Automatic Welding of Chrome-Nickel Stable Austenite Steels, Using an Unprotected Arc

steels will be used in practice because of its simplicity. For open arc welding, normal welding heads with constant speed electrode supply and the normal generators for flux welding can be successfully used.

ASSOCIATION: Ordena trudovogo krasnogo znameni institut elektrosvarki imeni Ye.O.Patona AN USSR (Order of the Red Banner of Labor Institute of Electric Welding imeni Ye.O.Paton of the AS UkrSSR)

SUBMITTED: December 17, 1958

SAFONNIKOV, A.N.

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Akademiya nauk URSR, Kiyev. Instytut elektrozvaryuvannya

Vnedreniye novykh sposobov svarki v promyshlennost'; sbornik statey. vyp. 3. (Introduction of New Welding Methods in Industry; Collection of Articles. v. 3) Kiyev, Gos. izd-vo tekhn. lit-ry UkrSSR, 1960. 207 p. 5,000 copies printed.

Sponsoring Agency: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki imeni akademika Ye. O. Patona Akademii nauk Ukrainskoy SSR.

Ed.: M. Pisarenko; Tech. Ed.: S. Matusevich.

PURPOSE: This collection of articles is intended for personnel in the welding industry.

COVERAGE: The articles deal with the combined experiences of the Institut elektrosvarki imeni Ye. O. Patona (Electric Welding Institute imeni Ye. O. Paton) and several industrial enterprises in solving scientific and engineering problems in welding technology. Problems in the application of new methods of mechanized welding and electroslag welding in industry are discussed. This is the third collection of articles published under the same title. The Foreword was written by B. Ye. Paton, Academician of the Academy of Sciences Ukrainian SSR and Lenin prize winner. There are no references.

TABLE OF CONTENTS:

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S/125/60/000/05/08/015

AUTHOR: Safonnikov, A. N.

TITLE: The Effect of Carbon Dioxide-Shielded Welding Process Parameters on the Weld Dimensions

PERIODICAL: Avtomaticheskaya svarka, 1960, No. 5, pp. 62-68

TEXT: The metallurgical and engineering peculiarities of the process were studied before (Ref. 1-6), but no sufficient data are available on the effect of separate factors (current, voltage, welding speed, electrode, and work incline) on the dimensions and the shape of welds. The article gives the results of an experimental investigation at the author's Institute, in which the effect of these parameters was studied under guidance of Candidate of Technical Sciences B. I. Medovar. The chemical composition of "Kh18N11B" steel used for the experiments was (in %): 0.08 C; 0.75 Si; 1.03 Mn; 18.5 Cr; 13 Ni; 1.10 Nb; 0.012 S; 0.025 P. In general, the basic process parameters had the same effect on the welds as in the welding process under "ANF-5" flux, but the fusion depth and the weld width was slightly greater. Satisfactory seam formation was observed in a wide range of conditions.

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S/125/60/000/05/08/015

The Effect of Carbon Dioxide-Shielded Welding Process Parameters on the Weld Dimensions

Details of the experiments are included. There are 5 diagrams, 4 tables, and 6 Soviet references.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye. O. Patona AN USSR (Red Banner of Labor Electric Welding Institute imeni Ye. O. Paton AS UkrSSR)

SUBMITTED: November 18, 1959

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80824
S/125/60/000/06/07/007

18.7200

AUTHORS: Medovar, B.I., and Safonnikov, A.N.

