(12) UK Patent Application (19) GB (11) 2 149 869 A

(43) Application published 19 Jun 1985

(21) Application No 8428354

(22) Date of filing 9 Nov 1984

(30) Priority data
(31) 3341044 (32) 12 Nov 1983 (33) DE

(51) INT CL⁴
F16L 55/00 23/00

(52) Domestic classification
F2G 2A 2J 8
U1S 1905 F2G

(56) Documents cited
GB A 2118657 GB 1524394 GB 1071155
GB A 2038971 GB 1496021

(58) Field of search
F2G

(71) Applicant
Deutsche Gesellschaft Fur Wiederaufarbeitung Von Kernbrennstoffen mbH (FR Germany),
Postfach 1407, 3000 Hannover 1, Federal Republic of Germany

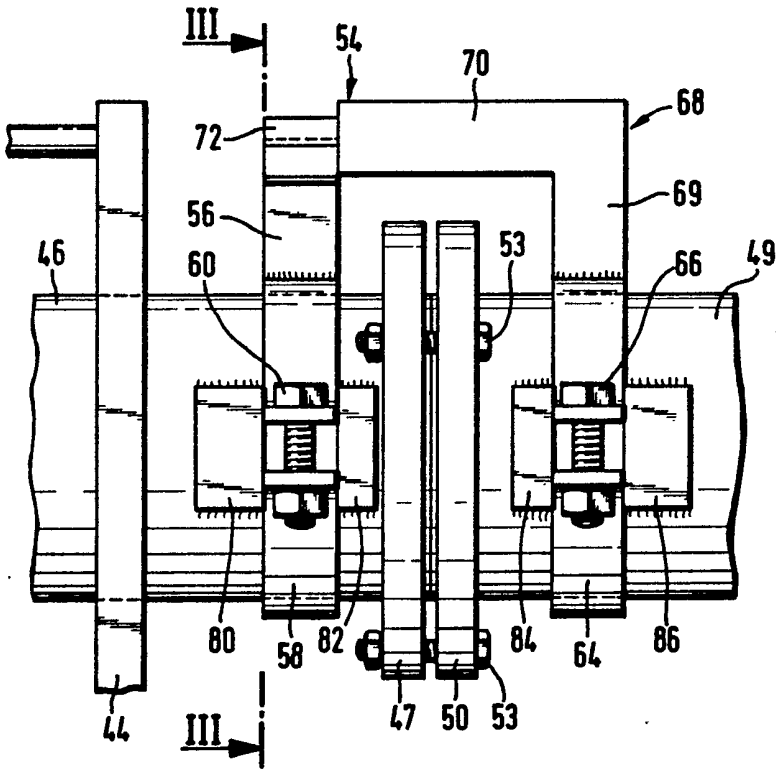
(72) Inventors
Jurgen Forster
Helmut Westendorf

(74) Agent and/or Address for Service
D Young & Co,
10 Staple Inn, London WC1V 7RD

(54) Centring device for connecting jumper pipes

(57) In large cells for reprocessing irradiated nuclear fuel, pipes link materials processing apparatus. Joining of a stationary end flange (47) to a pipe flange (50) of a jumper pipe section has to be carried out by remote controlled handling, and the operator has to carry out the connecting process by television monitoring. To enable the process of coupling the flanges to be carried out quickly, safely and in simple manner, an upwardly projecting vertical centring peg (56) is provided on the stationary pipe (46) and a docking member (72) with centring surfaces, which fits over the centring peg (56) is provided on the jumper pipe (49). The centring device described is in itself an optical aid in bringing together the flanges (47, 50) to be coupled.

