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(54) CRIMPING TOOL, BASE, RAM ASSEMBLY, PLANT AND METHOD OF CHANGING BETWEEN TOOLS OF A CRIMPING TOOL

CRIMPWERKZEUG, BASIS, RAMMANORDNUNG, ANLAGE UND VERFAHREN ZUM WECHSELN ZWISCHEN WERKZEUGEN EINES CRIMPWERKZEUGS

OUTIL DE SERTISSAGE, BASE, ENSEMBLE PISTON-PLONGEUR, INSTALLATION ET PROCÉDÉ DE CHANGEMENT ENTRE LES OUTILS D'UN OUTIL DE SERTISSAGE

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Description

[0001] The present invention relates to a crimping tool according to the preamble of claim 1. The invention further relates to an assembly comprising the crimping tool and a base, to a plant for the automated production of wiring harnesses and to a method of changing between crimping rams of a crimping tool.

[0002] Crimping is the process of joining two or more components, such as pieces of metal or other ductile material to one another. The joint is formed by deforming one or more of the pieces to be joined. For example electrical terminals are joined to conductors of electric cables in order to use the terminal to connect the cable to an electronic installation. The terminal typically has a crimp portion that is arranged adjacent to the terminal. The crimp portion is designed to be deformed relative to the conductor of the electric cable to form an electrically conductive connection between the conductor and the terminal.

[0003] Semi-automatic or automatic crimping tools require a specific die assembly for each type of terminal to be crimped. The terminal and the cable are placed at an anvil and a crimp portion is deformed towards the anvil by means of a press to produce the crimp in such crimping tools. Typically a separate die assembly and crimping anvil is provided for each size and shape of terminal that needs to be crimped, i.e. a specifically shaped tool is used for each type of terminal. Even for similar terminals one individual crimping die has to be used and installed at the crimping station which is demanding in effort and cost.

[0004] Moreover, in a factory operated to e.g. produce electrical components, for example, wiring harnesses of vehicles, such as cars, various cables and terminals are connected one to another on the formation of the electrical components. Depending on the application of the terminal, the terminal and the associated cable have various sizes (diameters and lengths) adapted to the application. Each type of terminal and each size of cable requires its own crimping tool in order to produce the crimp, thus a plethora of tools is required for the individual cables of one and the same wiring harness. The documents FR2643514A1 and JP2002158074A disclose crimping tools according the preamble of claim 1.

[0005] Setting up the automatic crimping tools such that they can crimp a certain type of terminal to a specific cable takes time and precision in order to ensure good quality joins, i.e. crimps.

[0006] It is therefore an object of the present invention to make available a tool for crimping terminals that reduces the time required to change a tool for different terminals to be crimped. It is a further object of the invention to reduce the number of crimping stations required to crimp a plurality of various types of terminals in one plant. It is a further object of the invention to increase the efficiency of a plant adapted to crimping a plethora of terminals.

[0007] This object is satisfied by a crimping tool for connecting terminals to components in accordance with claim 1. Advantageous designs of the crimping tool are discussed in the dependent claims and the following description.

[0008] Such a crimping tool, in particular an automatic crimping tool, comprises: a ram assembly having a plurality of vertical sides, with the ram assembly being configured to reciprocally move to and fro between a crimping position and a position of rest; and a plurality of tools arranged at least two of the vertical sides, with each tool being configured to cooperate with a crimping anvil to crimp the terminals to the respective components.

[0009] In this way a crimping tool can be made available that is capable of crimping terminals of different shape and/or size with respect to the component at one and the same apparatus at different vertical sides of the apparatus.

[0010] To date no crimping tool was available that comprised a ram assembly having a plurality of tools mounted thereon at different sides, with the different tools each being capable of processing terminals if in the crimping position. Moreover, the up time of the crimping tool is increased as the period between setting up the crimping tool and the calibration is reduced for the different tools. Moreover, a crimp process control is improved, since fewer crimping tools exist and the changeover between tools is made more simply and less costly with respect to time.

[0011] Problems associated with a low efficiency of the plant due to changeovers having to occur between terminals of different size are overcome by simply moving the spare crimp tools into an active position and subsequently using these tools to connect terminals to components such as cables.

[0012] Moreover, prior art crimping tools required a re-calibration if the ram assembly was removed, by not having to remove the ram assembly to switch between different tools, the crimping tool does not require a re-calibration on switching between different tools. On installing e.g. four or five tools at a rectangular or pentagonal shaped ram assembly and installing this at the crimping tool one calibration process can take place for four to five tools simultaneously cutting back on down time considerably and increasing the efficiency of a plant while simultaneously being able to reduce the number of crimping stations for the same number of tools.

[0013] It is preferred if the crimping tool is an automatic crimping tool and if the crimping tool is configured to only use a respective one of the tools during a crimping action.

[0014] Each crimping ram differs from any other crimping ram from the plurality of crimping rams. In this way one and the same ram assembly can be used for various terminals without requiring a recalibration of the ram assembly on switching between tools of the crimping tool.

[0015] The ram assembly has a substantially polygonal outer shape forming vertical sides, preferably an at least substantially rectangular outer shape with four ver-

tical sides, each vertical side comprising a mount for the respective ram. Such shapes can be used to mount three, four, five six or more tools at one crimping station increasing the flexibility of the system. The crimping tool thereby allows the processing of e.g. four terminals at the same tool body without having to recalibrate the crimping tool between tool changes.

[0016] It is preferred if the ram assembly is configured to be moved such that only one of the plurality of tools can occupy the crimping position in which one terminal can be crimped to one component at a time. This means that one only of the tools is in an active position in which it is capable of carrying out a crimping process at the same time. The remaining tools are inactive and thereby do not wear while present at the ram assembly.

[0017] The crimping tool further comprises a rotatable disc, with a plurality of crimping anvils being arranged at the rotatable disc. A rotatable disc is an advantageous component to allow a swift change between tools. Providing the plurality of crimping anvils at the rotatable disc ensures that both the tool, i.e. the die assembly, and the anvil are adapted to the terminal and the component to be processed. The ram assembly is also arranged at the rotatable disc such that the crimping anvil can be moved together with the tools from an inactive position to an active position.

