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Process for the installation of a conduit pipe system and a device for creating unreleasable connections.

The invention concerns a process for the installation of a conduit pipe system as well as a device for the creation of unreleasable connections between elements and conduit pipe sections respectively.

For the transportation of liquid and gaseous media, in particular in buildings but also on board ships, conduit pipe systems are installed which consists mainly of conduit pipe sections that are cut to measure and related elements such as fittings, connectors and shaped parts. The connection of the conduit pipe sections to each other or to the elements described above, is created either releasable, e.g. through screw connections, or unreleasable, e.g. through welding, soldering or pressing. For the connection technique last mentioned, pressing systems have been developed by various manufacturers. These are characterized by elements that have at least one pressable end section and a sealing ring located in that section. Smooth end conduit pipe sections, that have been cut to measure, are inserted into the aforementioned section and these are then connected with the inserted end of the conduit pipe section, using a portable pressing tool. (see brochure of Mannesmann Edelstahlrohr GmbH, 1992 (excerpts); see brochure of company Benkan, 1992 (excerpts); see brochure of



company Viega, March 1990 (excerpts)). Alternatively, a process (EP-A-0 390 747) is known, in which so-called composite pipes, consisting of a plastic pipe and a metallic tube slid over it, are pressed onto the connection piece of a fitting or onto a supporting sleeve, using a portable pressing tool. For the pressing the connection piece and the supporting sleeve respectively have recesses in the form of grooves and hollows. In a variation of this process, a pressing sleeve made of metal is slid over the composite pipe and connected to the supporting sleeve by pressing (DE-GM 90 16 310). In this case the supporting sleeve also has corresponding recesses and projecting areas.

Due to the development of a pressable element that has different characteristics, in particular fittings (DE-B-38 34 353), it was possible to extend the press fitting system with internal pressures exceeding 16 bar to dimensions exceeding 54 mm. For these larger dimensions, in particular 2" and larger, working with portable pressing clamp becomes difficult because the pressing jaws, the mounting for the pressing jaws and therefore the tool as a whole become very heavy. And very soon a point is reached, with regard to the weight and the handling, whereafter the pressing clamp as a portable device can no longer be used or only be used with great difficulties. It has already been suggested (DE-GM 90 07 414) to use a multi-section open pressing ring, at the free ends of which a separate drive unit could be connected. The pressing ring is designed in such a way that it is slipped over the pressing area of the fitting, the connector or the shaped part while open and that after the closing of the ends, the drive unit is attached in order to carry out the pressing.

In the case of large and complex installations of multi-pipe conduit pipe systems, for example in the installation shaft of a high rise building or on board a ship, the



step-by-step pressing of the element in question together with a pertaining conduit pipe section and another element respectively is very troublesome. For each pressing process the entire tool or the pressing ring has to be attached after the insertion or sliding over of the parts to be connected, the pressing has to be carried out and the tool has to be removed. Furthermore the needed free length of the conduit pipe section in question has to be determined and the necessary length of pipe, taking into consideration the stipulated insertion length, has to be cut and the cut edge has to be deburred. Rarely are pipes that are already cut to size taken to a construction site.

It is the purpose of the invention, to explain a process for the installation of a generic conduit pipe system, which allows the pressing, in particular for dimensions 2 1/2" and above, to be carried out in a simple manner and with lower cycle times, while at the same time increasing the quality of the connection and thus the protection against defects. Furthermore, a corresponding device is to be created for this.

This task is solved with the characteristics, listed in the characterizing part of the claims 1 and 8 respectively. Advantageous further developments are part of subsidiary claims.

In accordance with the invention it is proposed, to prefabricate one section of a conduit pipe system in a workshop or in an assembly hall in the case of a large construction site. This has the advantage that it will be possible to carry out not only one pressing, but two or even more at the same time. For this purpose, the parts to be connected are moved in relation to each other within the contact area of a stationary pressing device and are aligned with regard to distances and



angles and then pressed. Preferably two pressings are carried out simultaneously on one element. This applies in particular to elements such as sleeves, bends, straightway parts of T-pieces and reducing fittings. For the latter element, the advantage of the process of the invention is obvious. Usually, it is necessary in the case of a reducing fitting to work with two different pressure clamps that correspond to the different rated dimensions at the two ends. This means, that the pressing clamps have to be changed after the first pressing or that another pressing ring has to be fitted before the second pressing can be carried out.

The proposed prefabrication can be automated to a great extent as the parts that are to be connected can be fed to the stationary pressing installation via appropriate auxiliary means such as roller tables, gripping device, robots etc. The quality of the pressing can be improved as well because it is easier to check the proper adjustment of the distances and angles before the pressing than it would be in the case of a manual operation at the location of the installation. The stationary pressing installation can, for example, be equipped with a release lock, in which the proper insertion or sliding over is controlled either by an optical measuring device that is connected to a computer or mechanically via appropriately located sensors (DE-B-40 12 504).

The brochures mentioned in the introductory description show, that the proper insertion plays an important role in the quality of the pressing. In principle it is also possible to press a part that is only partially inserted. However, sooner or later such an insufficient pressing will lead to leakages, especially because the axial anchoring of the connected parts is insufficient. In addition to the checking of the overlapping of the inserted and slid-on part respectively, it is also possible to check an element for correct angles. The relative angular position with

reference to the system axis is important for all elements that are not rotation-symmetrical, e.g. T-pieces, bends, crossover bends and crossover angles as well as connectors. The checking of the relative angular position, too, can be connected electronically with a release lock.

The advantages of the process in accordance with the invention lie in the fact, that due to the proposed prefabricating, preferably in a workshop, a large portion of the individual working steps can be automated. This starts with the cutting into sections of the desired conduit pipe sections, the de-burring of the two ends and the feeding into the stationary pressing installation. The element that is to be connected, too, can be taken from a container and inserted in the pressing installation in the correct relative position using the gripping arm of a robot. The section of the conduit pipe is inserted into the element via driving pulleys or suitably designed gripping devices. A sensor element monitors the proper insertion. The command for the pressing process is given only after the release. Following the pressing the pressing installation is moved apart and the prefabricated section is removed from the pressing installation. Following that there is a choice of either carrying out another pressing on a second, independent pressing installation or pressing on of branching elements, using the known portable pressing clamp. With regard to saving time, the process has particular advantages if several pressings are carried out simultaneously and if conduit pipe sections with large diameters are prefabricated. The handling of the pressing clamp, that is especially heavy for large dimensions, in areas of the installation system that are not easily accessible then becomes unnecessary.

The invention achieves the desired shorter cycle times by allowing the user to arrange several pressing jaws of different rated diameters in one holder.

Depending on the dimension to be pressed, the corresponding pressing jaw is moved from the holder into the operating area of the pressing installation mechanically, hydraulically or pneumatically. In order to carry out two pressings at the same time, another holder is placed beside the stationary first holder. This second holder can be positioned in such way that it can be moved in the axial direction. However, this is not a must as the necessary shifting can also be realized by a movement of the pressing jaws. Such shifting allows for the exact distancing of the two pressing points from each other. This proposal of a simultaneous dual pressing can be extended by positioning a second movable pressing installation in the direction of the system next to the first stationary pressing installation. The shifting of this second pressing installation corresponds

to the free length of a conduit pipe section between two pressing points. In order to make the system for multiple pressings flexible for all imaginable sections of conduit pipes, it is further proposed to provide for a rotating ring disk around the center of a stationary press, on which at least one more press is positioned in such a way that can be moved in the radial direction. Through the combination of a circular movement with radial movability, it will be possible, within the limit of the radial distance of the two presses from each other, to set up practically any configuration of conduit pipe sections. If the second press is also adjustable in height, then it will also be possible to produce pipe sections that run in three planes. For most applications a second press, which is movable only in the direction of the system axis and which is positioned either to the left or to the right of the first stationary press, will be sufficient. If the cycle times are to be increased further, it is possible, for example, to design the stationary press as a double press and to plan for a movable press on the left as well as on the right of it. On such a layout it would be possible to alternate simultaneous cycles on the one side for the insertion and adjusting and on the other side for the pressing and removal. This design would furthermore have the advantage that in the case of failure of one part of the press, work could continue on the other part.

