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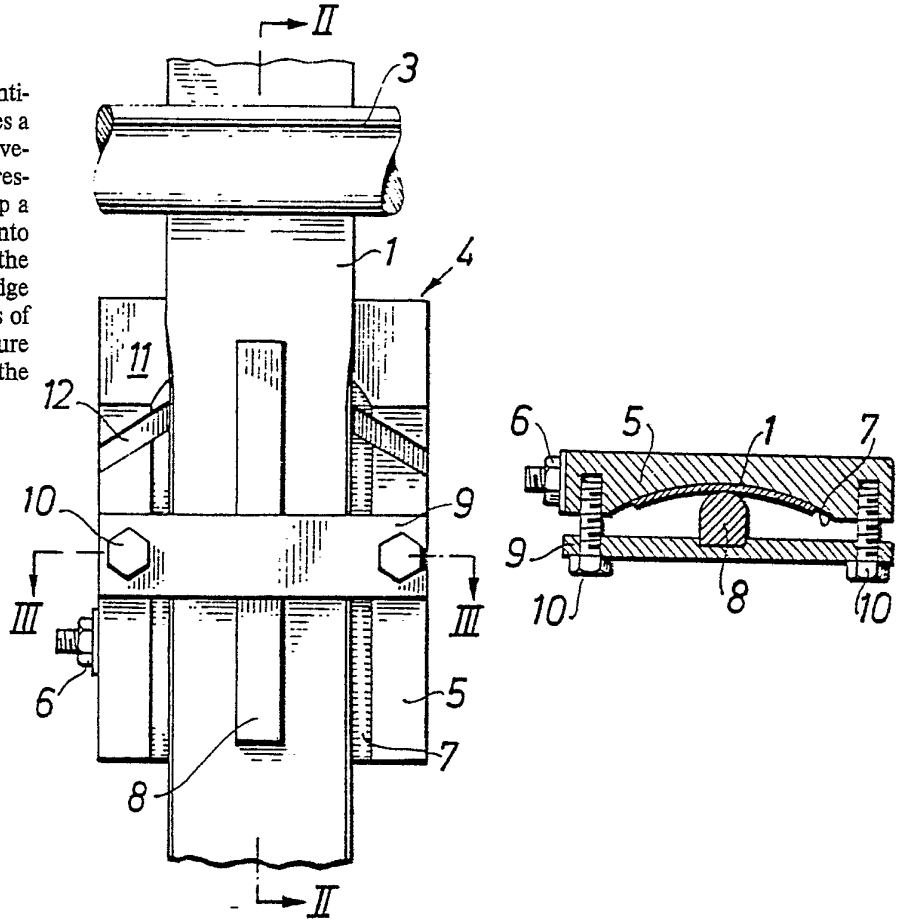
(54) Title: A CONTACT DEVICE FOR STRIP-SHAPED WELDING ELECTRODES

(57) Abstract

A contact device for a continuous strip electrode (1) comprises a contact member (5) having a groove-shaped contact surface (7) and a pressure member (8) arranged to keep a center zone of the strip depressed into the groove, thereby submitting the strip to a bending stress causing edge portions of the strip on both sides of the zone engaged by the pressure member to be pressed against the contact surface (7).



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A contact device for strip-shaped welding electrodes

Technical Field of the Invention

This invention relates to automatic arc welding and more particularly to an improved contact device for supplying welding current to a continuous, strip-shaped welding electrode.

Contact devices of this kind are used, for instance, in welding apparatus for coating or cladding a metallic workpiece with a layer of the same or another metal by means of strip electrodes having a width/thickness ratio in the range between 300:1 and 10:1. A usual strip dimension is 60 x 0.5 mm. The electrodes may consist of various steel alloys or nonferrous metals or alloys, according to the desired composition of the layer of metal deposited. One or more strip electrodes are fed forward from a reel or reels by means of an advancing unit towards the welding arc through the contact device in which the welding current is transmitted to the electrode from one terminal of a source of welding power. The other terminal of the source of welding power is connected to the workpiece on which the electrode metal is to be deposited.

BACKGROUND ART

Contact devices for strip electrodes are shown and described in, for instance, the U.S. patents Nos. 3,936,654 (Cannata), and 3,271,554 (Johnson). In the device shown in the Cannata patent, the electrode strip is pushed through a pair of spring-pressed contact jaws by a pair of advancing rolls having annular projections imparting longitudinal undulations to the strip. In the devices shown in the Johnson patent, the electrode strip is pushed by a cylindrical advancing roll trhough a gap between a contact member and a pressure member actuated by a spring mechanism.