[0018] Advantageously a respective crimping anvil is associated with a respective one of the plurality of tools, i.e. each tool is configured to interact with a specific one of the plurality of crimping anvils, and said respective crimping anvil and its associated tool can be moved, in particular rotated, into an active position forming part of the crimping position of the ram assembly by means of the rotatable disc. The provision of a respective crimping anvil for a respective tool ensures the correct combination of parts for carrying out a crimp at a specific size of terminal.

[0019] It is preferred if at least one of the rotatable disc and the base comprises a ram assembly receiver adapted to receive a part of the ram assembly, with the ram assembly receiver optionally being configured to entrain the ram assembly such that the ram assembly can be moved to move one of the tools from an inactive position into an active position; and/or with the ram assembly receiver having an opening with an at least polygonal shape in a cross-section thereof, preferably an at least substantially square or rectangular cross-section, with the opening preferably being configured to receive a correspondingly shaped part of the ram assembly, in particular a coupling portion of the ram assembly.

[0020] Forming the ram assembly receiver at one of the rotatable disc and the base ensures that the components that are moved, in particular rotated, on changing between tools can interact with one another. In this way a size of the crimping tool can be reduced while a rigidity of the crimping tool can be enhanced.

[0021] Preferably the rotatable disc is arranged at a base and can be locked into a plurality of pre-defined positions at the base, wherein each pre-defined position corresponds to a position in which one of the plurality of tools and its associated crimping anvil can occupy the crimping position. Being able to lock the crimping tool into various positions ensures that the tool in use cannot accidentally be moved out of use.

[0022] Preferably coding means, such as color coding means, can be provided at the crimping tool. Thereby the correct tool for the correct terminal can be installed in the active position at the crimping tool.

[0023] Advantageously the tools are configured as removable from said ram assembly and the ram assembly comprises a plurality of mounts for said tools, with each one of the plurality of mounts preferably being of identical design, and/or with one mount preferably being provided at each vertical side. In this way one and the same ram assembly can be used for a plethora of tools when a change is made between tools at the ram assembly. Providing one tool per vertical side allows the crimping of terminals to one cable at a time.

[0024] It is preferred if each tool comprises a die assembly, with each die assembly comprising at least one of a conductor crimping plate, an insulator crimping plate and a strip cutting tool. Such tools are advantageously used to carry out the crimping process.

[0025] Preferably the ram assembly is connected to a crimping head comprising tool setting means by means of which tool setting means a position of each of the tools can be pre-defined relative to the crimping anvil and/or terminal, preferably wherein the tool setting means are configured to set a position of all of the tools arranged at the ram assembly. In this way one and the same crimping head can be used to calibrate the plurality of tools installed at the ram assembly.

[0026] According to a further aspect the present invention relates to an assembly comprising the crimping tool of claim 1 and a base for said crimping tool, wherein the base comprises a plurality of crimping anvil receivers and a ram assembly receiver, wherein the plurality of crimping anvil receivers and at least a part of the ram assembly receiver is formed at the rotatable disc. Such a base can advantageously be used in a crimping tool as described in the foregoing having a plurality of tools present thereat. For this reason the advantages discussed in the foregoing also hold true for the base.

[0027] According to a further aspect the present invention relates to a plant for the automated production of crimped cables, the plant comprising one or more crimping tools in accordance with any of claims 1 to 7. Such a plant has an increased output efficiency, as the downtimes between tool changes can be reduced significantly.

[0028] According to yet a further aspect the present invention relates to a method of changing between crimping rams of a crimping tool, the crimping tool comprising a plurality of tools arranged at a ram assembly, the method comprising the step of moving the ram assembly to move a respective one of the plurality of tools from an inactive position - in which no crimping takes place - to

an active position - in which a crimping action can take place, wherein the step of moving preferably comprises a rotating movement.

[0029] Further embodiments of the invention are described in the following description of the Figures. The invention will be explained in the following in detail by means of embodiments and with reference to the drawing in which is shown:

Fig. 1 a view of a prior art crimping tool, as well as an exploded view of the individual components of the prior art crimping tool;
Fig. 2 a perspective view of a first embodiment of an automatic crimping tool;
Fig. 3 a perspective view of a ram assembly of the automatic crimping tool of Fig. 2;
Fig. 4 a perspective view of a base and associated crimping anvils of the automatic crimping tool of Fig. 2;
Fig. 5 a schematic example of a tool; and
Fig. 6 an example of a strip cord for guiding terminals.

[0030] In the following the same reference numerals will be used for parts having the same or equivalent function. Any statements made having regard to the direction of a component are made relative to the position shown in the drawing and can naturally vary in the actual position of application.

[0031] Fig. 1 shows a prior art automatic crimping tool 10'. The crimping tool 10' comprises a ram assembly 12' moveably received in a guide block 14'. A crimping anvil 16' is arranged at a base 18' of the guide block 14' and is in reciprocal engagement with the ram assembly 12' on the vertical to and fro movement of the ram assembly 12' towards and away from the crimping anvil 16'.

[0032] A terminal feeding unit 20' is provided to feed terminals 60, e.g. present at a strip cord 58 (see Fig. 6), to the crimping anvil 16'. The crimping tool 10' further comprises a feeder unit 22', such as a mechanic, pneumatic or hydraulic feeder unit 22' to drive the ram assembly 12' and to actuate a guiding of terminals 60 via the terminal feeding unit 20' to the crimping anvil 16'.

[0033] On driving the ram assembly 12' towards the crimping anvil 16', a cable (not shown) can be connected to a respective terminal 60 placed at the crimping anvil 16'.

[0034] For the purpose of crimping, the ram assembly 12' comprises a die assembly 24'. The die assembly 24' is shaped so as to connect a crimp portion of the terminal 60 to a conductor of the cable and optionally also an insulation crimp portion to an insulation of the cable at the crimping anvil 16'. The crimping anvil 16' is configured as a terminal support and shaped to hold the terminals 60 in a defined position until the end of the crimping process for a respective terminal 60.

[0035] The die assembly 24' may also comprise means for separating the terminal 60 from the strip cord 58 via which it is supplied to the crimping anvil 16'.

[0036] The ram assembly 12' further comprises a crimping head 26' via which at least one of a crimp height, an insulation height and a cutting height can be adapted in dependence on size and dimensions of the terminals 60 and the cables to be crimped one to another as well as the strip cord 58 in a manner known per se.