The magazining of the pressing jaws in a holder in the form described above can also be realized in such a way, that the pressing jaws are placed in a rotating holder. This holder could, for example, be a turnstile or, expressed more generally, a star wheel with e.g. three or five arms. The number of arms depends on the size of the pressing jaw and the possibility of the placing of a star wheel in the pressing installation.

Besides the pair of pressing jaws with two jaws as described before, arrangements with three or four jaws may also be useful. The radial movement of

the individual jaws of such multi-jaw arrangements could be done e.g. through tapered slide valves or through hydraulic or pneumatic drives.

The concept of fitting the stationary press with several pressing jaws as described above can also be used, for example, to carry out a multiple pressing process for a double section in particular for a double pipe cross element. For that purpose at least a second pair of pressing jaws is arranged axially displaced in the longitudinal and transverse direction to a first pair of pressing jaws. For the concrete case of a double pipe cross piece, two more pairs of pressing jaws would be used in order to carry out four pressings simultaneously. Theoretically a 8-fold simultaneous pressing would also be possible. However, this would only be done in very rare cases as it is difficult to handle such a prefabricated section and the transportation possibilities would be limited. However, it is certainly worthwhile to prefabricate for example, the horizontal double conduit pipe of a heating installation for adjacent rooms and to connect it afterwards with a continuous ascending pipeline or vice versa.

The pressing profile of the pressing jaw in question depends on the profile of the parts to be pressed. It has proven advantageous to position a pressing web that runs in the direction of the circumference on one side beside the somewhat, this pressing web, seen in the direction of the circumference, can have a hexagonal or lemon shape (DE-A-38 33 748). In particular the latter profile is advantageous for the pressing of dimensions 2" and larger.

Here the process according to the invention is first of all explained in drawings, using some examples :

The drawings show :

- | | |
|----------------|---|
| Illustration 1 | A longitudinal section of a prefabricated conduit pipe train |
| Illustration 2 | A view in the direction X in illustration 1 |
| Illustration 3 | Diagramme of a simultaneous double pressing in accordance with the invention |
| Illustration 4 | A diagramme of the main elements of a production line in accordance with the invention. |

A conduit pipeline that is to be installed is shown in illustration 1 in a longitudinal view and in illustration 2 in a projection. This train section consists, in the example shown here, of the conduit pipe sections 1, 2, 3 with different free lengths L1, L2, L3. These conduit pipe sections 1, 2, 3 are connected by elements that are typical for a conduit pipeline, such as T-pieces 4, 5 and 90 degrees bend 6. For reasons of simplicity, two T-pieces 4, 5, that have an open end 7, 8 as large as the straightway pipe, were selected. However, these could just as well be T-pieces that have a reduced or expanded open end as well as an open end with internal thread. As illustration 2 shows, the two T-pieces 4, 5 are positioned at a relative angle of 90 degrees to each other; a layout that is also typical for a train of conduit pipes. At the end of conduit pipe section 3 shown on the left side of the illustration, a 90 degrees bend, which runs downward at an angle of 45 degrees as shown in illustration 2, is pressed on.

Both T-pieces 4, 5 as well as bend 6 can, of course, assume any other relative position to each other. The example of the conduit pipe section 1 that is lying in the center, shows clearly, that the insertion length in question E11, E21 still have to be added to the free length L1 in order to determine the length to be cut off L1 ges. = $L1 + E11 + E21$.

The diagramme in illustration 3 shows a simultaneous double pressing in accordance with the invention. In this illustration a T-piece 11 is fixed with an open end 12 of the same size on a stationary pressing point 10. On the left side a conduit pipe section 13 is inserted with its free length L1. On the right hand side of the straight through-path of the T-piece 11, a reduction piece 14 has been inserted. The pressing installation in the area of the stationary pressing point which is not shown here, has two pairs of jaws 15, 15', 16, 16', of which the pair of jaws 16, 16' on the right hand side can also be moved axially. This axial movability, indicated here by the arrows 19, 19', makes it possible, that the pressing jaws 15, 15', 16, 16', depending on the distance of the two pressing areas 17, 18, are in the necessary position to do this. After the appropriate insertion and adjustment, the two pairs of jaws 15, 15' and 16, 16' respectively can be radially closed simultaneously and then the pressing process can be carried out. The radial closing is marked by the arrows 20, 20', 21, 21'. On the right hand side another conduit pipe section 22 is shown. It has been pressed with a reduction piece 14 in a separate pressing installation. But instead of the conduit pipe section 22, it is also possible to insert an auxiliary element into the reduction piece 14, in order to be able to adjust the entire conduit pipe section so that it has the correct angles. For this purpose an axially movable clamping device 23, that is not illustrated in detail here, is flanged at the end. The axial shifting is marked by arrow 24. Furthermore it is possible to turn the clamping

device 23 as indicated by the arrow 25. This rotation is necessary in order to be able to position e.g. a second T-piece, shifted with reference to the pressed T-piece 11 as shown here in illustrations 1, 2.

Illustration 4 shows the diagramme of the main elements of a production line in accordance with the invention. Pipe blanks 31 of e.g. 6m length are stored ready for use on a high storage shelf 30,. In order to be able to store various dimensions, a second high storage shelf that is not shown could be placed next to or opposite this high storage shelf 30. Alternatively, the high storage shelf 30 could be designed in such a way that different dimensions could be stored on several levels. When there is a request, a pipe blank 31 automatically will roll onto the roller conveyor 32 - due to the corresponding tilt of the high storage shelf - or it is placed onto the roller conveyor by swivel arms that are not shown here. A saw or cutting unit 33 can be moved into the axis of this roller conveyor 32. The movability is indicated by the arrow 34. In the preferred design this installation 33 is combined with a deburring device, so that both ends of the pipe blank 31 can be deburred. Depending on the order, a pipe blank or an appropriately cut shorter length is transferred from the abovementioned roller conveyor 32 to a parallel roller conveyor 35 by swivel arms that are not shown here after the preprocessing. In accordance with the invention, a stationary press 36 is placed along the axis of this roller conveyor 35. Using the robot 37 - here in the function of a handling device - the fitting or shaped part or connector that is to be pressed (not shown here) is taken from the storage containers 38 and inserted at the correct position and angle into the pressing area of the stationary press 36. A combined insertion and rotation device 39, 39' that is connected to a release lock is attached at both front sides of the stationary press 36. The combined insertion and rotation device 39, 39' ensures that the cut straight pipe that is deburred on

both sides is properly inserted into the fitting, shaped part or connector that is fixed in the pressing area and is then adjusted to the correct angle. Only after the proper insertion and the correct angle position respectively have been checked, will the release lock be opened and the pressing can be carried out. In order to be able to feed the stationary press 36 with pipes from both sides, an intermediate storage shelf 40 is placed at the right hand end of the first roller conveyor 32. Here, pipe blanks 31 or cut pipes 41 can be stored temporarily. With swivel arms that are not shown here, these temporarily stored pipes can be transferred to the second roller conveyor 35. A second press 42, which is movable relative to the first stationary press 36 and in the direction of the roller conveyor 43, is positioned at the right hand end of this roller conveyor 35. This press 42, too, is equipped at both front sides with a combined insertion and rotation device 39, 39'. The advantage of the second, movable press 42 lies in the fact, that in connection with the first, stationary press 36, several pressings can be carried out simultaneously.