Fig. 2



GB 2 149 869 A

2149369

Fig. 1

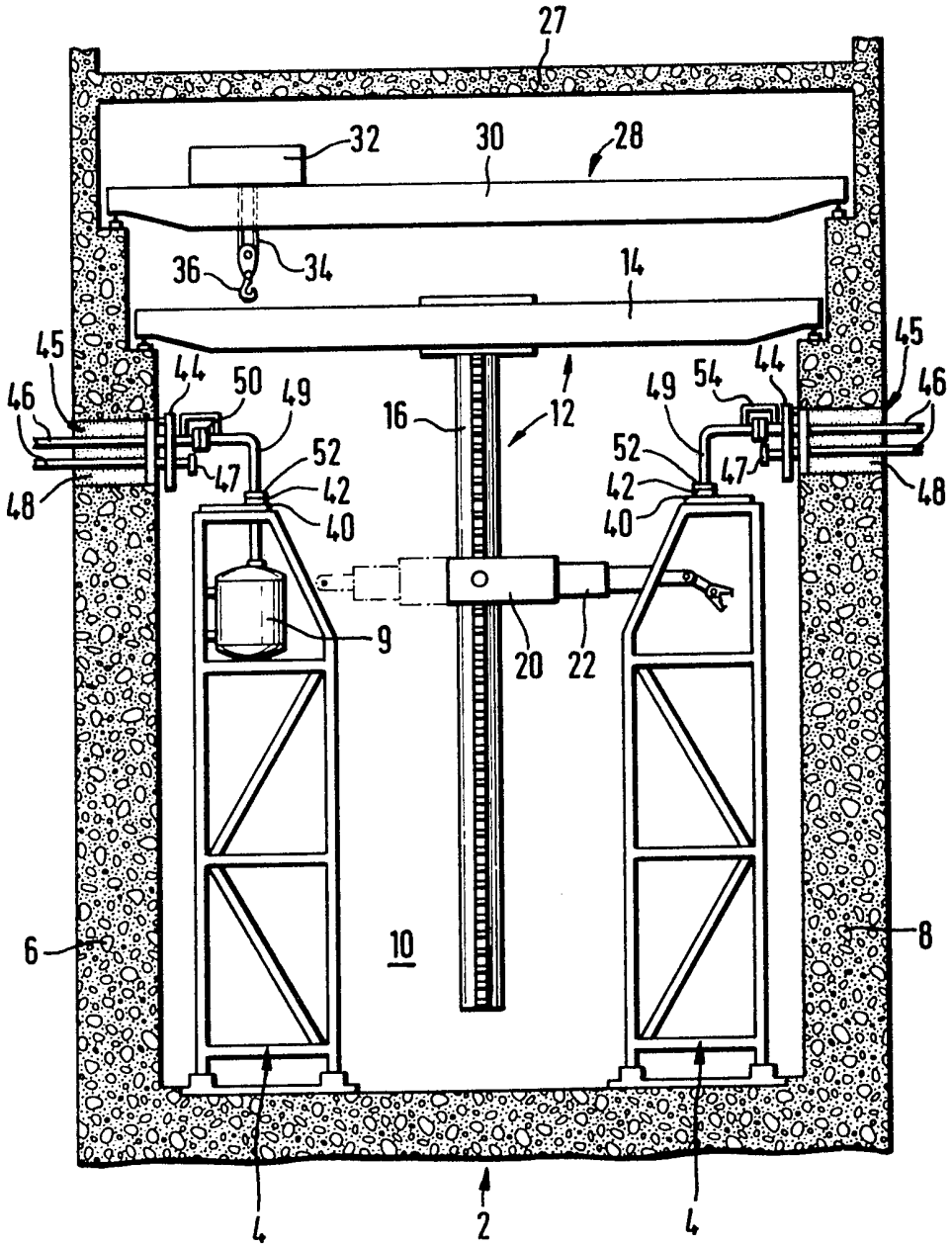


Fig. 3

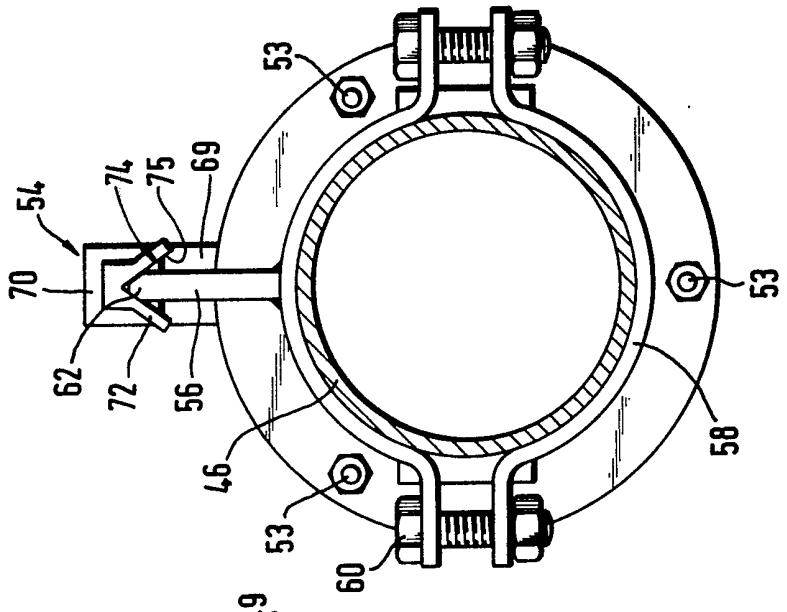
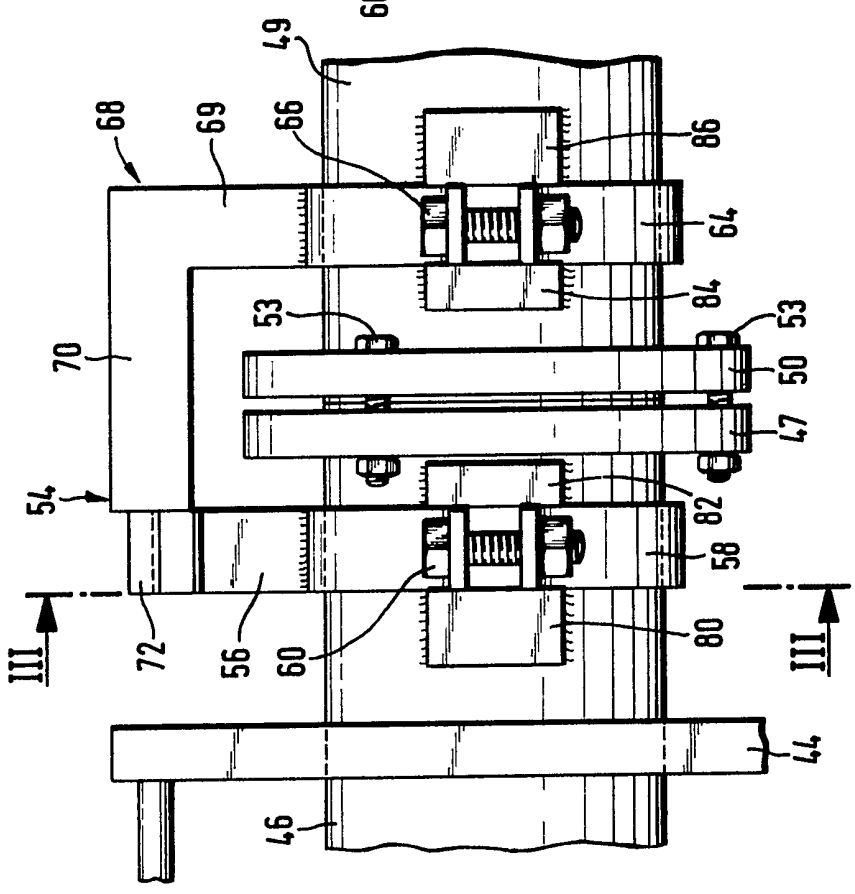

53
54
74
75
69
70
62
72
56
46
53
60
58
53

Fig. 2


49
68
69
66
86
64
84
53
53
70
50
47
54
82
58
III
III
72
56
60
80
44
46

SPECIFICATION

Centring device for connecting jumper pipes

The invention relates to a centring device for remote controlled coupling of an end flange of a stationary pipe to a pipe flange of a vertically removable jumper pipe in a large cell for reprocessing irradiated nuclear fuel.

Installations for reprocessing irradiated nuclear fuel have large so-called "hot" cells to accommodate the materials processing section. In these cells, which provide a shield from radiation, processing components are installed in so-called racks.

Maintenance jobs inside the large radioactive cells have to be done without any workers having to enter the cell. Maintenance work is therefore carried out by travelling remote handling machines. It is desirable for the racks holding the processing components to be installed appropriately for remote handling, in a modular construction along the walls of the hot cell. This makes it possible to exchange a complete rack module or parts of the module.

When a rack is exchanged all the pipes which connect two racks directly with one another or directly to pipes leading through the wall of the cell have to be separated by remote control and reconnected when a new rack module has been installed. It is necessary for whole sections of the pipes to be removed in order to enable the rack to be dismantled, since the pipes would impede the exchangeability, *i.e.* the removal of the module.

Removable jumper pipes are therefore used, joined to connectable pipe flanges at the ends. When pipes leading through the wall of the cell are connected to pipe unions in the rack, the jumper pipes are inserted between the stationary end flange at the pipe plate mounted on the wall of the cell and the end flange of the pipe union of a materials processing apparatus provided in the rack, and are coupled to these two end flanges.

Between the two end flanges there is a fixed space into which the interchangeable or removable jumper pipe is vertically inserted and from which it is removed. The flanges are joined together by means known *per se* such as tension ring couplings or screw connections.