DISCLOSURE OF THE INVENTION

The invention provides an improved contact device for a continuous, strip-shaped welding electrode comprising a

contact member having a contact surface for slidingly engaging one side of the moving electrode strip, and a pressure member arranged slidingly to engage the other side of the electrode strip for providing the contact pressure required between the electrode strip and the contact member. The improvement according to the invention resides therein that said contact surface constitutes a shallow groove arranged to be traversed longitudinally by the electrode strip and that said pressure member is arranged to engage the strip at a zone intermediate edge zones of the strip to depress said intermediate zone into the groove and thereby to cause said edge zones to engage the groove under the action of the bending stress caused by the depression of said intermediate zone. The term "shallow" should be understood to indicate that the depth of the groove must not be so large as to allow a permanent (plastic) deformation of the strip depressed therein.

The new features above specified result in that the electrode strip itself serves as a spring member providing the required contact pressure between the strip and the contact member. Another advantage is that the inclined walls of the groove provide a lateral guiding action upon the strip.

Other objects and advantages of the invention will be apparent from the following description of embodiments of the invention with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a (somewhat schematical) side view of a welding head for a strip electrode.

Fig. 2 is a vertical section taken along II-II of Fig. 1.

Fig. 3 is a horizontal section taken along III-III of Fig. 1.

Fig. 4 is a side view of a contact member forming part of the welding head of Fig. 1.

Fig. 5 is a side view of a modified form of the contact member.

Fig. 6 is a vertical section taken along VI-VI of Fig. 5.

Fig. 7 is a view from one end of a modified form of the contact device.

Fig. 8 is a vertical section of a welding head for two strip electrodes.

Fig. 9 is a horizontal section taken on IX-IX of Fig. 8.

Fig. 10 is an end view of a modified form of the contact device of Figs. 8 - 9.

Fig. 11 shows, in transversal section, one form of the pressure member of the contact device of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The welding head represented in Figs. 1 to 4 comprises a strip advancing unit and a contact device. The advancing unit is shown schematically only as a pair of cylindrical rolls 2, 3 gripping the electrode strip 1 to push the strip through the contact device 4. As usual, at least one of the rolls 2, 3 has to be driven by a motor through suitable drive mechanism. The advancing unit as well as the contact device are assumed to be supported by a welder frame not shown.

The contact device 4 is provided with a contact member 5 which may, for instance, consist of copper or a wear-resistant copper alloy. A screw clamp 6 serves to connect the contact member to a welding current conductor connected to one terminal of a source of welding power the other terminal of which is connected to a workpiece. The side of the contact member 5 facing the strip 1 is provided with a contact surface having the form of a shallow, transversally curved groove 7. A pressure member 8 is rigidly attached to the contact member 5 by means of an electrically insulating cross-piece 9 and a pair of screws 10. The pressure member 8 consists of a straight bar extending

along the centre line of the contact surface. The edge of the bar facing the contact surface is rounded with a radius of curvature less than the one of the contact surface and is separated from the contact surface by a space slightly exceeding the thickness of the strip 1. The bar 8, or at least its edge portion engaging the strip 1, preferably consists of wear-resistant material. As the bar 8 is electrically insulated from the contact member 5 and the strip 1 and, consequently, substantially no current will flow from the bar 8 to the strip, no electric erosion (spark erosion) of the bar can occur along its line of engagement with the strip 1.

To facilitate the transition of the strip from the plane shape emerging from between the rolls 2, 3 to the transversally curved shape imparted to the strip by the contact device 4, the end of the contact member 5 adjacent to the rolls 2, 3 is bevelled at 11 to provide an inclined surface by which the edge portions of the strip are gradually bent out of the plane shape (to the right in Fig. 2) while the middle portion of the strip is retained by the bar 8 in a position close to the central portion of the groove-shaped contact surface 7. The pressure required to be exerted upon the edge zones of the strip at both sides of the bar 8 in order to retain the strip in its bent state maintains a firm engegement between said edge zones and the contact surface and this ensures the trouble-free passage of the welding current from the contact member to the strip.

In the contact device of Fig. 1, the ratio length/width of the groove of the contact member is about 1.6. As a rule, said ratio should not be less than unity.