For example, the working steps listed in the following, can be carried out automatically to a great extent. A pipe blank 31 is taken from the high storage shelf 30 that is shown on the left hand side of the illustration. It is then placed on the roller conveyor 32 and transported to the cutting and deburring device 33. After the cutting to the specified length, which could be controlled via a measuring point 44, the conduit section is placed on the roller conveyor 35 which is parallel to the cutting and deburring device. The robot 37, which can be moved in vertical direction to the direction 45 of the roller conveyor, has taken the selected fitting, e.g. a T-piece, from one of the storage containers 38 and placed it into the pressing area of the stationary press 36. At the same time as the abovementioned working steps a cut length of pipe 41 is taken from the

intermediate storage shelf 40 and placed on the roller conveyor 35. From the left and from the right one pipe section each is fed to the stationary press 36. These sections are then inserted into the T-piece by the insertion device 39, 39'. While this work is carried out, another part, e.g. a bend, is inserted by another robot into the pressing section of the movable press 42. For this purpose the second robot is best installed on the right hand side at the end of the travel path 43 of the movable press 42. After the insertion of the bend, the press 42 is moved to the left until the pipe section that lies between the two presses 36, 42 is also inserted into the bend. After the adjusting and the checking of the proper insertion and the angular position respectively, a triple pressing process is carried out, that is two pressings at the T-piece and one pressing at the bend.

At this point it has to be pointed out expressly that the installation shown and explained in illustration 4. is only one possible example of a production line. Depending on the position of a stationary press 36 in accordance with the invention, there are a great number of other possibilities to place roller conveyors, sawing or cutting devices, measuring points, high storage shelves, intermediate storage areas and more presses. The choice of the positions depends on the space available, the dimensions to be pressed and the largest transportable ready-to-install conduit pipe section.

The installation according to the invention is now explained in more detail in drawings with the help of some layout examples.

The following are illustrated :

- Illustr. 5 Diagramme of another multiple pressing
- Illustr. 6 The magazining of the pressing jaws in the from of a turnstile
- Illustr. 7 The magazining of the pressing jaws in the form of a holder
- Illustr. 8 A longitudinal section of a pressing jaw
- Illustr. 10 A cross section along the line A-A in partial illustration 8
- Illustr. 11 The positioning of a multiple jaw press
- Illustr. 12 The positioning of a second press that is movable on a plane

Illustration 5 shows the diagramme of another multiple pressing. Besides the stationary pressing point already described above (Illustration 1), a second pressing point, which can be moved along the system axis, is positioned on the left hand side. The axial movability of the second pressing point is marked by an arrow 47. Both pressing points have two pairs of pressing jaws each. Of these, one pair of the pressing jaws 50, 50' or 15, 15' is axially stationary and the other two pressing jaws 46, 46' and 16, 16' respectively are axially movable. The axial movability of the latter pressing jaws is marked by an arrow. The radial closing of all pressing jaws is also marked by arrows. In the example shown here, a T-piece 11, that has an open end 12 of the same size to that of the straightway pipe, is pressed onto the first stationary pressing point simultaneously with a reduction piece 14 that is attached to the right hand side and a conduit pipe section 13 that

is positioned on the left hand side and drawn with a broken line. After the appropriate insertion and adjustment, the two pairs of jaws that were mentioned before can be radially closed and thus the pressing can be carried out.

On the second axially movable pressing point a sleeve 51 for example is to be pressed with the previously mentioned conduit pipe section 13 and the conduit pipe section 49 that is positioned on the left hand side. The shifting arrow 48 is to indicate that the conduit pipe section 49 that lies on the left hand side is to be shifted together with the pressing point (see arrow 47) to the right until the conduit pipe section 17 first mentioned is inserted into the sleeve 51. After this insertion and the appropriate adjustments the simultaneous pressing can be carried out at both pressing points so that a total of 4 areas are pressed at the same time. The axial movability of a pair of jaws that was mentioned at the beginning is necessary. in order to be able to adjust the distance of the pairs of jaws that belong together - 50, 50'; 40, 40' and 15, 15'; 16, 16' respectively - to the distance of the pressing areas of the element in question.

Illustration 6 shows. in an example, one of the possibilities of a magazining of several pressing jaws. In this example the pressing jaws 56, 56'; 52, 52'; 51, 51'; 54, 54' are arranged in the form of a turnstile 55, 55'. In general this could be a star wheel with three, four or five arms. The number of arms depends on the size of the pressing jaws and on the space available in the press. The abovementioned turnstiles 55, 55' can, on the one hand, be shifted radially - marked here by the arrows 58, 58' - and on the other hand, can be rotated - marked here by the arrows 57, 57'. Depending on the dimensions of the part to be pressed, the turnstile is rotated until the appropriate pair of jaws lies within the contact range of the press.

Illustration 7 shows another type of magazining. Here the individual pairs of pressing jaws 56, 56'; 52, 52'; 53, 53'; 54, 54'; are stored in a holder that is not shown in great detail. The individual pressing jaws can be taken from this holder mechanically, hydraulically or pneumatically and then can be placed in the contact area 59 of the press. The radial closing of the pair of pressing jaws 52, 52' that has been placed there is marked by the arrows 60, 60'.

Illustrations 9 and 10 show in the partial pictures a section along the line A-A of one half of the pressing jaw 61 in partial illustration 8 shown in a longitudinal section. In a way that is known, the pressing web 62 is only placed on one side of the pressing profile 63. Partial illustration 9 shows the originally developed hexagonal form 64 of the pressing web 62 and partial illustration 10 shows the later developed lemon-shaped form 65. The latter form of the pressing web 62, 62' has the advantage that even in the case of large dimensions of the elements to be pressed, that is 2" and larger, the axial anchoring is strengthened. This means that axial forces that increase with increasing dimensions for the same internal pressure can be safely controlled.

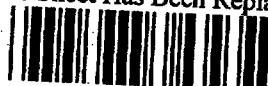
Illustration 11 shows a pressing possibility with multiple jaws. As shown in this example, the part to be pressed 66 of the element in question, is enclosed by not only two but four jaws 67 to 70. This division of the area to be pressed between more than two jaws has the purpose of decreasing the necessary penetration depth. At the same time the portion of the material that has to be displaced tangentially is reduced. The radial closing 71 of the jaws 67 to 70 can, for example, be carried out with appropriately positioned tapered slide valves 72 or with a hydraulic or pneumatic drive 72. In order to simplify the drawing the other three tapered slide valves or drives have been left out.

Illustration 12 in shows the diagramme of an arrangement in which a second press 75 that is movable in the plane, is placed next to a stationary press 74. The shifting on a plane is indicated by the arrows 76, 77. Construction-wise this is, for example, solved in such a way that the second press is, on the one hand, radially movable 77 on tracks 78 and, on the other hand, movable via a carrier section that runs on tracks 79 in circumferential direction 76. A complete circumvention of the first, stationary press 74 is not necessary as bent or continuous conduit pipes run mostly at an angle of 90, 45 or 0 degrees. The position of the second press 77 shown here, would mean a 90 degree bending, realized through a 90 degree bend 80, as shown here as an example. One way to load the first, stationary press 74 is indicated by two rollers 81 of a roller conveyor. Also shown only as an indication is the positioning of an insertion control 82 at the two presses 74, 77. In addition, the stationary press 74 also has a rotation device 83, in order to adjust the conduit pipe section to the correct angle.



Patent claims :

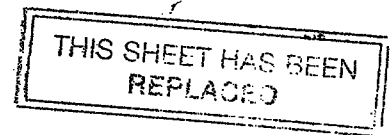
1. Process for the installation of a conduit pipe system, consisting of elements such as fittings, connectors and shaped parts as well as conduit pipe sections that have a pressable area; in this process the conduit pipe sections and elements or a conduit pipe section and one of the elements mentioned are inserted into each other or slid onto a connection piece or support body and are then unreleasably connected with each other by a pressing tool attached from the outside, this process being characterised by the fact that for the manufacturing of a section of a conduit pipe that is ready to be installed, at a place that is separate from the place of installation, the parts to be connected are moved in relation to each other towards a stationary pressing point and are adjusted correctly with regard to the distance from each other and to the angle and that after the adjustment, at least one connection point is pressed, for which the individual working steps are preferably carried out automatically.
2. Process in accordance with claim 1, characterised by the fact that independent of the rated measurement to be pressed, two pressings are carried out simultaneously on one element.
3. Process in accordance with the claims 1 and 2 characterised by the fact that in the system axis of the section that is ready to be installed, several connection points that are at a distance from each other are pressed simultaneously.





