

PATENT SPECIFICATION

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(54) APPARATUS FOR THE APPLICATION OF A FIRST FERROMAGNETIC COMPONENT TO A SECOND FERROMAGNETIC COMPONENT

- (71) We, TOTAL TRANSPORTATION SYSTEMS (INTERNATIONAL) A/S, of Bjornegarden, 5200 Os, Norway, a Norwegian Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 The invention relates to an apparatus for the application of a first ferromagnetic component, for example a sectional reinforcement member to a second ferromagnetic component, for example a panel.
- 15 According to the present invention, there is provided apparatus for the application of a first ferromagnetic component to a second ferromagnetic component, which apparatus comprises:
- 20 a) a horizontally movable gantry having two supporting uprights and a girder extending horizontally between the two uprights;
- b) a vertically movable yoke extending between the two uprights substantially parallel to the girder;
- 25 c) means for adjusting the vertical position of the yoke;
- d) at least one electromagnet on the yoke for holding the first ferromagnetic component; and
- 30 e) a jig which is displaceable along the yoke and which is provided with electromagnetic lifting means for holding the second ferromagnetic component and pressing means for pressing the first ferromagnetic component against the second ferromagnetic component.
- 35 The apparatus is intended to be used mainly in shipyards, but it also has application in other fields of mechanical engineering in which a relatively large number of ferromagnetic plates or panels having ferromagnetic sectional reinforcement members are produced.

It is known to use gantry cranes or the like to transfer sectional members from a store to that place on a horizontally-lying panel to which the section is to be welded. However, the final adjustment and retention of the sectional member must be performed manually, an operation calling for a large amount of labour and time. Moreover, the work is not completely safe. The aforementioned procedure is less suitable when the panel is uneven, since in such a case it is very difficult to produce the pressure required to bring the panel and sectional member into intimate contact with one another at the place where they are to be welded together. An attempt has been made to solve this last-mentioned problem by a system comprising a fixed gantry, through which the panels are passed to have the sectional members welded on. The individual sectional members are introduced laterally under the gantry and retained there, the panels being pressed upwards against the sectional members by means of subjacent hydraulic jacks. The gantry therefore acts as an abutment for the jacks, whose total force is transmitted to the gantry. For this reason the gantry must be very solidly and rigidly constructed, and this also requires very strong foundations. Similarly, expensive equipment is required for moving the panels under the gantry, since the correct placing of the sectional members depends on the accurate positioning of the panels for welding.

For a clearer understanding of the present invention, an embodiment of the invention will now be described by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a front elevation of the embodiment; and

Fig. 2 is a section, on a somewhat enlarged scale, taken along the line II-II in Fig. 1.

Fig. 1 shows a gantry comprising a substantially horizontal girder 1 attached to two supporting uprights 2 having at their bases wheels 3 running on rails 4 or the like in a workshop floor 5.

The gantry can be horizontally reciprocated on the rails by a motor 6 driving a shaft to which a sprocket wheel 8 is attached over which chains 9 run which transmit motive power to the wheels 3.

Disposed between the supporting uprights 2 of the gantry is a yoke 10 extending substantially parallel with the gantry girder 1. The yoke is connected to the supporting uprights by means of guide shoes 11 movable vertically along the supporting uprights by wires 12. The wires 12 run over three fixed pulleys 13 and one movable pulley 14, which is rotatably attached to a hydraulic lifting cylinder 15. One end of one of the wires 12 is attached to a hydraulic adjusting cylinder 16. The yoke 10 is connected to each of the guide shoes 11 at a top and bottom point. The bottom connecting point is formed by a journal 17 which is mounted to pivot around a horizontal axis in the yoke and is secured in the guide shoe after the fashion of a ball-and-socket joint. The top connecting point is formed by a control pin 18 which extends horizontally outwards from the guide shoe in the direction of the yoke and through a corresponding hole in a plate 19 attached to the yoke. Plate 19 can be moved in relation to the yoke and transversely of its longitudinal direction by means of a wheel 20 acting on an adjustment mechanism suitable for this purpose. By turning the wheels 20, therefore, the yoke can be rotated around a substantially horizontal axis through the journals 17.

Since the journal 17 is borne in ball-and-socket fashion in the guide shoe and the control pin 18 can move in the plate 19, one guide shoe is enabled to make a certain vertical movement in relation to the other guide shoe. Such relative vertical movement can be produced by means of a hydraulic adjusting cylinder 16.

The bearing of the journal 17 in the yoke 10 is formed by a hydraulic cylinder in which the journal forms the plunger rod. By means of the hydraulic cylinder the journal can be displaced to a certain extent in the longitudinal direction of the yoke and thereby cause a corresponding displacement of the yoke 10 in relation to the gantry. A displacement of this kind is used when finely adjusting the section to the panel plate.

Disposed on the underside of the yoke are a number of magnet holders 21 bearing gripper electromagnets 22, the purpose of which is to retain a sectional member (not shown) to be welded to a panel plate

23. The electrical power to each gripper electromagnet 22, which is a solenoid, can be cut off by means of individual circuit breakers 24 if this should be desirable to facilitate the fitting together of the sectional member and panel plate or to prevent the magnetic field of the gripper electromagnet from affecting welding in its immediate vicinity.