TITLE: Electroslag Welding of ЭИ 654 (EI654) Steel

PERIODICAL: Avtomaticheskaya svarka, 1960, No. 6, pp 82 - 84

TEXT: Institut elektrosvarki im.Ye.O.Patona (Electric Welding Institute imeni Ye.O.Paton) of AN USSR (AS UkrSSR) developed a new electroslag welding technology, with the use of a "plate electrode", for stainless high-strength "EI654" steel in thicknesses up to 65 mm and a cross section area up to 5,000 mm^2 forged or rolled. The plate electrodes are forged from the same steel grade into corresponding width. The recommended welding process parameters (Table 1) give a highly stable welding process. They are: Current 1,350 amp for 35 x 60 mm cross section, and 1,800 amp for 65 x 80 mm cross section; 25 volt; electrode feed of 2.0 m/h; a gap of 30 mm; АНФ -14 (ANF-14) flux; welding pool depth 10 mm and 12 mm respectively. Welding can also be done under АНФ-7 (ANF-7) flux, but it is highly hygroscopic and must therefore be preliminarily roasted in a temperature not lower than 800°C. The effect of heat treatment was investigated. The data (Table 2) proved that quenching practically did not affect the mechanical strength of the joint but affected the impact resistance, which increased considerably when

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S/125/60/000/009/017/017
A161/A130

1.2300 2702, 1573, 2808,

AUTHOR: Safonnikov, A.N.

TITLE: The First Welding Conference of Ural

PERIODICAL: Avtomaticheskaya svarka, 1960, No. 9, pp. 93-96

TEXT: The conference was convened in May 1960 in Sverdlovsk by GNTK Soveta Ministrov RSFSR (GNTK of the Ministers Council of the RSFSR), the Sverdlovsk Sovnarkhoz, and Institut elektrosvarki im. Ye.O. Patona AN USSR (Electric Welding Institute im. Ye.O. Paton of AS UkrSSR); 764 delegates from plants, research and education institutions, sovnarkhozes of different regions and party organizations were present. The conference heard 25 reports. The Director of the Electric Welding Institute im. Paton, Academician of AS Ukr SSR B.Ye. Paton read a report on "The Present State and Prospective Development of Welding in the USSR" and stated that the average mechanization level in welding has to reach 40% by 1965 (compared with 11% in 1959), and the planned application of automatic welding is expected to bring about a 20 billion roubles saving by 1965. A mass campaign of comprehensive mechaniza-

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The First Welding Conference of Ural

tion has started in the country, and production lines and automatic transfer lines are being built, as for instance at the Chelyabinskiy truboprokatnyy zavod (Chelyabinsk Tube Rolling Plant). B.Ye. Paton analyzed the causes of delayed application of progressive welding methods and spoke of measures against the delay. He stressed the importance of industrial cybernetics. F.S. Reznichenko (of GNTK RSFSR), in his report "The Seven-Year-Plan of Welding in the Economy of the RSFSR", outlined the basic problems: the higher volume of welded structures to be built; increasing the welding mechanization level 3.25 times; the organization of model welding plants. The organization of a center is envisaged for this purpose. Ye.V. Deyev (Gosplan RSFSR) reported on the state and the outlook of the supply of welding equipment and materials and dealt with information exchange and training problems. He said that an organized exhibition of welding equipment in Moscow will help to select the best and eliminate the obsolete. V.N. Solov'yev (Sverdlovsk Sovnarkhoz) and A.T. Larin (Chelyabinsk Sovnarkhoz) reported on the progress in the continued practical application of welding as decided on by the TsK KPSS (Central Committee of the CPSU) and the Ministers Council of the USSR. An institute called NIITekhmash has been organized at the Chelyabinsk

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Sovnarkhoz to assist the industry. N.I. Rozhkov (Uralmashzavod) informed on the state and prospective development of welding at his plant where the mechanization of gas cutting will reach the 95% level during 1960; model welding production is being organized and the construction of a welded structures shop is planned that will be the largest in the USSR. F.D. Kashchenko of Magnitogorskiy metallurgicheskiy kombinat (Magnitogorsk Metallurgical Combine), in the report "Experience with Specialized Surfacing Sections and Application of Surfacing for Restoring and Raising the Durability of Metallurgical Equipment Parts", mentioned that eight surfacing sections have been organized at the Combine and over 400 different types of parts of metallurgical and mining equipment are being surfaced. The use of a new highly effective and cheap surfacing method devised by the Electric Welding Institute of AS UkrSSR is being prepared - wide-layer surfacing with a cast iron band. Candidate of Technical Sciences N.D. Portnoy of Uralvagonzavod ("Comprehensive Mechanization and Automation of Welding in RR-Car Building") said that the plant has built eight special welding lines and a 1,500 kva 16-spot welding machine for low-alloy steel hatch covers. It has been mentioned in the report of I.F. Kobzev (of Chelyabinsk Tractor Plant) on

