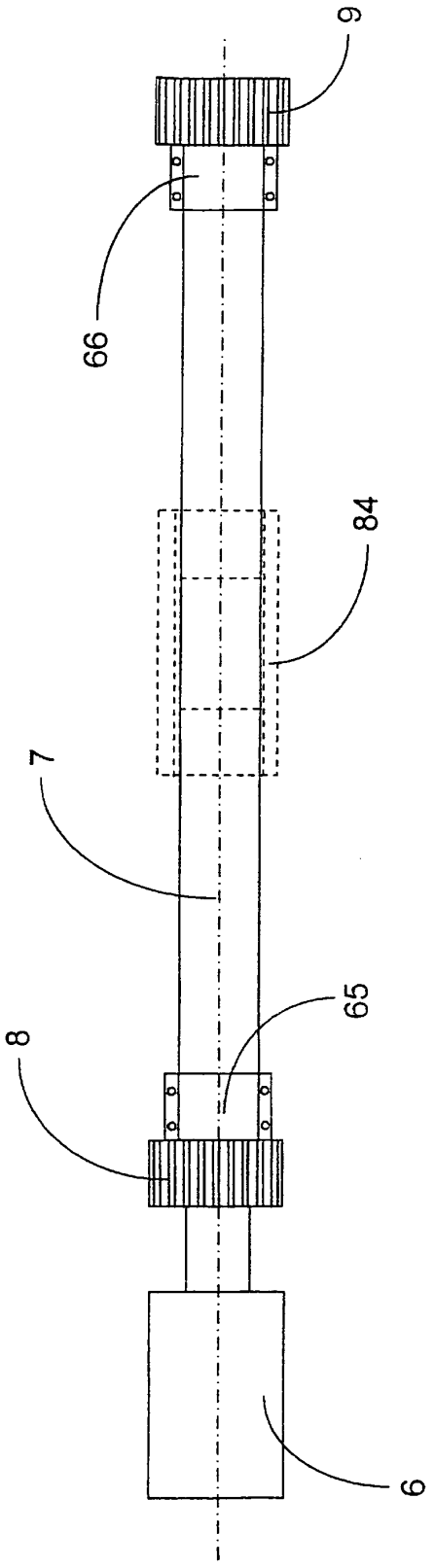


Fig. 10