The underside of the yoke 10 also has lowerable sectional member supporting legs 25 which, when in the lower position 25' help to prevent the sectional member retained by the gripper magnets from falling over with consequent risk of damage to material and persons, if the power supplies to the gripper magnets should fail.

A jig 26 is movably disposed on the yoke. As seen most clearly in Fig. 2, the jig has wheels 27 which run on rails 28 attached to the lower edge of the yoke.

The cross-sectional shape of the jig is substantially an inverted U, the arms of which extend down on each side of the yoke.

The jig has lifting magnets 29 which are each pivotably attached to a vertically movable hydraulic cylinder 30 and are adapted to lift the panel plate 23 up to the yoke.

The jig also has a pressing roller 31 which can be vertically displaced by a jack 32 in the form of a hydraulic cylinder. The top position of the pressing roller is shown by a solid line, its bottom position being shown by a chain-and-dot line. The function of the pressing roller is to press a sectional member downwards against the panel plate 23 retained by the lifting magnets 29 if the sectional member and panel plate do not automatically become laid against one another with the necessary precision when the sectional member is lowered on to the panel plate by means of the yoke 10.

Since both the lifting magnets 29 and the pressing roller 31 are supported by the jig 26, the necessary pressing forces between the sectional member and the panel plate are absorbed in the jig. This has the great advantage that the rest of the construction, i.e., the yoke and gantry, can be of relatively light weight, thus eliminating bulky dimensions and expensive foundations.

The jig also has a welding device 33 for tack welding of the sectional member to the panel plate while these parts are retained in the compressed position by the jig. The jig also has its own hydraulic systems 34 to which electrical power is supplied via an encapsulated conductor rail 35 extending along the yoke 10.

Fig. 2 shows how the chains, which transmit motive power from the shaft 7 to the wheel 3, runs over two pulleys 36 which are

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disposed, with provision for horizontal movement, in the plane of the supporting upright and are therefore adapted to displace one supporting upright in relation to the other in the direction of movement of the gantry. This permits some adjustment of the parallelism of the sectional members.

Fig. 2 also shows how the yoke 10 is a box construction having an internal cavity which can be used as a duct for the suctional removal of gases evolved during welding.

It will be clear to the skilled addressee that the invention can be varied in a number of ways within the scope of the following claims. For instance, the gripper magnets can be pivotably disposed on the magnet holders, so that the vertical position of the sectional members retained by the gripper magnets can be adjusted without necessitating the rotation of the yoke in relation to the guide shoes. The yoke can also have a plurality of jigs if this should be desirable for reasons of capacity.

The above described apparatus enables the sectional members to be accurately positioned with the minimum of labor and without the need for heaving rigid constructions having cumbersome foundations.

WHAT WE CLAIM IS:—

1. Apparatus for the application of a first ferromagnetic component to a second ferromagnetic component, which apparatus comprises:

a) a horizontally movable gantry having two supporting uprights and a girder extending horizontally between the two uprights;

b) a vertically movable yoke extending between the two uprights substantially parallel to the girder;

c) means for adjusting the vertical position of the yoke;

d) at least one electromagnet on the yoke for holding the first ferromagnetic component; and

e) a jig which is displaceable along the yoke and which is provided with electromagnetic lifting means for holding the second ferromagnetic component and pressing means for pressing the first ferromagnetic component against the second ferromagnetic component.

2. Apparatus according to claim 1, wherein the vertical adjustment means is capable of vertically displacing the two ends of the yoke independently of one another.

3. Apparatus according to claim 1 or 2, wherein the or each electromagnet on the yoke is capable of being angularly displaced about an axis directed along the

yoke.

4. Apparatus according to claims 1, 2 or 3, wherein the supporting uprights of the gantry are movable to a limited extent in relation to one another in the direction of movement of the gantry.

5. Apparatus according to any preceding claim, wherein the electromagnetic lifting means on the jig comprises electromagnets which are pivotably attached to hydraulic lifting devices.

6. Apparatus according to any preceding claim, wherein the jig is also provided with a tack welding device.

7. Apparatus according to any preceding claim, wherein the yoke is provided with lowerable legs for supporting the first ferromagnetic component.

8. Apparatus according to any preceding claim, wherein the yoke has a conductor rail for supplying electrical energy to the yoke.

9. Apparatus according to any preceding claim, wherein the yoke is formed with an inner cavity acting as a duct for the removal of gases.

10. Apparatus according to any preceding claim, wherein the yoke is provided with means for adjusting its position in the longitudinal direction of the yoke.

11. Apparatus according to claim 10, wherein the longitudinal position adjusting means comprises hydraulic cylinders which are disposed in the longitudinal direction of the yoke at its ends and whose plunger rods are at their projecting ends pivotably borne in guide shoes movable vertically along the supporting uprights of the gantry.

12. Apparatus according to any preceding claim, which apparatus is adapted for use with a second ferromagnetic component in the form of a panel and a first ferromagnetic component in the form of a sectional reinforcement member for the panel.

13. Apparatus for the application of a first ferromagnetic component to a second ferromagnetic component, which apparatus is substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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disposed, with provision for horizontal movement, in the plane of the supporting upright and are therefore adapted to displace one supporting upright in relation to the other in the direction of movement of the gantry. This permits some adjustment of the parallelism of the sectional members.

Fig. 2 also shows how the yoke 10 is a box construction having an internal cavity which can be used as a duct for the suctional removal of gases evolved during welding.

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