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"Mechanization and Automation of Welding and Application of Progressive Welding Methods at the Plant" that welding sections and places are located directly in the production lines of the plant. Candidate of Technical Sciences B.I. Medovar (of the Electric Welding Institute), report "Welding of Alloy Steel and Alloys" spoke of the tasks in the further improvement of the welding methods and modern preventive measures against hot cracking. G.V. Chepushtanov (Uralkhimmashzavod) spoke in his report on "Experience with a Raised Mechanization Level in Welding and in Welding New Materials in Chemical Machinery" and said that single components and production processes are being standardized at the plant. He described the electro-slag welding process with tape electrode on a УШТ-1 (UShP-1) installation designed and built at the plant. There is a manipulator accomodating work of up to 10 tons weight and of any shape. A new method of removing surplus weld metal with oxyacetylene flame has very much improved the work conditions at the plant. A.B. Fishbeyn (of Chelyabinsk) reported on "The Use of Advanced Welding Methods and Inspection of Welds". His plant is one of the first to use automatic welding with a controlled three-phase arc. A.F. Malyukov (from Perm') ("Capacitor Roll Welding of Thin Stainless Steel") spoke of

difficulties with stainless steel of 0.1-0.5 mm thickness and stated that the existing series machines МШК (MShK) are not suitable. The plant has tried to produce a new machine, "МШШК-2" (MShShK-2) for roller-welding expansion bellows ("sil'fon") and other work from thin metal of varying thickness. Candidate of Technical Sciences D.A. Dudko (Electric Welding Institute im. Ye.O. Paton) read a report on "What is New in Electro-Slag Welding", mentioning that using the melting nozzle ("plavyashchiysya mundshtuk") when welding with wires or plates is not possible because of the lack of space over the work, or for other reasons. An example was the welding of a turbine wheel for the Bratskaya GES (Bratsk Hydroelectric Power Plant). Castings and ingots are produced by the electro-slag process without hot tops, which results in 18-20% economy of liquid metal. Candidate of Technical Sciences A.N. Shashkov (of VNIIAvtogen) spoke on "What is New in Gas Flame Working", i.e., gas cutting and surfacing, and mentioned that VNIIAvtogen works in two trends: a) development of machines with remote scale control, and b) machines with program control. Candidate of Technical Sciences N.Ya. Kachanovskiy (VNIIESO) spoke in his report on "New Welding Equipment and its Prospective Output" about the work at VNIIESO and mentioned that it is

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planned to produce welding equipment in 1960 in the following percentages of total output: welding transformers 57%, motor-generator converters 29%, resistance welding machines 9%, automatic and semi-automatic arc welders 6%. The weight of transformers has been reduced and copper spared by using aluminum instead of copper in windings as well as a new regulating system. I.A. Valge spoke on the mechanization and automation of assembly operations at the Chelyabinskiy zavod metallokonstruktsiy (Chelyabinsk Metal Structures Plant) where the shops and shop sections have been specialized, a shop built for automatic welding and a section specialized for the production of containers. He also said that the plant produces light alloy structures for ЭКГ-4 (EKG-4) excavators. Candidate of Technical Sciences A.I. Chvertkov said in the report on "Welding Equipment designed by the Electric Welding Institute im. Ye.O. Paton" that work is in progress with equipment for mechanical arc welding and surfacing, electro-slag welding, resistance welding, and special welding methods. He mentioned the development of tracing devices for arc welding. Doctor of Technical Sciences I.I. Frumin (Electric Welding Institute im. Paton) read the report "Surfacing of Die Steel and Restoring of Forging Dies". He discussed the causes of failures and described restoring by coating with alloy steel combined with heat treatment /