[0037] The terminal feeding unit 20' is connected to the feeder unit 22' and their actions are synchronized in such a way that a new terminal 60 is fed to the crimping anvil 16' once a terminal 60 crimped to a cable is removed and the ram assembly 12' is moved away from the crimping anvil 16'.

[0038] Fig. 2 shows a perspective view of a first embodiment of an automatic crimping tool 10. The automatic crimping tool 10 comprises a ram assembly 12 having four vertical sides 28 of which only two can be seen in Fig. 2. The ram assembly 12 is configured to reciprocally move to and fro, i.e. down and up, between a crimping position and a position of rest. A tool 24 is arranged at each of the vertical sides 28. Each tool 24 is configured to cooperate with a respective crimping anvil 16 to crimp terminals 60 to respective components.

[0039] It should be noted in this connection that each tool 24 preferably differs from the other three tools 24 arranged at the ram assembly 12 and that each tool 24 is adapted to deform terminals 60 of different shape and/or size in comparison to the other tools 24 arranged at the ram assembly 12 with respect to the component at the crimping anvil 16 to form a crimp.

[0040] The crimping tool also comprises a feeder unit 22 adapted to drive the ram assembly 12. In the present instance the feeder unit is driven pneumatically, it should be noted that the feeder unit 22 could also be driven hydraulically or by means of an electric motor. Like with the prior art crimping tool 10' of Fig. 1 the crimping tool 10 of Fig. 2 comprises a terminal feeding unit 20 that is covered by the feeder unit 22 in the drawing shown.

[0041] The actions of the terminal feeding unit 20 and of the feeder unit 22 are synchronized such that on an upward movement of the ram assembly 12, a new terminal is introduced a the crimping anvil 16 for a subsequent crimping action.

[0042] On operation of the crimping tool 10 the ram assembly 12 is configured to be moved such that only one of the plurality of tools 24 can occupy the crimping position in which one terminal 60 can be crimped to one component at a time, i.e. the automatic crimping tool 10 is configured to only use a respective one of the tools 24 during a crimping action.

[0043] A rotatable disc 30 is arranged at the base 18, with a plurality of crimping anvils 16 being arranged at the rotatable disc 30. Each crimping anvil 16 is associated with one of the plurality of tools 24, i.e. a crimping anvil 16 is provided for each vertical side 28 of the ram assembly 12. Each crimping anvil 16 and its associated tool 24 can be moved, in particular rotated, into an active position forming part of the crimping position of the ram assembly 12 by means of the rotatable disc 30.

[0044] The rotatable disc 30 is arranged at the base 18 and can be locked into a plurality of pre-defined positions at the base 18, i.e. the active position and the inactive positions. The active position corresponds to a position in which the crimping action can take place and that comprises the crimping position of the ram assembly 12. In the active position one of the plurality of tools 24 and its associated crimping anvil 16 can be brought so close to one another that the tool 24 deforms crimping portions 62, 64 of the terminal 60 (see Fig. 6) and crimps a conductor crimp portion 64 to the conductor of e.g. a component, such as a cable, and an insulting crimp portion 62 to an insulator of the cable.

[0045] Further shown is a lever 100 via which the rotatable disc 30 can be locked into one of the positions at the base 18. In the unlocked position the rotatable disc 30 can be rotated to move one of the crimping anvils 16 from the inactive position into the active portion while moving the crimping anvil 16 previously present in the active position into an inactive position.

[0046] Fig. 3 shows a perspective view of the ram assembly 12 of the automatic crimping tool 10 of Fig. 2. The ram assembly 12 comprises the plurality of vertical sides 28 with each vertical side 28 comprising a mount 32 for a respective tool 24 for connecting terminals 60 to a component. In this way the tools 24 are configured as removable from said ram assembly 12.

[0047] The plurality of mounts 32 can either be of identical design and size, or vary in their design and/or size in dependence on the tool 24, such as a die assembly (see Fig. 5) installed at the mount 32.

[0048] The ram assembly 12 is connected to a crimping head 34 at the top end of Fig. 3. The crimping head 34 comprises tool setting means 36, 38. The tool setting means 36, 38 can vary a position each of the tools 24 can adopt relative to the crimping anvil 16. In this connection only one tool setting means 36, 38 is provided that is configured to set a position of all of the tools 24 arranged at the ram assembly 12. In this connection it should be noted that tool setting means 36, 38 could be provided for each of the tools 24.

[0049] The tool setting means 36, 38 can be configured to vary at least one of a crimp height, an insulation height and a cutting height in dependence on the size and dimensions of the terminals 60 and the cables to be crimped one to another.

[0050] Each tool 24 differs from the other tools 24 of the plurality of tools 24 arranged at the ram assembly 12. Each tool is configured as a ram that is adapted to crimp the terminal 60 to the cable.

[0051] The ram assembly 12 has an at least substantially polygonal outer shape. In the example of Figs. 2 to 4 the ram assembly has a rectangular outer shape making up the four vertical sides 28 having the respective mount 32 for a respective tool 24 present there.

[0052] At the end of the ram assembly 12 disposed opposite to the crimping head 34, the ram assembly 12 comprises a coupling portion 40 via which the ram assembly 12 can be coupled to the base 18. The coupling portion 40 also has a rectangular shape in a cross-section thereof.

[0053] Fig. 4 shows a perspective view of the base 18 and the associated crimping anvils 16 of the automatic crimping tool 10 of Fig. 2 arranged at the rotatable disc 30. The base 18 further comprises a ram assembly receiver 42 formed at the rotatable disc 30 between and by the four crimping anvil receivers 44. The four crimping anvil receivers 44 can be of differing height and/or size, with walls of the coupling portion 40 likewise having differences in height and/or size. The different heights and/or sizes of the crimping anvil receivers 44 and of the coupling portion 40 can enable a coded alignment of the ram assembly 12 relative to the rotatable disc 30 such that each corresponding tool 24 is aligned with its associated crimping anvil 16.

[0054] The ram assembly receiver 42 has an opening with an at least polygonal shape in a cross-section thereof, in the present instance an at least substantially square cross-section. The opening is configured to receive a correspondingly shaped part of the ram assembly 12, namely the coupling portion 40.

[0055] Individual components 46 of the crimping anvils 16 are connected to the respective crimping anvil receivers 44 by means of connection elements 48. In the present instance by a combination of a screw that engages a corresponding thread present at the crimping anvil receiver 44.