4. Process in accordance with one of the preceding claims 1 to 3
characterised by the fact
that preferably at the branching end points, a part that is to be connected
is pressed by using a portable generally known pressing device.
5. Process in accordance with one of the preceding claims 1 to 4
characterised by the fact
that the inserting into each other or the sliding on of the parts that are to be
connected is monitored and that only after the stipulated overlapping has
been reached, a release signal is generated for the triggering of the
pressing process.
6. Process in accordance with one of the preceding claims 1 to 5
characterised by the fact
that the angle position of elements that are not rotation-symetrical are
checked with reference to a defined 6 or 12 o'clock position of the system
axis and that only after congruence has been achieved between the set
angle position corresponds to the desired position, a release signal is
generated for the triggering of the pressing process.
7. Process in accordance with one of the preceding claims
characterised by the fact
that conduit pipe sections that are cut to length and that have smooth ends
and that are deburred on both sides are automatically fed to the stationary
pressing installation and that the element to be connected is fixed in the
pressing installation at the correct position and angle.





8. Device for the unreleasable connection of elements - such as fittings, connectors and shaped parts that have a pressable area as well as of conduit pipe sections among each other or of a conduit pipe section and one of the said elements for the installation of a conduit pipe system - through a holding element that is connected to a drive unit, in which arc-shaped pressing jaws - that are movable relative to each other - can be arranged wherein on the inside of the pressing jaws a press profile that runs in the direction of circumference is formed and at the end of the pressing process the jaws form a closed pressing chamber, this device being characterised by the fact that at least two replaceable pressing jaws (13-16, 30-33) are arranged in a stationary press (55), whereby the lower part of the pressing table serves at the same time as a support table for the parts to be connected and by the fact that an automatic insertion device (64) is provided for within the area of the press (55), connected to a signal transmitter for the release of the pressing process.
9. Device in accordance with claim 8 characterised by the fact that the pressing jaws (46-49) are arranged in the form a multiple jaw configuration, whereby the multiple jaws (46-49) can be moved radially by a tapered slide valve (51).

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10. Device in accordance with claim 8
characterised by the fact
that several pressing jaws (30-33) of different rated dimensions are
arranged in a holder in such way that they can be selectively removed for
the pressing.
11. Device in accordance with claim 10
characterised by the fact
that the press (55, 56) has a second pair of holders.
12. Device in accordance with claim 8
characterised by the fact
that the pressing jaws (30-33) are arranged on a holding element (34, 34')
that can be rotated.
13. Device in accordance with claim 9
characterised by the fact
that the multiple jaws (46-49) can be moved by hydraulic or pneumatic
drives (52).
14. Device in accordance with claim 8
characterised by the fact
that at least one other pair of pressing jaws (13, 14) is arranged axially
shifted in the longitudinal and transverse direction to the first pair of
pressing jaws (15, 16).





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15. Device in accordance with claims 8 to 14
characterised by the fact
that another press (56) that can be moved in the direction of the system
axis is provided for beside a first stationary press (55).
16. Device in accordance with the claims 8 to 15
characterised by the fact
that the pressing profile of the pressing jaw (40) has a somewhat
semicircular pressing groove (42) in the cross section and a pressing web
(41) on one side, for which it is generally known that this pressing web is
hexagonal (43) in the direction of the circumference.
17. Device in accordance with the claims 8 to 15
characterised by the fact
that the pressing profile of the pressing jaw (40) has a somewhat
semicircular pressing groove (42) in the cross section and a pressing web
(41) on one side, for which it is generally known that this pressing web is
lemon-shaped (44) in the direction of the circumference.
18. Device in accordance with the claims 8 to 15
characterised by the fact
that an automatic insertion device (64) is provided for within the area of the
press (55), whereby this is connected to a signal transmitter for the release
of the pressing process.

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19. Device in accordance with the claims 8 to 15
characterised by the fact
that a rotating device (65) is provided for within the area of the press (55),
whereby this is connected to a signal transmitter for the release of the
pressing process.
20. Device in accordance with one of the preceding claims
characterised by the fact
that means of transportation are arranged for within the area of the press
for the automatic feeding of conduit pipe sections (1, 2, 3) that are cut to
size and that are deburred at both ends.
21. Device in accordance with the claims 8 and 15
characterised by the fact
that at least one additional press (56) which is movable in the radial
direction (58) is arranged on a circular disk (59) which can be rotated (57)
around the center point of a stationary press (55).
22. Device in accordance with the claim 21
characterised by the fact
that the additional press (56) can also be adjusted in height.
23. Device in accordance with claims 8 and 15
characterised by the fact
that the stationary press (55) is designed as a double press and that one
press (56) each which can be moved in the direction of the system axis is
provided for on the left hand side and on the right hand side of it.





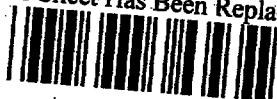
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Summary :

This invention concerns a process for the installation of a conduit pipe system, consisting of elements such as fittings, connectors and shaped parts as well as conduit pipe sections that have a pressable area. In this process, the parts that are to be connected are moved in relative positions to one another towards a stationary pressing point and adjusted with regard to the distance and the angle. After the adjustments the pressing is carried out, whereby the individual working steps are preferably carried out automatically.

The invention also concerns a device for this with at least two replaceable pressing jaws that are arranged in a stationary press in which the lower press table serves at the same time as support table.

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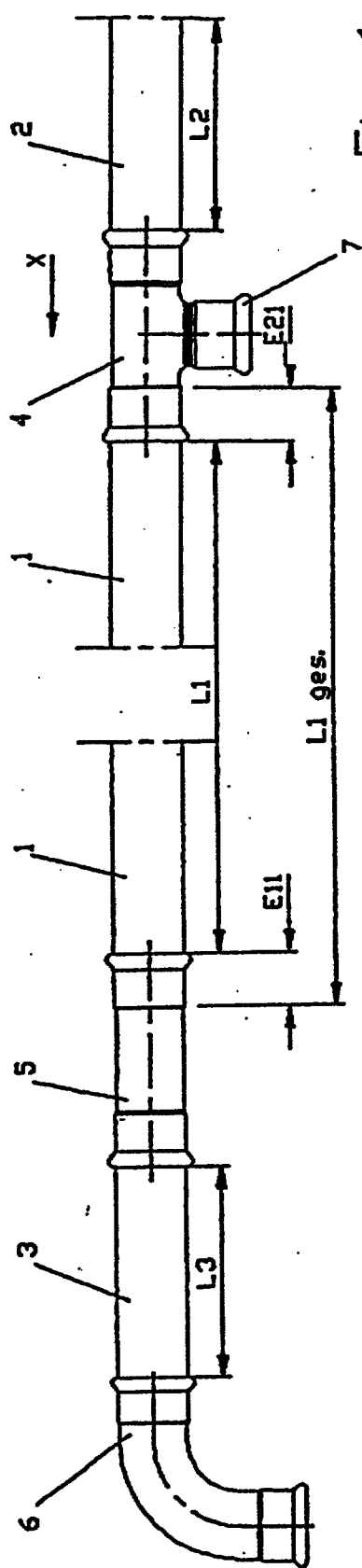