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[Abstractor's note: no details are mentioned]. Candidate of Technical Sciences V.V. Shevernitskiy (Electric Welding Institute im. Paton) said in the report "The Problems of the Strength of Welded Structures and the Basic Design Principles" that a yield limit drop is caused by an unfavorable combination of high local stress with stress concentrators and low temperature. He pointed out that brittle failure can be avoided by using steel insensitive to notch, avoiding uneven stresses and loss of plasticity, using steel that fills beginning brittle cracks - 15X (15Kh), CHX (SNKh), 10XГСНД (10KhHSND). In the report "New Work of the Electric Welding Institute in the Field of Electric Gas Welding" by Candidate of Technical Sciences D.A. Dudko, the problems were discussed of welding thin sheet steel by carbon electrode in carbon dioxide. The Institute has developed a new semi-automatic A-533 welder for the argon arc-welding of thin metal by a tungsten electrode with double shielding - with argon in the mid at the electrode and carbon dioxide on the periphery. A technique has been developed for automatic and semi-automatic welding of thin metal, and welding seams in any position. Candidates of Technical Sciences A.T. Galaktionov of Ural'skiy politekhnicheskiy institut im. S.M. Kirova or UPI (Ural Polytechnical

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Institute im. S.M. Kirov) and O.A. Baksni of Chelyabinskiy nauchno-issledovatel'skiy institut tekhnologii mashinostroyeniya (Chelyabinsk Scientific Research Institute of Mechanical Engineering) said that the UPI is studying the strength of welded structures working in corrosive and common environment, electric heating of ingots and special castings, surfacing of metallurgical equipment, and air-arc cutting. Machines for small cross sections welding are being developed. Work is in progress in three trends: a) comprehensive mechanization and automation of assembly and surfacing; b) new welding methods including ultrasonic, friction, puls-arc welding; c) strength of structures. An automatic spiral welding process has been developed for welding air line tubes of 100 to 1,120 mm diameter and 0.6 to 2.0 mm wall. Candidate of Technical Sciences I.F. Patskevich (of Chelyabinsk Polytechnical Institute) spoke on the use of vibrating-arc welding. Doctor of Technical Sciences I.I. Frumin read the report on "Welding of Non-ferrous Metals and Light Alloys" and mentioned the automatic welding of aluminum by a semi-open arc on flux layer by single or split electrode. He mentioned difficulties with welding aluminum-magnesium alloys and titanium alloys that can be welded by the argon arc process with a non-melting

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electrode (thin metal), or by the electro-slag process (thick metal); he also referred to the electron beam welding of chemically active and refractory metals [Abstractor's note: no details are mentioned.] The following information is mentioned to be given in discussions after reports. By F.V. Arifmetchikov (GNTK SSSR) on the progress in fulfulling the decisions of the party and government, and on exhibitions of welding equipment; by Kulikov, on resurfacing work at Nizhne-Tagil'skiy metallurgicheskiy kombinat (Nizhniy Tagil Metallurgical Combine); by Ye.M. Lekarenko (from Kamensk-Ural'sk), on automatic resurfacing of press tools under flux and in carbon dioxide; by S.N. Dmitriyev, on the production of electrodes at Magnitogorskiy metizno-metallurgicheskiy zavod (Magnitogorsk Meal Products and Metallurgical Plant) where a third production line has started operation and the output of electrodes will reach 60,000 tons by 1965; by Alekseyev - on the construction of a blast furnace at the Nizhniy Tagil Combine. Levin pointed out the deficiencies of welding equipment being produced and little care for manual welding at the research organizations. Several technical films have been demonstrated at the conference, and excursions organized to the plants UZTM,

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A161/A130

The First Welding Conference of Ural

Uralkhimmash, Uralelektroapparat and the Turbomotornyy (Turbo-motor Plant). Welding equipment of the Sverdlovsk, Chelyabinsk and Perm' sovnarkhoz regions was exhibited.

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S/125/61/000/003/009/016
A161/A133

AUTHORS: Safonnikov, A.N.; Medovar, B.I.; Kontorovich, L.Ye.; Khimushin, F.F.