[0056] The components 46 comprise a stationary terminal support surface adapted to support the terminal 60 during the crimping process, an insulation portion support surface adapted to support the part of the insulation to which the terminal 60 is crimped and a conductor portion support surface adapted to support the part of the conductor to which the terminal 60 is crimped.

[0057] The ram assembly receiver 42 is configured to entrain the ram assembly via the coupling portion 40 such that the ram assembly 12 can be moved to move one of the tools 24 and its associated crimping anvil 16 from an inactive position into an active position. The tools 24 are moved by means of rotation of the rotatable disc 30. The automatic crimping tool 10 is configured to only use a respective one of the tools 24 during a crimping action.

[0058] The automatic crimping tool 10 discussed in the foregoing can be installed in a plant (not shown) for the automated production of crimped cables, the plant comprising one or more such crimping tools 10 or a combination of crimping tools 10 with prior art crimping tools 10'. The plant can be semi-automatic, e.g. the cables are individually guided to the crimping tool 10 by means of personnel, on the other hand the plant can be fully automatic and the cables are guided to the respective crimping tool via a robot.

[0059] Fig. 5 shows a schematic example of the tool 24, i.e. the die assembly as can be used in Fig. 2. The tool 24 is composed of a ram 50 at which a wire guide 52, an insulator crimping plate 54 and a conductor crimp-

ing plate 56 are mounted, e.g. via screws (not shown). The wire guide 52 is configured to guide the cable to the terminal 60. The insulator crimping plate 54 is used to deform portions of the terminal 60 with respect to the insulator of the cable. The conductor crimping plate 56 is used to deform portions of the terminal 60 with respect to a conductor, i.e. the core, of a cable.

[0060] The ram 50 is attachable to the ram assembly 12 and on the to and fro movement enables the crimping of the terminals 60 the respective components. The attachment of the ram 50 and the further parts of the die assembly to the ram assembly 12 can be made by way of grooves and/or fastener elements (both not shown) cooperating with corresponding members present at the ram assembly 12.

[0061] Not shown, but likewise optionally available at the crimping tool 10 is a strip cutting tool that is used to separate a respectively crimped terminal 60 from the strip cord 58, so that the cable with the attached terminal 60 can be removed from the crimping tool 10 after a crimping process has taken place.

[0062] Fig. 6 shows a schematic example of the strip cord 58 having the terminals 60 attached thereto. Each terminal 60 comprises the insulator crimp portion 62 used to crimp the terminal 60 to an insulator of a cable and the conductor crimp portion 64 used to crimp the terminal 60 to a conductor of a cable. A connector 66 is present at the free end of the terminal 60 and is configured to be connected to a further electric component (not shown).

[0063] On making a change between the tools 24 of the automatic crimping tool 10, the lever 100 is set such that the rotatable disc 30 is moved into the unlocked position and can be rotated. Thereby the desired crimping anvil 16 and the associated tool 24can be rotated into the active position while a further currently non-desired crimping anvil 16 and its associated tool 24 are moved from the active position into an inactive position by means of a rotation. Thereafter, the lever is engaged again to lock the rotatable disc 30 in a locked position.

[0064] In the active position a crimping action can take place due to the reciprocal movement of the ram assembly 12 to and away from the crimping anvil 16 between a crimping position in which a terminal is crimped to a cable and a position of rest in which no crimping takes place.

Claims

1. A crimping tool (10) for connecting terminals (60) to components, the crimping tool (10) comprising:
   a ram assembly (12) having a plurality of vertical sides (28), the ram assembly (12) being configured to reciprocally move to and from between a crimping position and a position of rest;
   characterized by

   a plurality of crimping rams (24) arranged on at least two of the vertical sides (28), each crimping ram (24) being configured to cooperate with a corresponding crimping anvil (16) to crimp the terminals (60) to the respective components,
   wherein each crimping ram (24) differs from any other crimping ram (24) from the plurality of crimping rams (24),
   wherein the ram assembly (12) has a substantially polygonal outer shape forming the vertical sides (28), preferably a substantially rectangular outer shape with four vertical sides (28), each vertical side (28) comprising a mount (32) for the respective ram (24) from the plurality of crimping rams (24),
   the crimping tool (10) further comprising a rotatable disc (30) with a plurality of crimping anvils (16) arranged at the rotatable disc (30), wherein the ram assembly (12) is arranged at the rotatable disc (30).

2. A crimping tool (10) in accordance with claim 1, wherein a respective crimping anvil (16) is associated with a respective ram (24) from the plurality of crimping rams (24) and said respective crimping anvil (16) and its associated crimping ram (24) can be moved, in particular rotated, into an active position forming part of the crimping position of the ram assembly (12) by means of the rotatable disc (30).

3. A crimping tool (10) in accordance with claim 1 or claim 2, wherein at least one of the rotatable disc (30) and a base (18) forming a support for the rotatable disc (30), comprises a ram assembly receiver (42) adapted to receive a part of the ram assembly (12), with the ram assembly receiver (42) optionally being configured to entrain the ram assembly (12) such that the ram assembly (12) can be moved to move one of the crimping rams (24) from an inactive position into an active position; and/or with the ram assembly receiver (42) having an opening with an at least polygonal shape in a cross-section thereof, preferably an at least substantially square or rectangular cross-section, with the opening preferably being configured to receive a correspondingly shaped part of the ram assembly (12), in particular a coupling portion (40) of the ram assembly (12).

4. A crimping tool (10) in accordance with one of claims 1 to 3, wherein the rotatable disc (30) is arranged at a base (18) and can be locked into a plurality of predefined positions at the base (18), wherein each predefined position corresponds to a position in which one of the plurality of crimping rams (24) and its associated crimping anvil (16) can occupy the crimping position.

5. A crimping tool (10) in accordance with any of the preceding claims, wherein the crimping rams (24)

are configured as removable from said ram assembly (12) wherein the plurality of mounts (32) are of identical design.

6. A crimping tool (10) in accordance with any of the preceding claims, wherein each crimping ram (24) comprises a die assembly, with each die assembly comprising at least one of a conductor crimping plate (56), an insulator crimping plate (54), a wire guide (52) and a strip cutting tool; and/or
wherein coding means, such as color coding means, are provided at the crimping tool (10).