The pipe flanges to be coupled have to be brought together centrally. Since this has to be done by the remote controlled handling technique, there is a particular problem for the operator who is monitoring and operating the connecting process by means of televion pictures. There is found to be a bad view of the coupling position shortly before the flanges engage and this can lead to frequent unsuccessful attempts to insert the interchangeable jumper pipes.

According to the invention, there is provided a centring device for remote controlled coupling of an end flange of a stationary pipe to a pipe flange of a vertically removable jumper pipe in a large cell for reprocessing irradiated nuclear fuel where the dividing plane between the end flange and the pipe flange is located in a vertical plane, the device comprising an upwardly projecting vertical centring peg on the stationary pipe, and a docking member with centring surfaces which fits onto the centring peg provided on the removable jumper pipe section.

When the clamping means has been released by remote control, the jumper pipe is taken out in a vertical direction. After the maintenance work has been done or a rack module has been exchanged the jumper pipe has to be reinserted to connect the pipe unions.

For the operator the centring device according to the invention is in itself an optical aid in bringing together the flanges to be coupled. This is made possible because with the centring device according to the invention the centring process occurs advantageously outside the coupling position rather than at it. The flanges to be coupled can therefore be brought together quickly and centrally.

Preferably the centring peg and the docking member are mounted on pipe clips fixed round the respective pipes to give accurate alignment in the vertical direction. The centring peg on the stationary pipe may be mounted during the original erection and assembly in the large cell. The docking member on the jumper pipe may be mounted in a service area, which is in a shielded location above or adjacent the large cell.

Advantageously the centring peg comprises a flat rod, which has a longitudinally extending wedge-shaped tip at the upper end and which extends perpendicular to the axis of the pipe, and the docking member presents a widening wedge-shaped docking recess which is downwardly open and which extends parallel to the axis of the pipe.

This can have the advantageous effect that the centring means extend over conical surfaces of a determined width. Accurate guidance and stability for the centring device are obtained.

Abutment means may be provided to prevent any axial displacement of the two parts of the centring device.

The invention can provide a centring device which enables flanges which have to be coupled to be brought together quickly and centrally by remote handling.

The invention is diagrammatically illustrated by way of example with reference to the accompanying drawings from which features not essential to an understanding of the invention have been omitted and in which:–

Figure 1 is a cross section through a large

cell with racks extending along the walls and showing a jumper pipe provided between an end flange of a stationary pipe projecting from the cell wall and a stationary pipe union provided on one of the racks;

Figure 2 is a larger scale view of the coupling between the stationary end flange at the cell wall and the adjacent pipe flange of the jumper pipe section, in the coupled state and including a centring device according to the invention; and

Figure 3 is a cross section taken on line III–III in Fig. 2.

Referring to the drawings in a large cell 2 a plurality of so-called racks 4 are arranged along two opposed walls 6 and 8. The racks 4, which may have a lattice structure, accommodate processing components, of which only one container 9 is shown. A central transporting passage 10 is formed between the two opposed rows of racks. A manipulator carrying system 12 is arranged movably in the passage 10. It comprises an upper transverse girder 14 which is movable horizontally, laterally in the side walls 6, 8 of the large cell 2. A vertical guide column 16 is suspended from the middle of the girder 14.

The guide column 16 is rotatable about its longitudinal axis and has a support 20 mounted on it. The support can move up and down the column and carries a telescopic boom 22. Manipulators, tools or other remote handling equipment can be fitted to the end of the boom 22.

Above the transverse girder 14 of the manipulator carrying system 12 and only slightly below the cell roof 27 there is a remotely controllable travelling bridge crane 28, provided with a trolley 32 which can be moved transversely to the crane girder 30. The crane 28 carries a hook 36 which can be moved vertically on a wire cable 34.

The racks 4 each have a horizontally extending pipe union plate 40 at the top, holding pipe unions 42 for the materials processing components 9. Above the racks 4 inside the cell 2, at the cell walls 6, 8, there are vertically arranged union plates 44 for pipes 46 which are brought in from outside through plugs 45 in the cell wall. The plates 44 have end flanges 47, in which the pipes 46 brought in terminate. The plug 45 in the cell wall is filled with granulated lead 48.

At each rack 4 the two union plates 40 and 44 are linked by a jumper pipe 49. The jumper pipe 49 has a respective pipe flange 50, 52 at each end, the flanges 50, 52 being joined by screw connections 53 to the end flange 47 at the cell wall and the end flange 42 of the plate 40 respectively. When the screw connections 53 have been released the jumper pipe 49 can be removed in a vertical direction.