TITLE: Heat-resistant ЭИ703 (EI703) alloy welded by electro-slag process with plate electrodes

PERIODICAL: Avtomaticheskaya svarka, no. 3, 1961, 68 - 74

TEXT: The EI703 alloy is a substitute of the ЭИ435 (EI435) and ЭИ602 (EI602) nickel alloys used for combustion chambers and rings in gas turbines. It has a slightly higher heat-resistance at high temperatures than EI435 and nearly the same as EI602, and a high ductility. Its chemical composition is the following: 0.06 - 0.12% C, ≤0.8% Si, ≤0.7% Mn, ≤0.020% S, ≤0.030% P, 20 - 23% Cr, 35 - 40% Ni, 2.5 - 3.5% W, 0.7 - 1.2% Ti, or 1.2 - 1.7% Nb, ≤0.5% Al, 0.05% Ce. The article presents details of electro-slag welding tests with EI703 alloy forgings with 120 by 120 mm cross section area, produced by the "Elektrostal'" Plant. Plate electrodes used as filler metal had the same width as the forgings being joined, and 12 to 18 mm thickness. The welding equipment consisted of a A-550 apparatus and a ТШС-3000/1 (TShS-3000/1) transformer. The A-550 welder permit-

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Heat-resistant ЭИ703 (EI703) alloy welded by....

ting plate electrode feed variations in a range of from 0.9 to 17 m/h had been described (Ref. 2: Opyt vnedreniya avtomata A-550 dlya elektroshlakovoy svarki plastinchatym elektrodom. Avtomaticheskaya svarka, no. 11, 1959). Four types of flux were tried: three fused fluoride type АНФ-6 (ANF-6), АНФ-7 (ANF-7), and АНФ-14 (ANF-14) and nonfused АНФ-1 (ANF-1) (fluorite concentrate). The latter flux proved not suitable for the EI703 alloy because of a dangerous defect - the weld metal did not fuse with the base metal. [Abstracter's note: The chemical composition of the fluxes is not given.] The following welding technology is recommended as a result of experiments welding the EI703 alloy with EI703 plate electrodes and the base metal dimensions as above (120 x 120 mm): plate electrode 12 by 120 mm; 1,500 ÷ 2,000 amp; plate electrode feed velocity 2.2 ÷ 2.5 m/h; starting voltage 33 v; voltage in established process 28 ÷ 31 v; either ANF-14 or ANF-7 flux; flux quantity of 300 g; slag pool depth of 18 mm; gap between welded elements 40 mm. The soundness of joint is illustrated in a photo. The mechanical strength of welds was slightly lower than that of the base metal, but the heat resistance was close to the one required by specifications. It is stressed that the required quality of welded joints is only possible when the prescribed process technology is followed strictly. Hot cracks are possible when the metal pool is deep. The rupture strength of the welded joints amounted to

Heat-resistant 703 (EI703) alloy welded by....

about 75% of the heat resistance of base metal. Technician B.R. Kleinerman is mentioned having participated in the tests. There are 6 figures, 3 tables and 4 Soviet-bloc references.

ASSOCOATIONS: Ordena Trudovogo Krasnogo Znanemi Institut elektrosvarki imeni Ye. O. Patona AN USSR ("Order of the Red Banner of Labor" Electric Welding Institute im. Ye.O. Patona AS UkrSSR) (A.N. Safonnikov and B.I. Medovar); L.E. Kontorovich and F.F. Khimushin (Moscow)

SUBMITTED: June 8, 1960

Card 3/3

S/125/61/000/004/013/013
A161/A127

AUTHORS: Medovar, B. I., Safonnikov, A. N.