As the "stick-out", that is, the length of the electrode between the lower edge of the contact member and the arc, is usually comparatively small, this portion of the electrode will retain a transversally curved shape. The increased stiffness imparted thereby to the stick-out part of the electrode is useful when the electrode is used for submerged-arc welding, as it improves the ability

of the electrode to plow through the layer of welding flux on the workpiece.

As shown in Figs. 1 to 3, the contact member is provided with a V-shaped groove 12 extending transversely of the contact surface 7, each of the parts of the V extending from the centre of the contact surface 7 to the edge of the contact member 5. The groove 12 allows the escape of particles, for instance flux powder grains, which may have been caught between the strip 1 and the contact surface 7. The particles thus entering the groove 12 will slide along the groove and drop out at the edge of the contact member.

The welding head of Figs. 1 to 4 can also be used for operating two superimposed strip electrodes instead of the single electrode 1 shown.

The modified contact member 15 shown in Figs. 5 and 6 is provided with a slot 13 extending transversely of the contact surface 14. The slot is slightly inclined downwards from its aperture in the contact surface to allow entering particles to slide towards the backside 16 of the contact member and drop out.

In the embodiments of Figs. 1 - 4 and 5 - 6, the contact member may, if desired, be provided with two or more grooves 12 and slots 13, respectively, arranged behind each other.

Instead of a single pressure member, two laterally spaced pressure members 17a, 17b may be provided, as shown in Fig. 7. This arrangement is sometimes useful, for instance when very wide strips are used.

The welding head of Figs. 8 - 9 is provided with a wire advancing mechanism with a pair of advancing rolls 20, 21 common to two strip electrodes 18, 19. The strips are pushed into a contact device 22 having a contact member 23 common to both strips and provided with a groove-shaped contact surface 24, 25 for each of the strips. Each of said contact surfaces cooperates with a bar-shaped pressure member 26, 27, respectively, similar to the pressure member 8 of Figs. 1 - 3. Both

of the contact surfaces are provided with a transversal groove 28, 29 similar to the groove 12 of Figs. 1, 2 and 4.

The contact device of Figs. 8 - 9 does not have to be combined with an advancing mechanism common to both of the strips. It is equally possible to advance the strips by means of individual pairs of advancing rolls which may, for instance, be operated at different advancing rates to provide different rates of fusion for two electrodes having different compositions.

The modified contact device shown in Fig. 10 has a contact member consisting of two halves 30, 31 separated by a longitudinal gap 32 and connected by a yoke 33. This arrangement allows the strip electrodes to be advanced very close to each other.

Fig. 11 shows (in section) a pressure member having a wear-resistant edge portion 34 consisting, for instance, of hardened steel or sintered carbide or sintered alumina.

In the contact device according to the invention, the contact surface, or at least the zones of the same destined to engage the edge zones of the strip, should be curved in order to provide a favourable distribution of the contact pressure. As a rule, a cylindrical surface will be suitable. For example, a contact member the contact surface of which forms a segment of a cylinder having the radius 125 mm operates satisfactorily with an austenitic stainless steel strip of the dimensions 60 x 0.5 mm.

Claims

1. A contact device for a continuous, strip-shaped welding electrode comprising a contact member having a contact surface for slidingly engaging one side of the moving strip, and a pressure member arranged slidingly to engage the other side of the strip for providing the contact pressure required between the strip and the contact member, characterized in that said contact surface constitutes a shallow groove arranged to be traversed longitudinally by the strip, and in that said pressure member is arranged to engage the strip at a zone intermediate edge zones of the strip to depress said intermediate zone into the groove and thereby to cause said edge zones to engage the contact surface under the action of the bending stress caused by the depression of said intermediate zone.

2. A contact device as claimed in Claim 1, characterized in that said groove has a length at least equal to its width.

3. A contact device as claimed in Claim 1, characterized in that the pressure member is a straight bar aligned with said groove.

4. A contact device as claimed in Claim 1, in which the pressure member is rigidly attached to the contact member.

5. A contact member as claimed in Claim 1, in which the pressure member is electrically insulated from the contact member.

6. A contact member as claimed in Claim 3 characterized in that the bar is arranged to engage the strip with a narrow edge only.

7. A contact device as claimed in Claim 3, in which the edge of the bar engaging the strip is transversally rounded with a radius of curvature less than the one of the underlying portion of the contact surface.