7. A crimping tool (10) in accordance with any of the preceding claims, wherein the ram assembly (12) is connected to a crimping head (34) comprising tool setting means (36, 38) by means of which a position of each of the crimping rams (24) can be pre-defined relative to the crimping anvil (16) and/or terminal (60), preferably wherein the tool setting means (36, 38) are configured to set a position of all of the crimping rams (24) arranged at the ram assembly (12).

8. An assembly comprising the crimping tool (10) of claim 1 and a base (18) for said crimping tool (10), wherein the base (18) comprises a plurality of crimping anvil receivers (42) and a ram assembly receiver (42), wherein the plurality of crimping anvil receivers (42) and at least a part of the ram assembly receiver (42) is formed at the rotatable disc (30).

9. A plant for the automated production of crimped cables, the plant comprising one or more crimping tools (10) in accordance with any of claims 1 to 7.

10. A method of changing between crimping rams (24) of a crimping tool (10) according to any of claims 1 to 7, the crimping tool (10) comprising a plurality of crimping rams (24) arranged at a ram assembly (12), the method comprising the step of moving the ram assembly (12) to move a respective one of the plurality of crimping rams (24) from an inactive position - in which no crimping takes place - to an active position - in which a crimping action can take place, wherein the step of moving comprises a rotating movement.

Patentansprüche

1. Crimpwerkzeug (10) zum Verbinden von Anschlüssen (60) mit Komponenten, wobei das Crimpwerkzeug (10) umfasst:

eine Stempelbaugruppe (12) mit einer Vielzahl von vertikalen Seiten (28), wobei die Stempelbaugruppe (12) so konfiguriert ist, dass sie sich zwischen einer Crimpposition und einer Ruheposition hin- und herbewegt;
gekennzeichnet durch
eine Vielzahl von Crimpstempeln (24), die an mindestens zwei der vertikalen Seiten (28) angeordnet sind, wobei jeder Crimpstempel (24) so konfiguriert ist, dass er mit einem entsprechenden Crimpamboss (16) zusammenwirkt, um die Anschlüsse (60) mit den jeweiligen Komponenten zu crimpen, wobei sich jeder Crimpstempel (24) von jedem anderen Crimpstempel (24) aus der Vielzahl von Crimpstempeln (24) unterscheidet,
wobei die Stempelanordnung (12) eine im Wesentlichen polygonale Außenform, die vertikale Seiten (28) bildet, vorzugsweise eine im Wesentlichen rechteckige Außenform mit vier vertikalen Seiten (28) aufweist, wobei jede vertikale Seite (28) eine Halterung (32) für den jeweiligen Stempel (24) aus der Vielzahl von Crimpstempeln (24) umfasst,
das Crimpwerkzeug (10) ferner eine drehbare Scheibe (30) mit einer Mehrzahl von an der drehbaren Scheibe (30) angeordneten Crimpambossen (16) umfasst, wobei die Stempelanordnung (12) an der drehbaren Scheibe (30) angeordnet ist.

2. Crimpwerkzeug nach Anspruch 1,
wobei ein jeweiliger Crimpamboss (16) einem jeweiligen Stempel (24) aus der Mehrzahl von Crimpstempeln (24) zugeordnet ist und der jeweilige Crimpamboss (16) und sein zugeordneter Crimpstempel (24) mittels der drehbaren Scheibe (30) in einen eine aktive Position bildenden Teil der Crimpposition der Stempelanordnung (12) bewegbar, insbesondere drehbar ist.

3. Crimpwerkzeug (10) nach einem der Ansprüche 1 oder 2,
wobei mindestens eines von der drehbaren Scheibe (30) und einer Basis (18), die eine Lagerung für die drehbare Scheibe (30) bildet, eine Aufnahme (42) für die Stempelanordnung umfasst, die so angepasst ist, dass sie einen Teil der Stempelanordnung (12) aufnimmt, wobei die Aufnahme (42) für die Stempelanordnung optional so konfiguriert ist, dass sie die Stempelanordnung (12) mitnimmt, so dass die Stempelanordnung (12) bewegt werden kann, um einen der Crimpstempel (24) von einer inaktiven Position in eine aktive Position zu bewegen; und/oder wobei die Aufnahme (42) für die Stempelanordnung eine Öffnung mit im Querschnitt zumindest polygonaler form, vorzugsweise mit zumindest im Wesentlichen quadratischem oder rechteckigem Querschnitt aufweist, wobei die Öffnung vorzugsweise zur Aufnahme eines entsprechend geformten Teils der Stempelanordnung (12), insbesondere eines Kupplungsabschnitts (40) der Stempelanord-

nung (12) ausgebildet ist.

4. Crimpwerkzeug (10) nach einem der Ansprüche 1 bis 3,

wobei die drehbare Scheibe (30) an einer Basis (18) angeordnet ist und in einer Vielzahl von vordefinierten Positionen an der Basis (18) verriegelt werden kann,
wobei jede vordefinierte Position einer Position entspricht, in der einer der Vielzahl von Crimpstempeln (24) und sein zugehöriger Crimpamboss (16) die Crimpposition einnehmen kann.

5. Crimpwerkzeug (10) nach einem der vorhergehenden Ansprüche,
wobei die Crimpstempel (24) so konfiguriert sind, dass sie von der Stempelanordnung (12) entfernbar sind, wobei die Mehrzahl der Halterungen (32) von identischer Bauart sind.

6. Crimpwerkzeug (10) nach einem der vorhergehenden Ansprüche,

wobei jeder Crimpstempel (24) eine Matrizenbaugruppe umfasst, wobei jede Matrizenbaugruppe mindestens eines einer Leitercrimpplatte (56), einer Isolatorcrimpplatte (54), einer Drahtführung (52) und eines Abisolierwerkzeugs umfasst; und/oder
wobei ein Kodiermittel, wie z.B. ein Farbkodiermittel, am Crimpwerkzeug (10) vorgesehen ist.