TITLE: Effect of the metal pool shape on the hot shortness of welds during the electro-slag welding of austenitic steels and alloys

PERIODICAL: Avtomaticheskaya svarka, no. 4, 1961, 87 - 88

TEXT: Brief general information is given on the effect of the metal pool shape factor (depth/width ratio) on the hot-crack resistance of welds. Welds with a low shape factor (deep but narrow pool), in which the crystallites meet by their face ends or at obtuse angles, have a relatively low crack resistance, and cracks are usually located along the weld axis. No hot cracks are forming, as a rule, in welds with a high shape factor (shallow and wide pool). The behavior of austenitic steels and alloys is similar. For instance, the resistance of the weld metal to hot (crystallization) cracks varies over a wide range in the electro-slag welding of refractory austenite-alloy forgings 120 by 120 mm with plate electrodes. The shape of the metal pool can be changed by changing the process. In welding with a plate electrode, the shape factor increases with the increasing gap width, voltage, electrode thickness, slag pool depth (to a certain limit), and with a de-

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Effect of the metal pool shape on the...

creasing welding current. Two process variations for welding 120 x 120 mm forgings are given in a table:

Gap width, mm	I_{weld}, amp	U, volt	Shape factor	Crystallization cracks
30	3,800	25	0.6	Present
40	2,000	28	3	Absent

Note: Electrode thickness was 10 mm and slag pool depth 15 mm in both cases.

The metal pool in the first process variation is deep but not wide, and crystallization cracks result. In the second variation, the metal pool is shallow but very wide, and the resistance to crystallization cracks is increased. There are 2 figures. [Abstracter's note: Essentially complete translation]

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26789
S/125/61/000/005/008/016
A161/A127

AUTHOR: Safonnikov, A. N.

TITLE: Peculiarities of electro-slag welding of modified 12% heat resistant chromium steels

PERIODICAL: Avtomaticheskaya svarka, no. 5, 1961, 59 - 66

TEXT: The article presents information on experiments with one of 12% type steel grades, ЭИ961, or 13Х12НВМФА (EI961, or 13Kh12NVMFA), used for turbine parts for maximum 600°C service. Its composition is: (%) 0.14 C, 0.19 Si, 0.32 Mn, 0.015 S, 0.018 P, 11.0 Cr, 1.75 Ni, 0.41 Mo, 1.66 W, 0.27 V. No data exist in literature on the welding of heavy components from this steel. Welding was carried out with alternating current, using an A-550 welder and a ТШС-3000-1 (TShS-3000-1) transformer. The electrodes were of the same steel, 22 mm thick for the thinner sections, and 12 mm for heavier ones. No cold cracks formed during the welding with 22 mm thick electrodes. As to the heavy 220 by 220 mm sections, cracks had to be prevented by special measures. A publication is referred to where recommendations are given for the electro-slag welding of EI961 steel sections of different dimensions [Ref. 5: B. I. Medovar, A. N. Safonnikov, "Avtom. svarka", no. 12, 1959].

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O.K.B. Inst. Electric welding im Ye. O. PATON, AS UkrSSR

Peculiarities of electro-slag welding of...

Sound joints were obtained steadily following the recommendations. Welding was carried out in iron boxes preheated with sand to at least 500°. The test data were verified in welding rings of EI961 steel 1,690 mm in diameter of 220 by 220 mm cross section under shop conditions. A photograph shows the installation in operation. Four sectors were first joined into ring halves, then the halves immediately annealed at 700° and joined. The ring halves were joined on a turn table, and boxes with hot sand placed on the joints and transported together with the ring to the heat-treatment shop for hardening at 1,010°C and subsequent tempering at 580°C. The weld metal had sufficient strength after welding, but a low ductility and notch toughness. The heat treatment improved both. The soaking time had a very high effect on the notch toughness. The article includes a table of the chemical compositions and properties of some 12% steel grades including EI961, photographs of joints and two photo-micrographs of the base and the weld metal. Doctor of Technical Sciences B. I. Medovar was in charge of the described experiments; Engineers A. M. Toshchev and I. A. Sidorov took part in shop welding; specimens of the weld metal were tested at NIAT, under the supervision of Candidate of Technical Sciences N. T. Azarenko. There are 6 figures, 4 tables and 5 Soviet-bloc references.

SUBMITTED: July 15, 1960.

Card 2/2

1.2300

24779
S/125/61/000/008/007/014
D040/D113

AUTHOR: Safonnikov, A.N.