Fig. 1

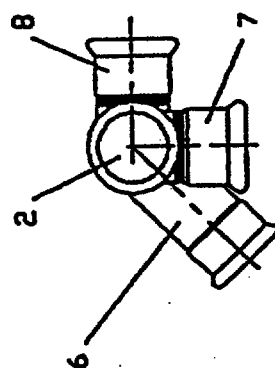


Fig. 2

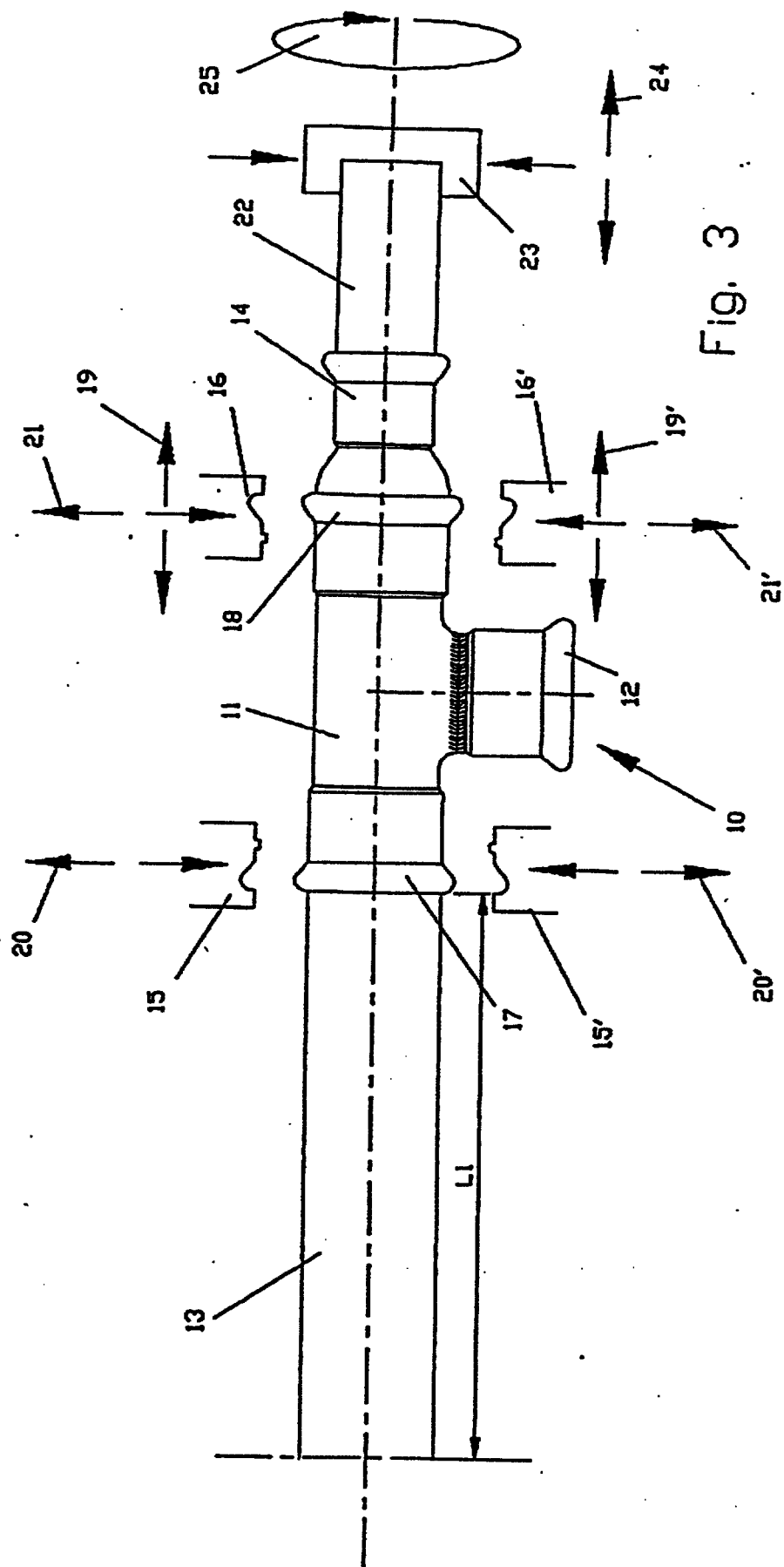


Fig. 3

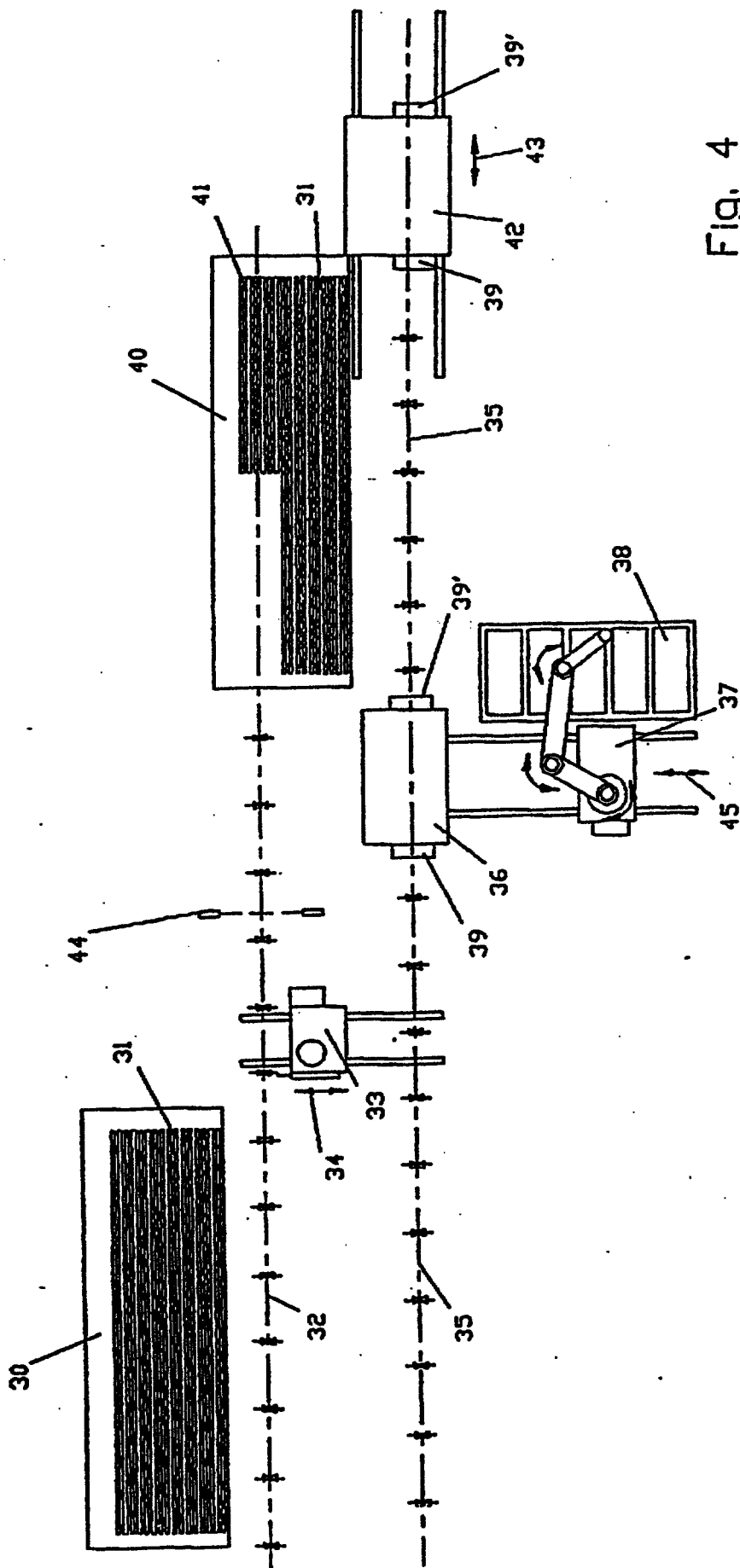


Fig. 4

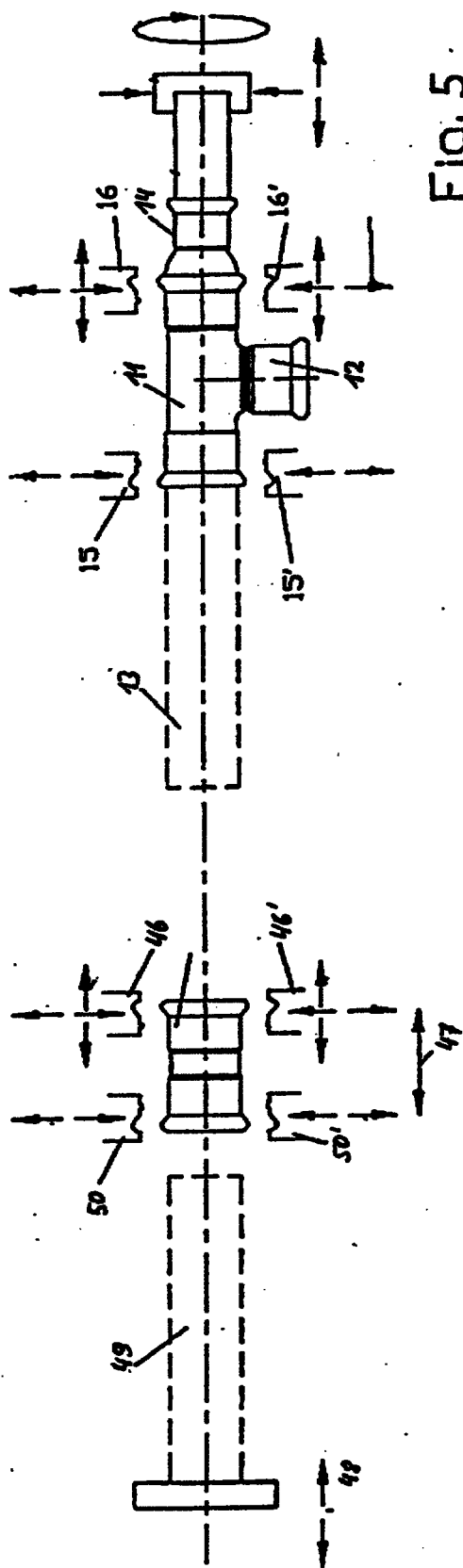


Fig. 5

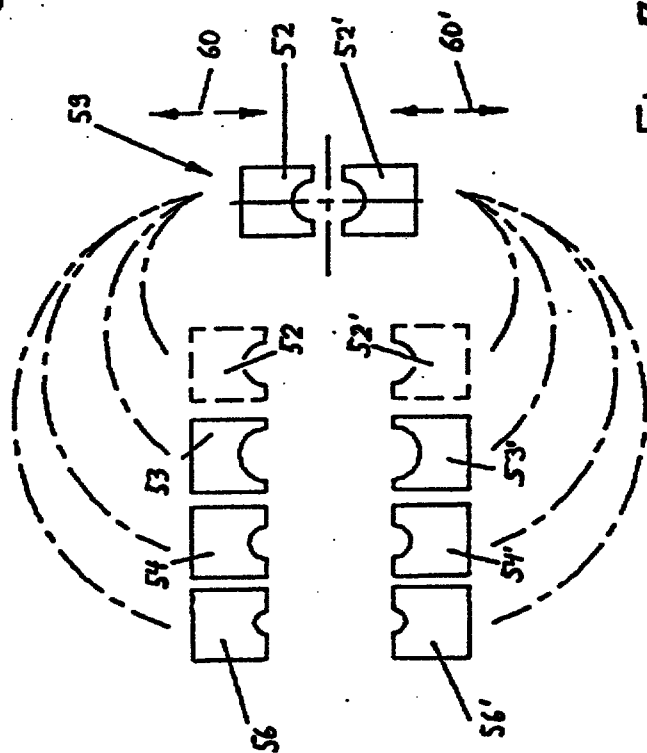


Fig. 7

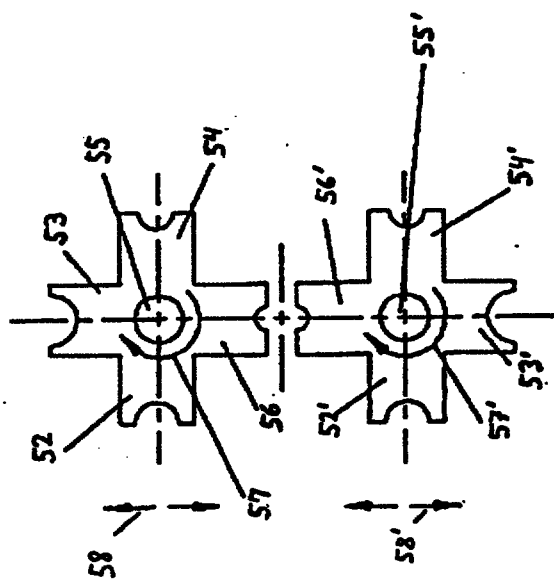


Fig. 6

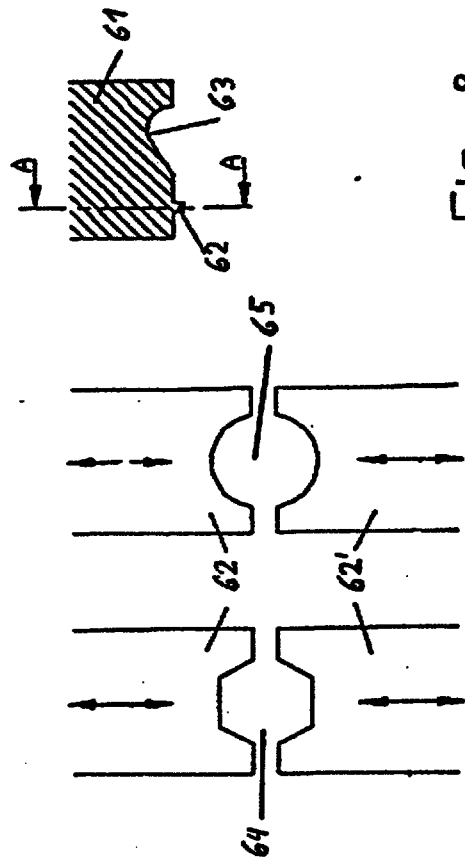


Fig. 8

Fig. 9

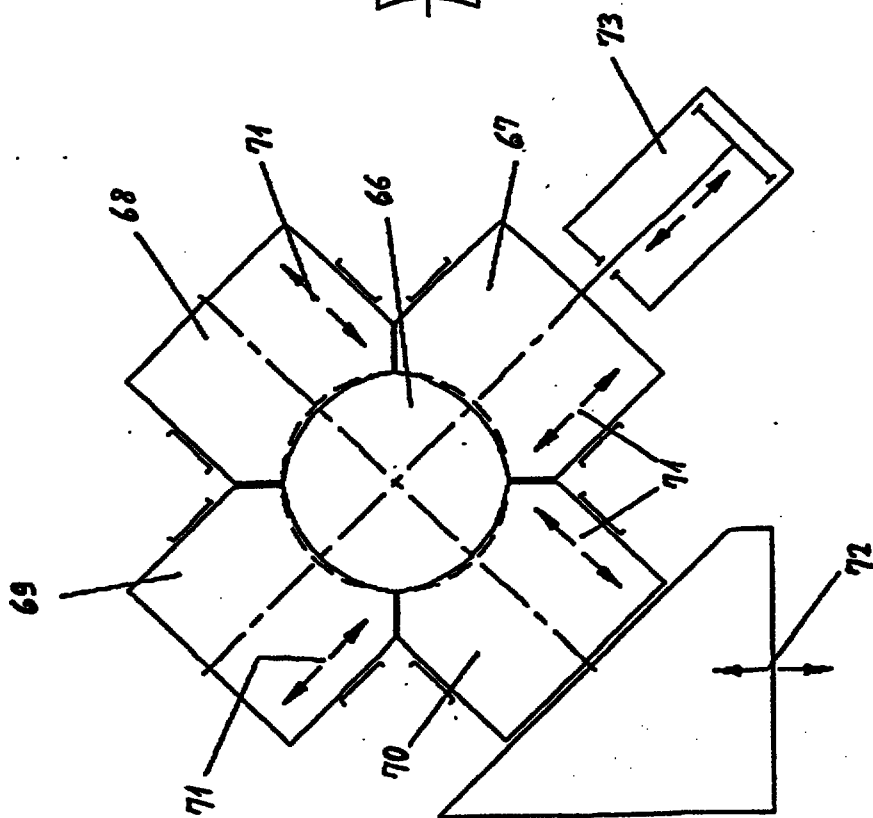


Fig. 11

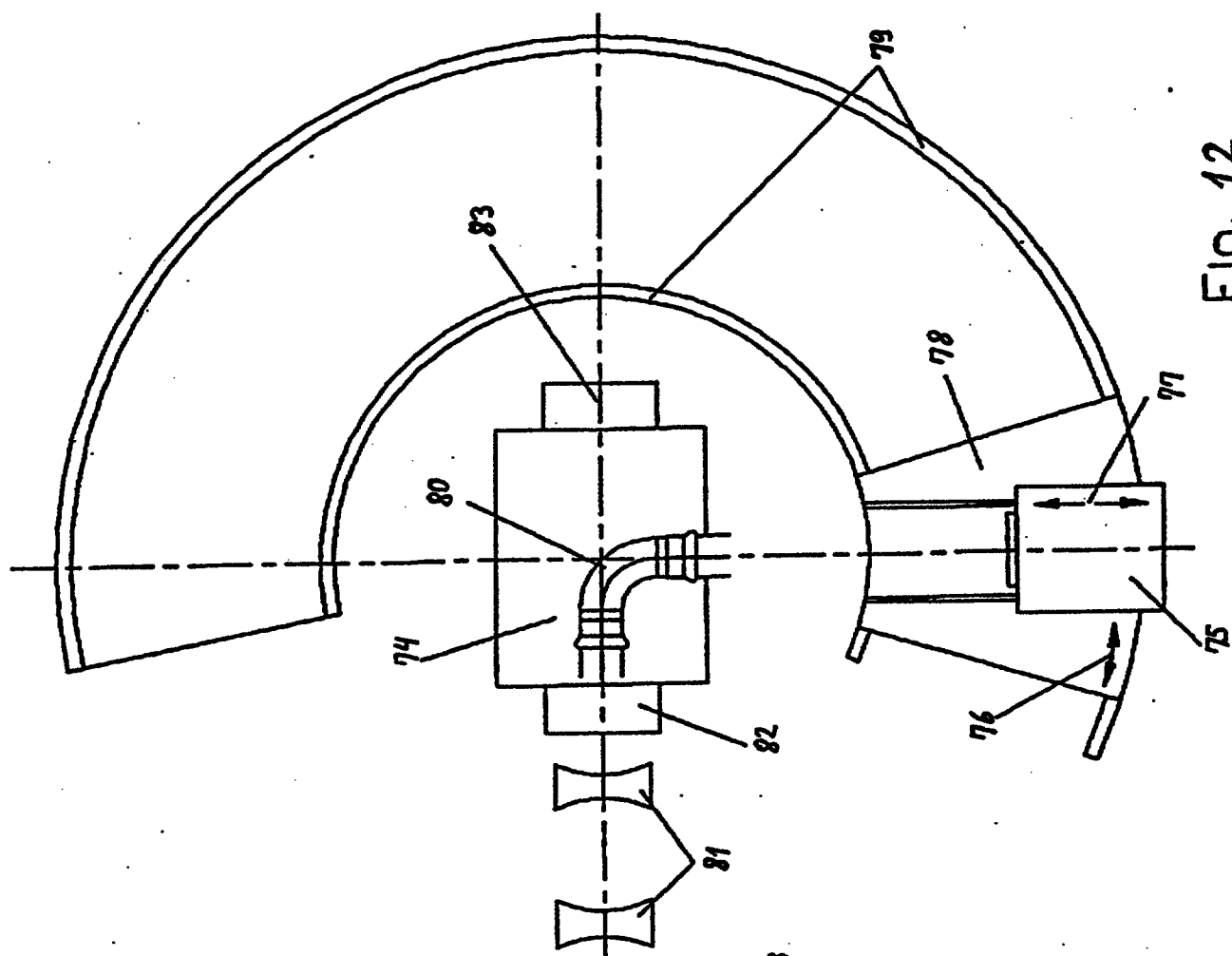


Fig. 12

REPLACEMENT SHEET
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PROCESS FOR THE INSTALLATION OF A CONDUIT PIPE SYSTEM AND DEVICE FOR UNRELEASABLE CONNECTIONS

ABSTRACT

This invention concerns a process for the installation of a conduit pipe system, consisting of elements such as fittings, connectors and shaped parts as well as conduit pipe sections that have a pressable area. In this process, the parts that are to be connected are moved in relative positions to one another towards a stationary pressing point and adjusted with regard to the distance and the angle. After the adjustments the pressing is carried out, whereby the individual working steps are preferably carried out automatically.

The invention also concerns a device for this with at least two replaceable pressing jaws that are arranged in a stationary press in which the lower press table serves at the same time as support table.

Figure 3

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PROCESS FOR INSTALLING A CONDUIT PIPE SYSTEM AND A DEVICE FOR UNRELEASABLE CONNECTION

The invention concerns a process for the installation of a conduit pipe system as well as a device for the creation of unreleasable connections between elements and conduit pipe sections respectively in accordance with the generic term of the claim 1 and 7 respectively.

From DE-U 90 16 310.9 a process is known for the installation of a conduit pipe system, consisting of elements having a pressable area such as fittings, connectors and shaped parts as well as conduit pipe sections, in which conduit pipe sections and elements are slipped on a connection piece and are releasably connected using a pressing tool that is put on on the outside.