To facilitate bringing together of the vertical flanges 47 and 50 of the horizontal pipe portions 46 and 49 centrally, the portions have a centring device 54. The device 54 (Fig. 2 and Fig. 3) substantially comprises a centring peg 56 which is disposed adjacent the end flange 47 of the stationary pipe 46 and which projects vertically upwards. The peg 56 comprises a flat rod which is welded axially parallel onto a pipe clip 58 and fixed onto the stationary pipe 46 by screws 60. The peg 56 has a wedge-shaped tip 62 aligned parallel with the axis of the pipe.

A pipe clip 64 is similarly fixed to the removable jumper pipe 49 adjacent its pipe flange 50, by means of screws 66. An angular bracket 68 projects vertically upwards with a vertical limb 69 welded to the pipe clip 64, while its horizontal limb 70 has a docking member 72 welded onto the end. The docking member 72 has a wedge-shaped docking recess 74 therein which is downwardly open. The docking recess 74 is aligned parallel with the axis of the pipe and thus interacts with the wedge-shaped tip 62 of the centring peg 56. The inclined surfaces 75 of the wedge-shaped docking recess 74 of the nut member 72 form centring surfaces for the peg 56 during the docking process.

At both sides of each pipe clip 58 and 64 restricting blocks 80, 82 and 84, 86 are welded onto the surface of the particular pipe in the region of the scews 60 and 66. The blocks 80, 82 and 84, 86 prevent any axial displacement of the pipe clips 60, 66.

The apparatus described operates as follows.

If the rack 4 or part of it has to be dismantled, the pipe connection between the pipe union plate 40 of the rack 4 and the pipe union plate 44 of the cell wall first has to be released and the jumper pipe 49 removed. An impact screwdriver carried by the manipulator arm 22 releases the screw connections of the coupled flanges. The jumper pipe 49 is thereupon raised upwards by the crane 36 from the position in which it connected the pipe unions. The rack 4 is now freely interchangeable.

When the rack 4 has been exchanged the pipe unions have to be reconnected. For this purpose the particular jumper pipe 49 is brought vertically downwards by the crane 28, into position between the two end flanges 47 and 42 of the plates 44 and 40, which have to be joined. With the aid of a television unit the operator can adjust the entry of the jumper pipe 49 on his screen, to the centring device 54 located outside the coupling position. This optical observation thus enables the coupling position to be approached with considerable accuracy. Precise centring of the flanges 47 and 50 relative to one another is obtained within the precise range by engaging the docking member 72 on the centring peg 56. The wedge-shaped tip 62 of the peg 56 is set down on the inclined centring surfaces

75 of the docking member 72 and, on further lowering of the jumper pipe 49, centres the pipe flange 50 accurately relative to the end flange 47 of the stationary pipe 46. When the two flanges 47 and 50 have been brought together with exact centring, they are joined by an impact screwdriver carried by the manipulator arm 22, which retightens the screws 53.

CLAIMS

1. A centring device for remote controlled coupling of an end flange of a stationary pipe to a pipe flange of a vertically removable jumper pipe in a large cell for reprocessing irradiated nuclear fuel where the dividing plane between the end flange and the pipe flange is located in a vertical plane, the device comprising an upwardly projecting vertical centring peg on the stationary pipe, and a docking member with centring surfaces which fits onto the centring peg provided on the removable jumper pipe section.

2. A centring device according to claim 1, in which the centring peg is mounted on a pipe clip, which is fixed around the stationary pipe adjacent the end flange thereof.

3. A centring device according to claim 1 or claim 2, in which the docking member is fixed to the end of an angular bracket, one limb of which is mounted vertically on the periphery of a pipe clip, and the clip is disposed around the removable pipe section adjacent the pipe flange to be coupled.

4. A centring device according to any one of claims 1 to 3, in which the centring peg comprises a flat rod, which has a longitudinally extending wedge-shaped tip at the upper end and which extends perpendicular to the axis of the pipe, and the docking member presents a widening wedge-shaped docking recess which is downwardly open and which extends parallel to the axis of the pipe.

5. A centring device according to claim 3, in which abutment means to prevent axial displacement of the pipe clips are provided adjacent the clip of the stationary pipe and/or adjacent the clip of the jumper pipe.

6. A centring device according to claim 5, in which the abutment means are restricting blocks which are welded onto the surface of the respective pipe.

7. A centring device for remote controlled coupling of an end flange of a stationary pipe to a pipe flange of a vertically removable jumper pipe in a large cell for reprocessing irradiated nuclear fuel substantially as hereinbefore described and illustrated with reference to the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.