7. Crimpwerkzeug (10) nach einem der vorhergehenden Ansprüche,
wobei die Stempelanordnung (12) mit einem Crimpkopf (34) verbunden ist, der ein Werkzeugeinstellmittel (36, 38) aufweist, mittels dem eine Position jedes der Crimpstempel (24) relativ zu dem Crimpamboss (16) und/oder dem Anschluss (60) vordefiniert sein kann, wobei das Werkzeugeinstellmittel (36, 38) vorzugsweise so konfiguriert ist, dass es eine Position aller an der Stempelanordnung (12) angeordneten Crimpstempel (24) einstellt

8. Baugruppe, die das Crimpwerkzeug (10) nach Anspruch 1 und eine Basis (18) für das Crimpwerkzeug (10) umfasst,
wobei die Basis (18) eine Vielzahl von Aufnahmen (42) für den Crimpamboss und eine Aufnahme (42) für die Stempelanordnung umfasst, wobei die Vielzahl von Aufnahmen (42) für den Crimpamboss und zumindest ein Teil der Aufnahme (42) für die Stempelanordnung an der drehbaren Scheibe (30) ausgebildet ist.

9. Anlage zur automatisierten Herstellung von gecrimpten Kabeln, wobei die Anlage ein oder mehrere Crimpwerkzeuge (10) nach einem der Ansprüche 1 bis 7 umfasst.

10. Verfahren zum Wechseln zwischen Crimpstempeln (24) eines Crimpwerkzeugs (10) nach einem der Ansprüche 1 bis 7, wobei das Crimpwerkzeug (10) eine Vielzahl von Crimpstempeln (24) umfasst, die an einer Stempelanordnung (12) angeordnet sind, wobei das Verfahren den Schritt zum Bewegen der Stempelanordnung (12) umfasst, um einen jeweiligen der Vielzahl von Crimpstempeln (24) aus einer inaktiven Position, in der kein Crimpen stattfindet, in eine aktive Position, in der ein Crimpvorgang stattfinden kann, zu bewegen, wobei der Schritt zum Bewegen eine Drehbewegung umfasst.

Revendications

1. Outil de sertissage (10) destiné à connecter des bornes (60) à des composants, l'outil de sertissage (10) comprenant :

un assemblage formant piston (12) ayant une pluralité de côtés verticaux (28), l'assemblage formant piston (12) étant configuré pour se déplacer en va-et-vient entre une position de sertissage et une position de repos ;
caractérisé par
une pluralité de pistons de sertissage (24) agencés sur au moins deux des côtés verticaux (28), chaque piston de sertissage (24) étant configuré pour coopérer avec une enclume de sertissage (16) correspondante pour sertir les bornes (60) aux composants respectifs,
dans lequel chaque piston de sertissage (24) diffère de l'un quelconque des autres pistons de sertissage (24) parmi la pluralité de pistons de sertissage (24),
dans lequel l'assemblage formant piston (12) présente une forme extérieure sensiblement polygonale formant les côtés verticaux (28), de préférence une forme extérieure sensiblement rectangulaire avec quatre côtés verticaux (28), chaque côté vertical (28) comprenant une monture (32) pour le piston (24) respectif parmi la pluralité de pistons de sertissage (24), l'outil de sertissage (10) comprenant en outre un disque rotatif (30) avec une pluralité d'enclumes de sertissage (16) agencées au niveau du disque rotatif (30),
dans lequel l'assemblage formant piston (12) est agencé au niveau du disque rotatif (30).

2. Outil de sertissage (10) selon la revendication 1, dans lequel une enclume de sertissage (16) respective est associée à un piston (24) respectif parmi la pluralité de pistons de sertissage (24) et ladite en-

clume de sertissage (16) respective et son piston de sertissage (24) associé peuvent être déplacés, en particulier mis en rotation, jusque dans une position active faisant partie d'une position de sertissage de l'assemblage formant piston (12) au moyen du disque rotatif (30).

3. Outil de sertissage (10) selon la revendication 1 ou 2, dans lequel au moins un élément parmi le disque rotatif (30) et une base (18) formant un support pour le disque rotatif (30) comprend un moyen de réception d'assemblage formant piston (42) adapté pour recevoir une partie de l'assemblage formant piston (12), le moyen de réception d'assemblage formant piston (42) étant en option configuré pour entraîner l'assemblage formant piston (12) de telle sorte que l'assemblage formant piston (12) peut être déplacé pour déplacer un des pistons de sertissage (24) depuis une position inactive jusque dans une position active ; et/ou le moyen de réception d'assemblage formant piston (42) présentant une ouverture avec une forme au moins sensiblement polygonale dans une section transversale de celui-ci, de préférence une section transversale sensiblement carrée ou rectangulaire, l'ouverture étant de préférence configurée pour recevoir une partie conformée en correspondance de l'assemblage formant piston (12), en particulier une portion de couplage (40) de l'assemblage formant piston (12).

4. Outil de sertissage (10) selon l'une des revendications 1 à 3,

dans lequel le disque rotatif (30) est agencé au niveau d'une base (18) et peut être verrouillé dans une pluralité de positions prédéfinies au niveau de la base (18),
dans lequel chaque position prédéfinie correspond à une position dans laquelle l'un de la pluralité de pistons de sertissage (24) et son enclume de sertissage (16) associée peut occuper la position de sertissage.

5. Outil de sertissage (10) selon l'une quelconque des revendications précédentes,
dans lequel les pistons de sertissage (24) sont configurés comme pouvant être retirés dudit assemblage formant piston (12), la pluralité de montures (32) présentant une conception identique.

6. Outil de sertissage (10) selon l'une quelconque des revendications précédentes,

dans lequel chaque piston de sertissage (24) comprend un assemblage de matrice, chaque assemblage de matrice comprenant au moins un élément parmi une plaque de sertissage conductrice (56), une plaque de sertissage isolante (54), un guide-fils (52) et un outil de découpe de bandes ; et/ou
dans lequel un moyen de codage, tel qu'un moyen de codage de couleur, est prévu au niveau de l'outil de sertissage (10).

7. Outil de sertissage (10) selon l'une quelconque des revendications précédentes,
dans lequel l'assemblage formant piston (12) est connecté à une tête de sertissage (34) comprenant un moyen de réglage d'outil (36, 38) au moyen duquel une position de chacun des pistons de sertissage (34) peut être prédéfinie relativement à l'enclume de sertissage (16) et/ou la borne (60), de préférence dans lequel le moyen de réglage d'outil (36, 38) est configuré pour régler une position de l'ensemble des pistons de sertissage (24) agencés au niveau de l'assemblage formant piston (12).