8. A contact device as claimed in Claim 1 for two strip electrodes advanced parallelly to each other, characterized in that the contact member is provided with a pair of contact faces facing away from each other and in that a pressure member is provided for each of said contact faces.

9. A contact device as claimed in Claim 1 characterized by at least one channel extending transversally across the contact surface to allow the escape of particles caught between the electrode strip and the contact surface.

10. A contact device as claimed in Claim 9 in which said channel is a groove inclined obliquely forwards towards an open end at one edge of the contact member.

11. A contact device as claimed in Claim 9 in which said channel is a slot extending through said contact member from its contact surface to the other side of the contact member.

Fig.1

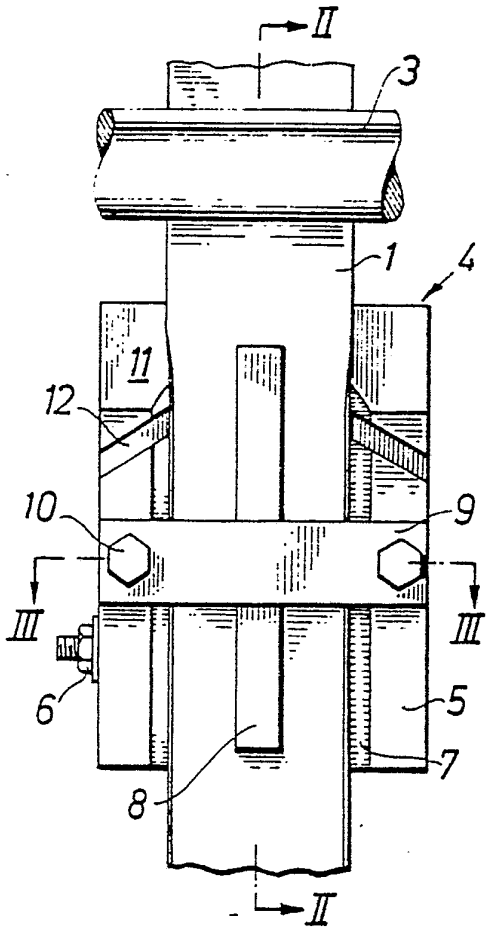


Fig.2

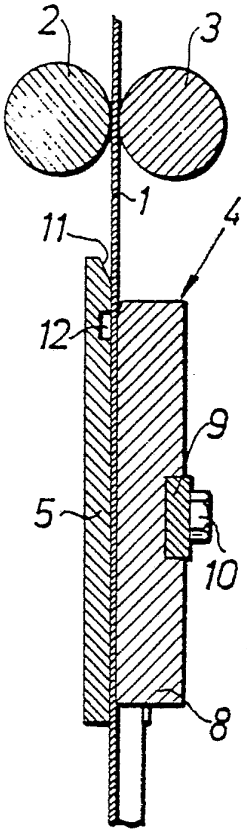


Fig.4

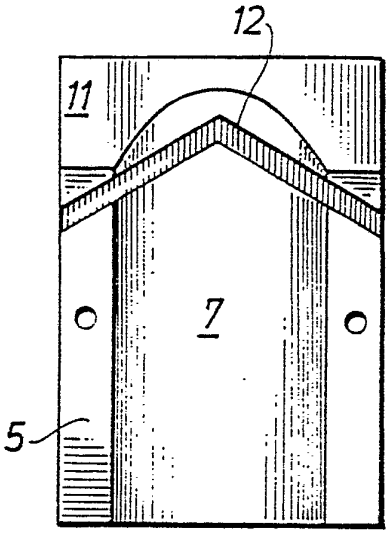


Fig.3

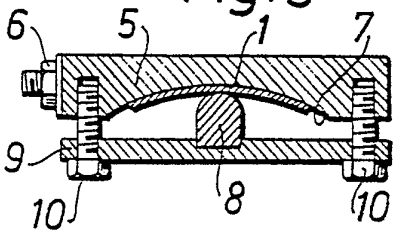


Fig.5

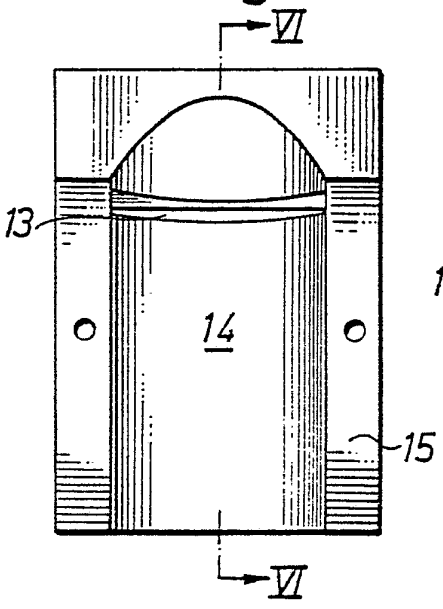


Fig.6

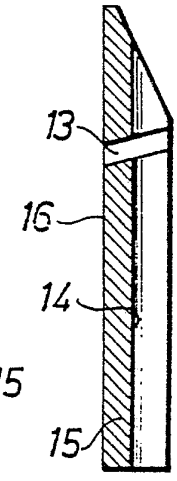


Fig.7

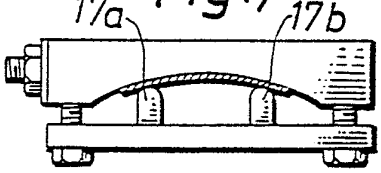


Fig 8

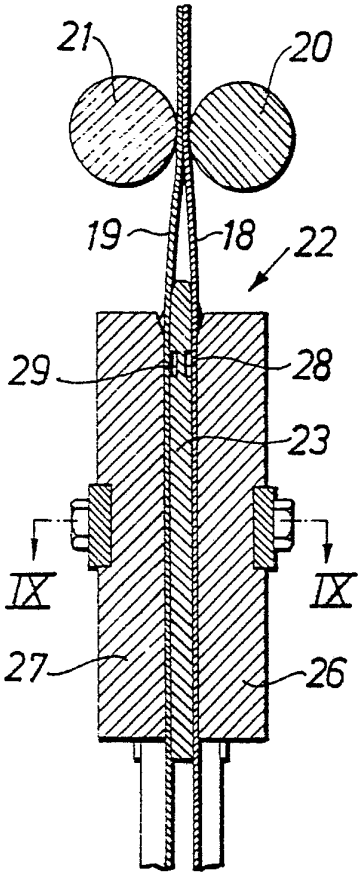


Fig.9