For the transportation of liquid and gaseous media, in particular in buildings but also on board ships, conduit pipe systems are installed which consists mainly of conduit pipe sections that are cut to measure and related elements such as fittings, connectors and shaped parts. The connection of the conduit pipe sections to each other or to the elements described above, is created either releasable, e.g. through screw connections, or unreleasable, e.g. through welding, soldering or pressing. For the connection technique last mentioned, pressing systems have been developed by various manufacturers. These are characterized by elements that have at least one pressable end section and a sealing ring located in that section. Smooth end conduit pipe sections, that have been cut to measure, are inserted into the aforementioned section and these are then connected with the inserted end of the conduit pipe section, using a portable pressing tool. (see brochure of Mannesmann Edelstahlrohr GmbH, 1992 (excerpts); see brochure of company Benkan, 1992 (excerpts); see brochure of company Viega, March 1990 (excerpts)). Alternatively, a process (EP-A-0 390 747) is known, in which so-called composite pipes, consisting

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of a plastic pipe and a metallic tube slid over it, are pressed onto the connection piece of a fitting or onto a supporting sleeve, using a portable pressing tool. For the pressing the connection piece and the supporting sleeve respectively have recesses in the form of grooves and hollows. In a variation of this process, a pressing sleeve made of metal is slid over the composite pipe and connected to the supporting sleeve by pressing (see the aforementioned DE-U-90 16 310). In this case the supporting sleeve also has corresponding recesses and projecting areas.