8. Assemblage comprenant l'outil de sertissage (10) selon la revendication 1 et une base (18) pour ledit outil de sertissage (10), dans lequel la base (18) comprend une pluralité de moyens de réception d'enclumes de sertissage (42) et un moyen de réception d'assemblage formant piston (42), dans lequel la pluralité de moyens de réception d'enclumes de sertissage (42) et au moins une partie du moyen de réception d'assemblage formant piston (42) sont formés au niveau du disque rotatif (30).

9. Installation destinée à la production automatisée de câbles sertis, l'installation comprenant un ou plusieurs outils de sertissage (10) selon l'une quelconque des revendications 1 à 7.

10. Procédé de changement entre pistons de sertissage (24) d'un outil de sertissage (10) selon l'une quelconque des revendications 1 à 7, l'outil de sertissage (10) comprenant une pluralité de pistons de sertissage (24) agencés au niveau d'un assemblage formant piston (12), le procédé comprenant les étapes consistant à déplacer l'assemblage formant piston (12) pour déplacer un piston respectif parmi la pluralité de pistons de sertissage (24) depuis une position inactive, dans laquelle aucun sertissage n'a lieu, jusqu'à une position active, dans laquelle une action de sertissage peut avoir lieu, dans lequel l'étape de déplacement comprend un déplacement en rotation.

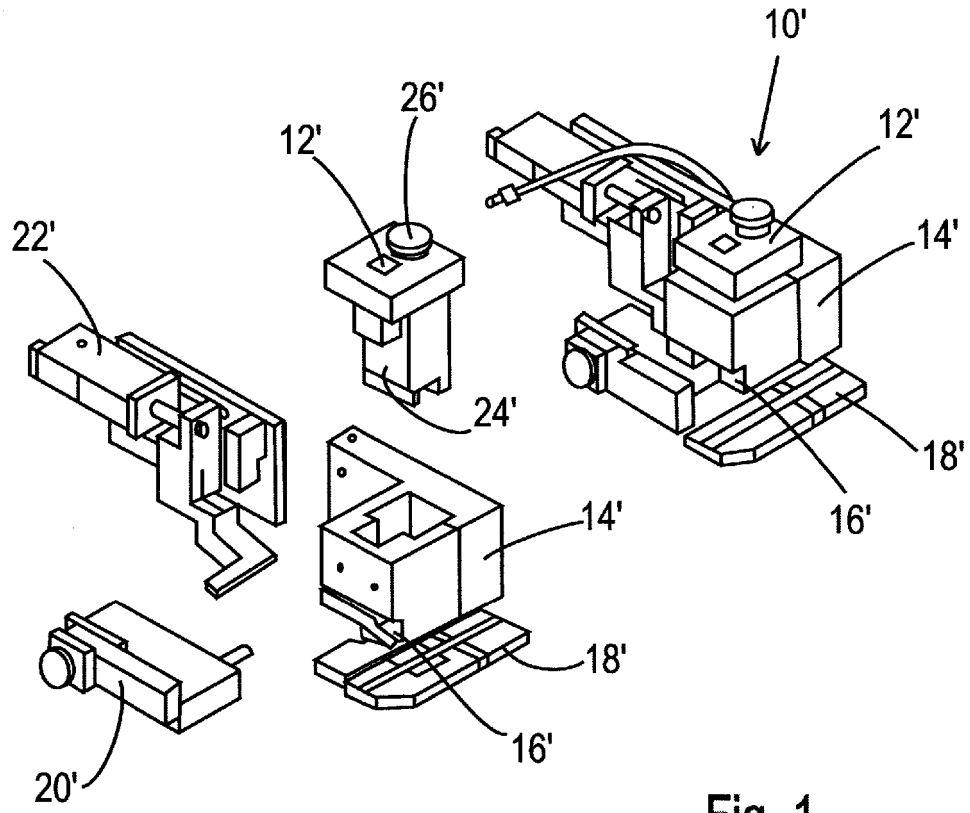

10'
26'
12'
12'
22'
14'
24'
18'
16'
14'
18'
16'
20'