TITLE: Electro-slag welding of heat-resistant pearlitic EI415 steel

PERIODICAL: Avtomaticheskaya svarka, no. 8, 1961, 65-69

TEXT: Information is presented on a new automatic electro-slag process technology experimentally developed at the Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O. Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" im. Ye.O. Paton AS UkrSSR) for heavy-section 20Kh3MVF (EI 415) (20Kh3MVF/EI415/) steel. This steel belongs to a grade used in turbine construction; most of the steels of this grade are austenitic and contain a considerable quantity of such scarce elements as nickel, cobalt and molybdenum. The percentage chemical composition of EI 415 steel in subject experiments was as follows: 0.21 C, 0.42 Mn, 0.28 Si, 0.017 S, 0.006 P, 3.06 Cr, 0.40 Ni, 0.58 W, 1.0 V, 0.65 Mo. It is pearlitic, hardens well and is susceptible to heat treatment, therfore being suitable for heavy forged turbine elements. According to data already obtained, it is weldable but requires preheating to 500°C and immediate tempering for stress relief. It was shown experimentally that EI415 steel welded by the

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Electro-slag welding...

electro-slag process does not require any preliminary, accompanying or subsequent heating; this is due to the absence of any high temperature gradient that could cause high stresses. EI415 steel forgings 80 x 95 mm in size were used in experiments. Bands of the same steel, 12 mm thick and 75-80 mm wide (plate electrodes) were used as filler metal. An АНФ-1 (ANF-1) or АНФ-7 (ANF-7) flux may be employed. Experiments showed that an increase in the electrode feed rate resulted in cracks in the weld metal and in the area near the weld. The following process technology produced fully sound welds: welding current-1500-1800 amp; welding voltage - 27 volts; electrode feed - 4 m/hr; 35 mm gap; slag bath depth - 15 mm; 200 g of ANF-1 flux. Full heat treatment after welding is obligatory: quenching in oil from 1050°C with subsequent tempering at 650°C in air. Normalization at 1150°C prior to welding does not strengthen the welds but pre-normalized steel remains sufficiently plastic and tough. Photo-micrographs show relatively equiaxial weld metal structure and an excessive phase on grain boundaries consisting of Cr, Mo and V carbides. If cracks occur in the weld metal, they propagate between and through the grains. The mechanical strength of welded joints after heat treatment exceeds the standard requirements. B.I. Medovar, Doctor of Technical Sciences, was in charge of the experiments. There are

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Electro-slag welding...

24779
S/125/61/000/008/007/014
D040/D113

7 figures and 2 tables.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O. Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" im. Ye.O. Paton of the AS UkrSSR)

SUBMITTED: November 29, 1960

Card 3/3

1573, 2808, 2708, 2208

26489

S/125/61/000/009/014/014
D040/D113

1.2300

AUTHOR: Safonnikov, A.N.

TITLE: Automatic submerged-arc welding of the Cr-Ni-W-Mo EI445R alloy

PERIODICAL: Avtomaticheskaya svarka, no. 9, 1961, 90-91

TEXT: The ЭИ445Р or 06Х 20Н 60В 5М 5ТЮР (EI445R or 06Kh20N60V5M5T\YuR) alloy, belongs to a grade of highly-refractory austenitic alloys. It was proposed by the Institut kachestvennykh staley TsNIIChermeta (Institute of High-Grade Steels of TsNIIChermet) and is being used for forgings and sheets for high-temperature service up to 950°C. The Institut elektrosvarki im.Ye.O.Patona (Electric Welding Institute im. Ye.O.Paton) has developed a new automatic sub-arc welding technology for butt and T joints in 10 and 15 mm thick sheets of this alloy - by bilateral seams, without bevelling edges, with the use of 2 and 3 mm electrode wire of the same metal and an АНФ-5 (ANF-5) fluorous flux. The weld metal does not contain hot cracks. This is due to a minimum content of silicon (maximum 0.2%) and phosphorus (0.007%), and the presence of molybdenum and tungsten. The few cracks that were observed in the weakness zone may be due to the low plasticity of metal at 800-950°C. The

Card 1/2

Automatic submerged-arc welding ....

joints were heat treated by cooling from 1200°C, with 5 hrs holding subsequent air cooling; aging at 850°C for 15 hrs and subsequent air cooling. The joints were tested after heat treatment for durability at 800°C. The test results show durability not below 90% of the durability of the base metal. Further investigations are necessary to find out the causes of cracks in the weakness zone and ways of preventing them. There is 1 figure and 1 table. [Abstracter's note: Essentially full translation].