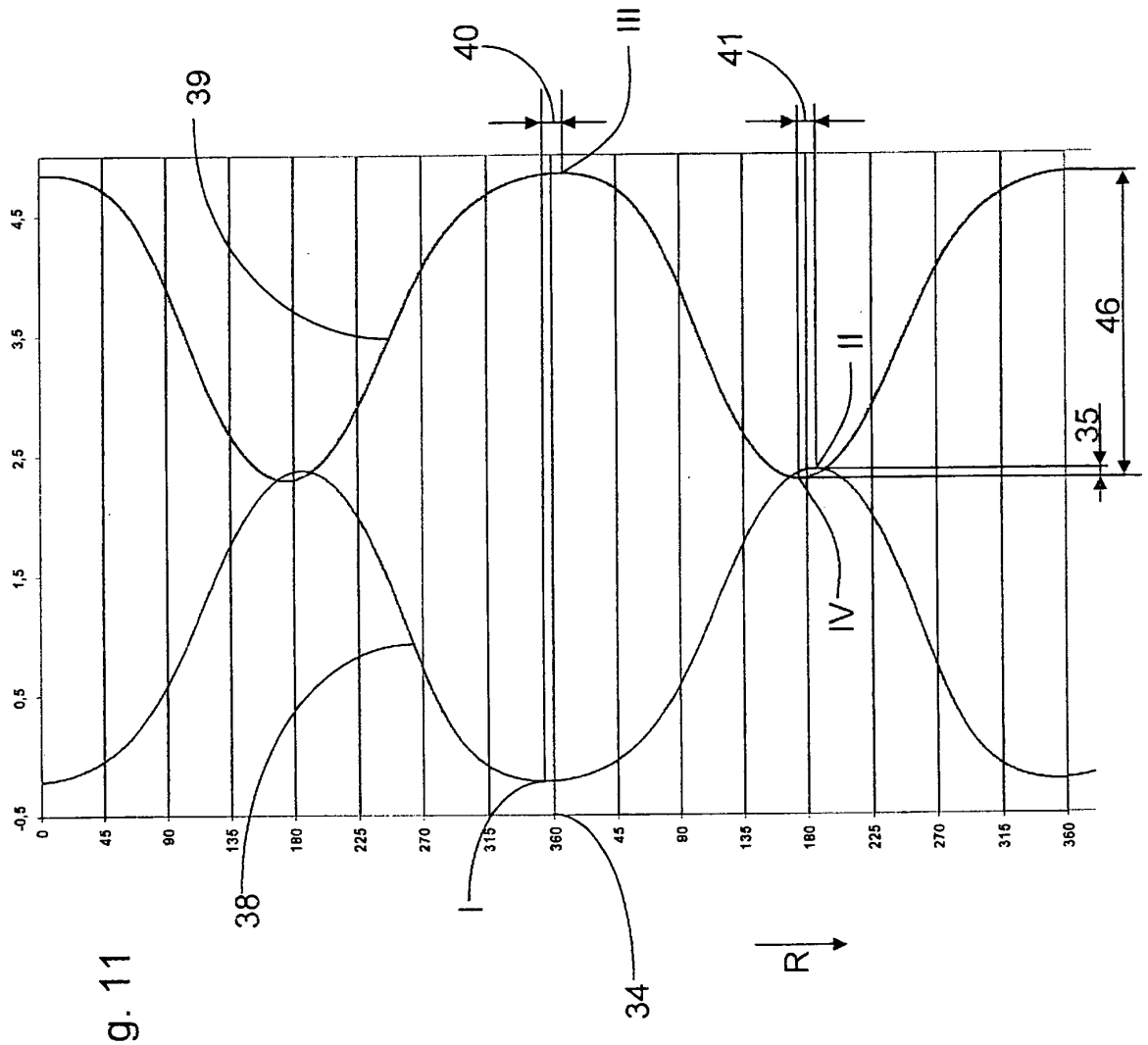
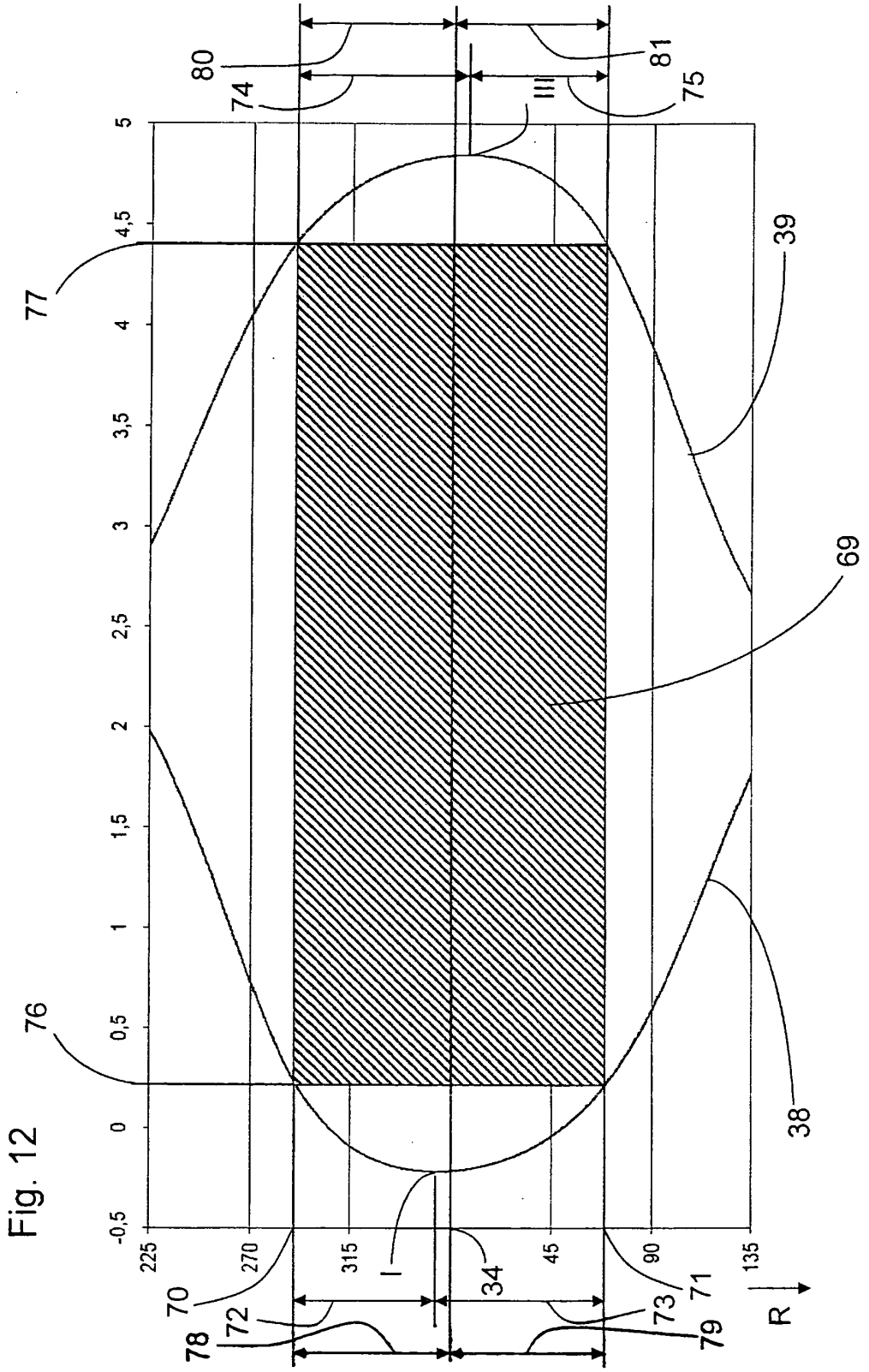