Due to the development of a pressable element that has different characteristics, in particular fittings (DE-B-38 34 353), it was possible to extend the press fitting system with internal pressures exceeding 16 bar to dimensions exceeding 54 mm. For these larger dimensions, in particular 2" and larger, working with portable pressing clamp becomes difficult because the pressing jaws, the mounting for the pressing jaws and therefore the tool as a whole become very heavy. And very soon a point is reached, with regard to the weight and the handling, whereafter the pressing clamp as a portable device can no longer be used or only be used with great difficulties. It has already been suggested (see the aforementioned DE-U-90 07 414) to use a multi-section open pressing ring, at the free ends of which a separate drive unit could be connected. The pressing ring is designed in such a way that it is slipped over the pressing area of the fitting, the connector or the shaped part while open and that after the closing of the ends, the drive unit is attached in order to carry out the pressing.

In the case of large and complex installations of multi-pipe conduit pipe systems, for example in the installation shaft of a high rise building or on board a ship, the step-by-step pressing of the element in question together with a pertaining conduit pipe section and another element respectively is very troublesome. For each pressing process the entire tool or the pressing ring has to be attached after the

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insertion or sliding over of the parts to be connected, the pressing has to be carried out and the tool has to be removed. Furthermore the needed free length of the conduit pipe section in question has to be determined and the necessary length of pipe, taking into consideration the stipulated insertion length, has to be cut and the cut edge has to be deburred. Rarely are pipes that are already cut to size taken to a construction site.