Fig. 1

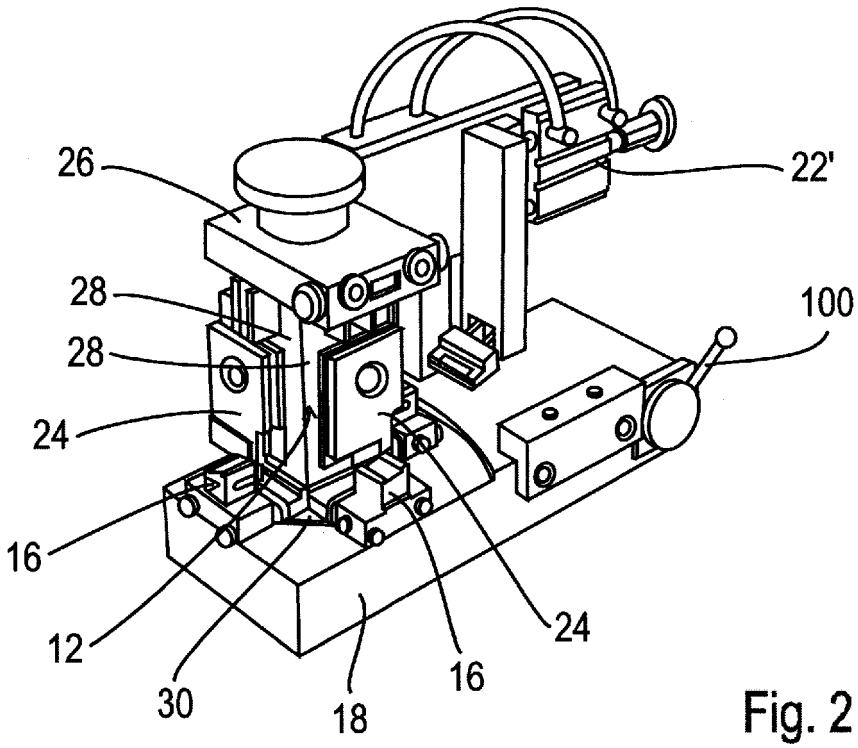

26
22'
28
100
28
24
16
12
30
18
16
24

Fig. 2

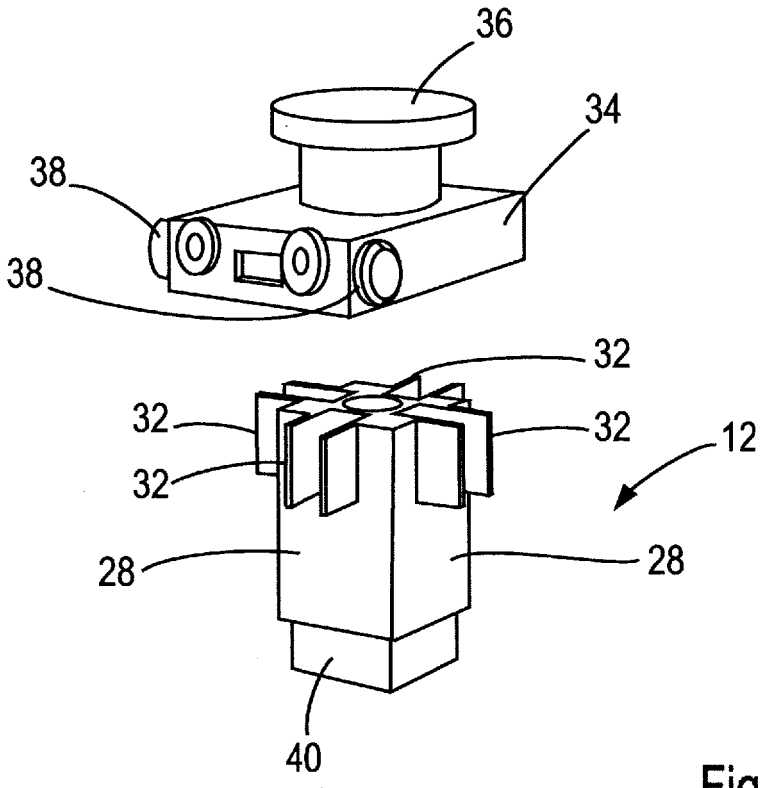

36
34
38
38
32
32
32
32
12
28
28
40

Fig. 3

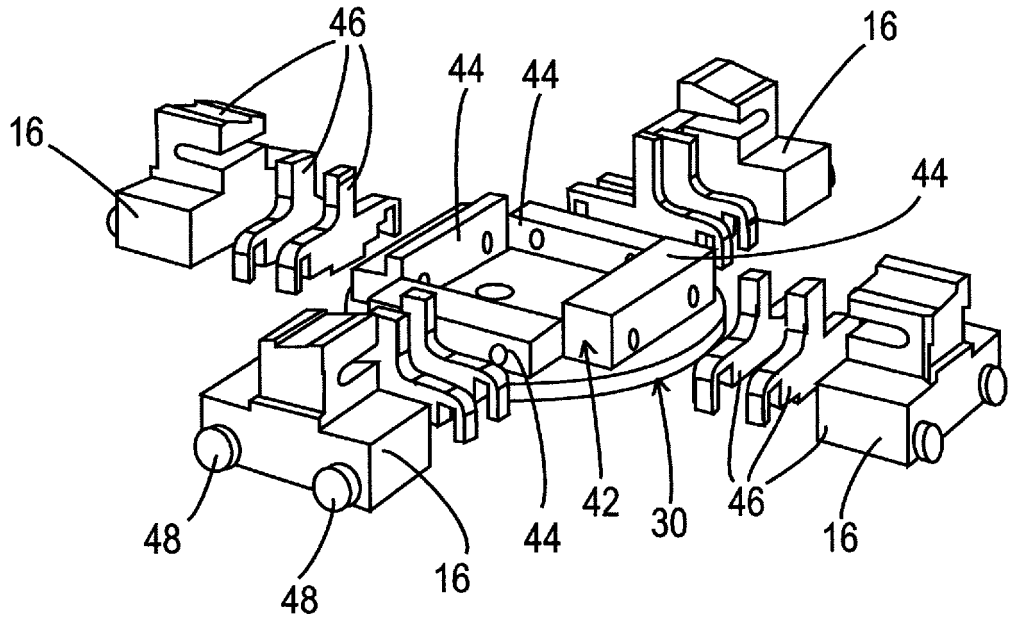

46
16
44
44
16
44
48
48
16
44
42
30
46
16

Fig. 4

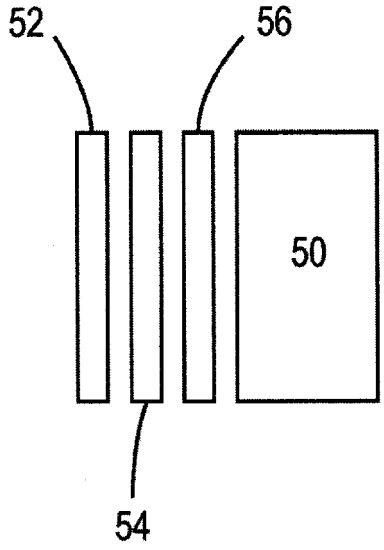


Fig. 5

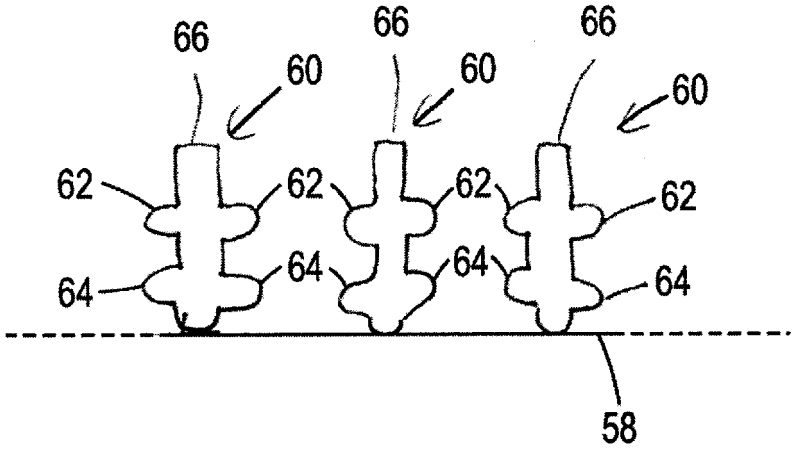


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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