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Fig. 11

Fig. 12


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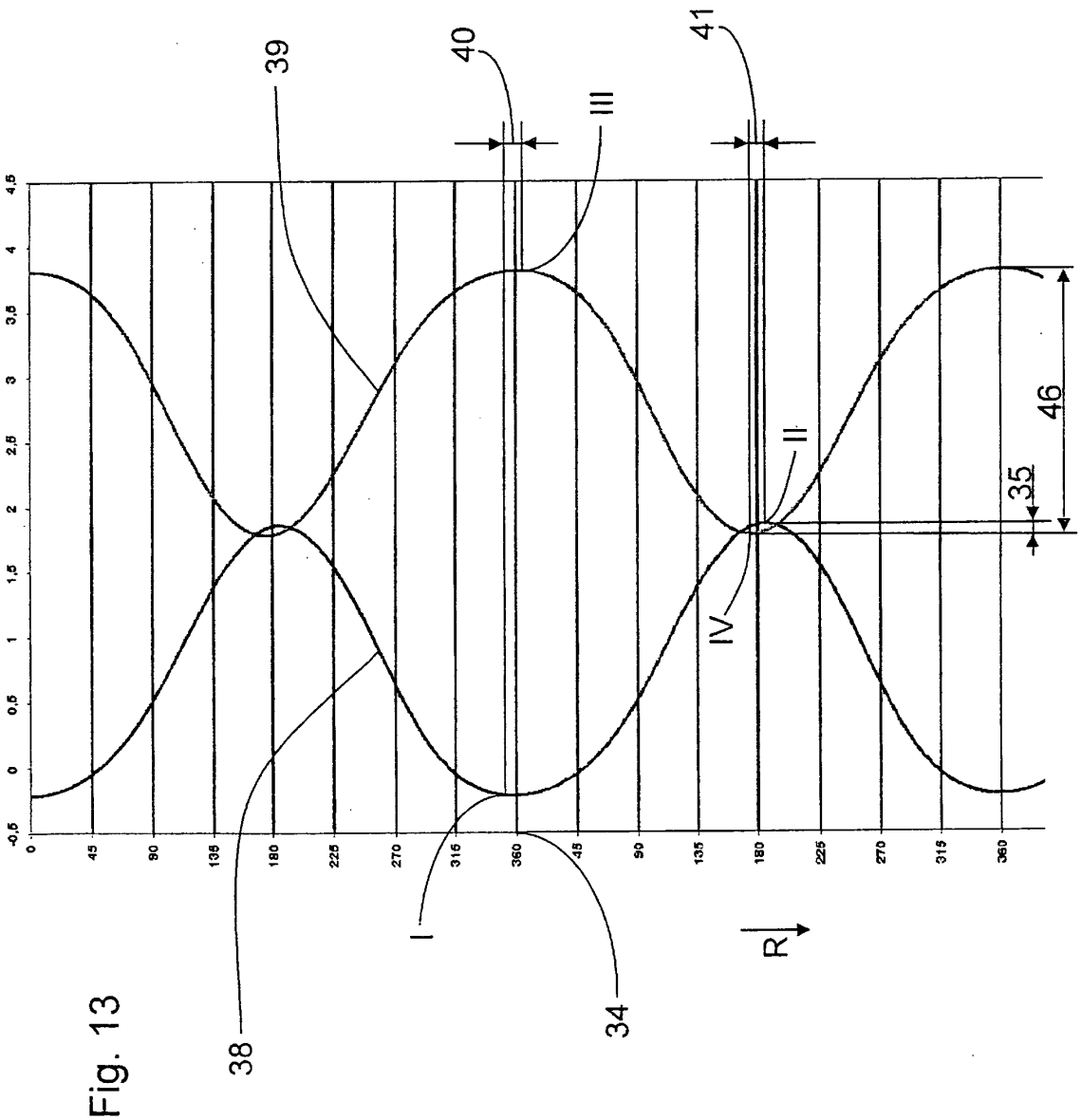

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Fig. 13

REFERENCES CITED IN THE DESCRIPTION

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