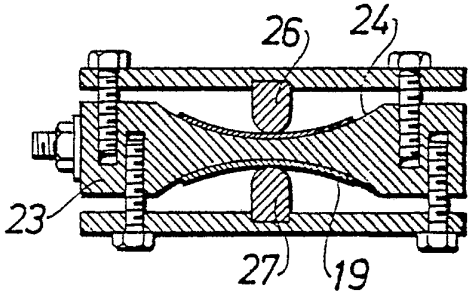


Fig.10

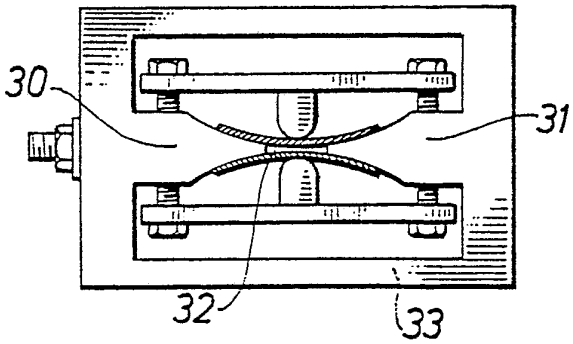
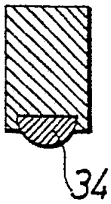


Fig.11



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE81/00043

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC [3]

B 23 K 9/24, H 01 R 41/00, H 01 R 35/00

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC [3]	B 23 K 9/00,04,18,24,28; 35/06, H 01 R 35/00; 41/00
US Cl	219:73, 74, 76, 130, 137

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category [6]	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	GB, A, 772 387 published 1957, April 10, Union Carbide and Carbon Corporation	
A	GB, A, 1 013 259 published 1965, December 15, Nurex Welding Process Ltd	
A	US, A, 3 513 287 published 1970, May 19, Arnoldy	
A	US, A, 3 936 654 published 1976, February 3, Cannata	
A	Welding Production Vol 25 no 10, October 1978, pages 17-20, Abington Cambridge G.B. A.S. Orlov et al. "Automatic Submerged-Arc Welding with a Shaped Strip Electrode"	
P	EPO,A, 0 013 374 published 1980, July 23, Lummus GmbH	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [3]	Date of Mailing of this International Search Report [3]
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Swedish Patent Office	Anders Axberger