It is the purpose of the invention, to explain a process for the installation of a generic conduit pipe system, which allows the pressing, in particular for dimensions 2 ½" and above, to be carried out in a simple manner and with lower cycle times, while at the same time increasing the quality of the connection and thus the protection against defects. Furthermore, a corresponding device is to be created for this.

This task is solved with the characteristics stated in the claims 1 and 7 respectively. Advantageous further developments are part of subsidiary claims.

In accordance with the invention it is proposed, to prefabricate one section of a conduit pipe system in a workshop or in an assembly hall in the case of a large construction site. This has the advantage that it will be possible to carry out not only one pressing, but two or even more at the same time. For this purpose, the parts to be connected are moved in relation to each other within the contact area of a stationary pressing device and are aligned with regard to distances and angles and then pressed. Preferably two pressings are carried out simultaneously on one element. This applies in particular to elements such as sleeves, bends, straightway parts of T-pieces and reducing fittings. For the latter element, the advantage of the process of the invention is obvious. Usually, it is necessary in the case of a reducing fitting to work with two different pressure clamps that correspond to the different rated dimensions at the two ends. This means, that the pressing

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clamps have to be changed after the first pressing or that another pressing ring has to be fitted before the second pressing can be carried out.

The proposed prefabrication can be automated to a great extent as the parts that are to be connected can be fed to the stationary pressing installation via appropriate auxiliary means such as roller tables, gripping device, robots etc. The quality of the pressing can be improved as well because it is easier to check the proper adjustment of the distances and angles before the pressing than it would be in the case of a manual operation at the location of the installation. The stationary pressing installation can, for example, be equipped with a release lock, in which according to the invention the proper insertion or sliding over is controlled mechanically via appropriately located sensors (DE-B-40 12 504). Instead of the sensors it is also possible to use an optical measuring device that is connected to a computer.

The brochures mentioned in the introductory description show, that the proper insertion plays an important role in the quality of the pressing. In principle it is also possible to press a part that is only partially inserted. However, sooner or later such an insufficient pressing will lead to leakages, especially because the axial anchoring of the connected parts is insufficient. In addition to the checking of the overlapping of the inserted and slid-on part respectively, it is also possible to check an element for correct angles. The relative angular position with reference to the system axis is important for all elements that are not

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**Patent claims :**

1. Process for the installation of a conduit pipe system, consisting of elements such as fittings (4-6, 11, 14), connectors and shaped parts as well as conduit pipe sections (1-3, 13, 22) that have a pressable area; In this process the conduit pipe sections and elements or a conduit pipe section (1-3, 13, 22) and one of the elements 4-6, 11, 14) mentioned are inserted into each other or slid onto a connection piece or support body and are then unreleasably connected with each other by a pressing tool attached from the outside, this process being
characterised by the fact
that for the manufacturing of a section of a conduit pipe that is ready to be installed, at a place that is separate from the place of installation, the parts to be connected (1-6, 11, 13, 14, 22) are moved in relation to each other towards a stationary pressing point (36) and are adjusted correctly with regard to the distance from each other and to the angle and that after the adjustment, at least one connection point is pressed, for which the slipping into each other or the slipping onto each other of the elements to be connected (1-6, 11, 13, 14, 22) is monitored and for which only after the stipulated coverage length (E11, E21) has been achieved a release signal is formed for the triggering of the pressing.
2. Process in accordance with claim 1,
characterised by the fact
that independent of the rated measurement to be pressed, two pressings are carried out simultaneously on one element.
3. Process in accordance with the claims 1 and 2

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characterised by the fact

that in the system axis of the section that is ready to be installed, several connection points that are at a distance from each other are pressed simultaneously.

4. Process in accordance with one of the preceding claims 1 to 3
characterised by the fact
that preferably at the branching end points, a part that is to be connected is pressed by using a portable generally known pressing device.
5. Process in accordance with one of the preceding claims 1 to 4
characterised by the fact
that the inserting into each other or the sliding on of the parts that are to be connected is monitored and that only after the stipulated overlapping has been reached, the release signal is generated for the triggering of the pressing process.
6. Process in accordance with one of the preceding claims 1 to 5
characterised by the fact
that the angle position of elements that are not rotation-symmetrical are checked with reference to a defined 6 or 12 o'clock position of the system axis and that only after congruence has been achieved between the set angle position corresponds to the desired position, a release signal is generated for the triggering of the pressing process.
7. Device for the unreleasable connection of elements - such as fittings (4-6,

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11, 14), connectors and shaped parts that have a pressable area (12, 17,18) as well as of conduit pipe sections among each other or of a conduit pipe section (1-3, 13, 22) and one of the said elements (4-6, 11, 14) for the installation of a conduit pipe system with a holding element that is connected to a drive unit, in which arc-shaped pressing jaws (15, 16, 46, 50) - that are movable relative to each other - can be arranged wherein the inside of the pressing jaws form a press profile that runs in the direction of circumference which at the end of the pressing process form a closed pressing chamber, this device being characterised by the fact that at least two replaceable pressing jaws (15, 16, 46, 50, 52-60) are arranged in a stationary press (36, 74), whereby the lower part of the pressing table serves at the same time as a support table for the parts to be connected (1-6, 11, 13, 14, 22) and by the fact that an automatic insertion device (39, 82) is provided for within the area of the press (36, 42, 74), connected to a sensor element for the monitoring of the proper insertion and a signal transmitter for the release of the pressing process.

8. Device in accordance with claim 7 characterised by the fact that the pressing jaws (67-70) are arranged in the form a multiple jaw configuration, whereby the multiple jaws (67-70) can be moved radially by a tapered slide valve (72).
9. Device in accordance with claim 7 characterised by the fact that several pressing jaws (52-56) of different rated dimensions are

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arranged in a holder in such way that they can be selectively removed for the pressing.

10. Device in accordance with claim 9
characterised by the fact
that the press (74, 75) has a second pair of holders.
11. Device in accordance with claim 7
characterised by the fact
that the pressing jaws (52-56) are arranged on a holding element (55, 55')
that can be rotated.
12. Device in accordance with claim 8
characterised by the fact
that the multiple jaws (67-70) can be moved by hydraulic or pneumatic
drives (73).
13. Device in accordance with claim 7
characterised by the fact
that at least one other pair of pressing jaws (46, 50) is arranged axially
shifted in the longitudinal and transverse direction to the first pair of
pressing jaws (15, 16).
14. Device in accordance with claims 7 to 13
characterised by the fact
that another press (75) that can be moved in the direction of the system axis

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is provided for beside a first stationary press (74).

15. Device in accordance with the claims 7 to 14
characterised by the fact
that the pressing profile of the pressing jaw (61) has an approximately
semicircular pressing groove (63) in the cross section and a pressing web
(62) on one side, for which it is generally known that this pressing web is
hexagonal (64) in the direction of the circumference.
16. Device in accordance with the claims 7 to 14
characterised by the fact
that the pressing profile of the pressing jaw (61) has a somewhat
semicircular pressing groove (63) in the cross section and a pressing web
(62) on one side, for which it is generally known that this pressing web is
lemon-shaped (65) in the direction of the circumference.
17. Device in accordance with the claims 7 to 14
characterised by the fact
that a rotating device (83) is provided for within the area of the press (74),
whereby this is connected to a signal transmitter for the release of the
pressing process.
18. Device in accordance with one of the preceding claims
characterised by the fact
that means of transportation are arranged for within the area of the press for
the automatic feeding of conduit pipe sections (1, 2, 3) that are cut to size
and that are deburred at both ends.

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19. Device in accordance with the claims 7 and 14
characterised by the fact
that at least one additional press (75) which is movable in the radial
direction (58) is arranged on a circular disk (78) which can be rotated (76)
around the center point of a stationary press (74).
20. Device in accordance with the claim 19
characterised by the fact
that the additional press (75) can also be adjusted in height.
21. Device in accordance with claims 7 and 14
characterised by the fact
that the stationary press (74) is designed as a double press and that one
press (75) each which can be moved in the direction of the system axis is
provided for on the left hand side and on the right hand side of it.

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