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29048
S/125/61/000/010/008/014
D040/D112

1.2300 1573

AUTHOR: Safonnikov, A.N.

TITLE: Electro-slag welding of EI736 and EI268 stainless steels

PERIODICAL: Avtomaticheskaya svarka, no. 10, 1961, 69-73

TEXT: Information is presented on a new technology for the electro-slag welding of ЭИ736 (EI736) and ЭИ268 (Kh17N2) (EI268 [Kh17N2]) steels. EI736 is a Cr-Ni-W-V steel of the martensite-ferritic type, has increased corrosion resistance and high strength, and is used for ship shafts and propellers, aircraft parts and heavy-duty engine parts working at temperatures up to 600°C. Its physical and mechanical properties are not inferior to those of steels with a higher Ni content or containing Mo, and it is a recommended substitute for steel alloyed with scarce elements. EI736 steel has its best properties after heating from 1050°C, cooling in oil or in air, and tempering at 550-680°C, after which its ultimate strength is 95-115 kg/mm^2 and its impact strength 6-7 kgm/cm^2. The EI268 steel, containing 0.11-0.17% C, 16-18% Cr and 1.5-2.5% Ni is a hardening steel with good mechanical properties

Card 1/3

a table of

29048
S/125/61/000/010/008/014
D040/D112

Electro-slag welding of ...

recommended welding conditions for welding 30 by 40, 50 by 80 and 80 by 120 mm sections of EI736 steel, a table and a graph illustrating the effect of heat treatment on the impact strength of EI736-steel weld metal and photographs of the structure of EI736 welds. There are 4 figures and 2 tables.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O.Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" im. Ye. O.Paton of the AS UkrSSR)

SUBMITTED: March 27, 1961

Card 3/3

SAFONNIKOV, Anatoliy Nikolayevich, inzh.; RYZHIK, Z.M., inzh., red.; VASIL'YEV, Yu.A., red.izd-va; BOL'SHAKOV, V.A., tekhn. red.

[Electric slag welding with lamellar electrodes of corrosion-, scale-, and heat-resistant chromium-nickel steels and alloys] Elektroshlakovaia svarka plastinchatym elektrodom korrozionnostoikikh, okalinostoikikh i zharoprochnykh khromonikelevykh stalei i splavov. Leningrad, 1962. 36 p. (Leningradskii dom nauchno-tekhnicheskoi propagandy. Obmen peredovym opytom. Seriia: Svarka i paika metallov, no.9) (MIRA 15:11)
(Chromium-nickel steel—Welding)
(Steel, Stainless—Welding)

1 2300

32960
S/125/62/000/001/007/011
D036/D113

AUTHORS: Safonnikov, A.N., Medovar, B.I. (see Association); Kontorovich, L.Ye., Khimushin, F.F. (Moscow)

TITLE: Electroslag welding of VZh100 (EP126 brand) iron-chrome-nickel heat-resistant alloy by a plate electrode

PERIODICAL: Avtomaticheskaya svarka, no. 1, 1962, 59-63

TEXT: The authors describe the technology developed for the electroslag welding of ВЖ100 (VZh100) (ЭП126 [EP126]) brand iron-chrome-nickel heat-resistant alloy by a plate electrode. This alloy, which contains less nickel than the ЭИ703 (EI703) alloy, is recommended for parts working at high temperatures and under considerable loads; the chemical composition is as follows: (in %) 0.04 C, 0.51 Si, 0.27 Mn, 19.6 Cr, 27.8 Ni, 4.78 W, 2.90 Mo, 1.05 Nb, 0.2 N_2, 0.008 B. The electroslag welding experiments were carried out with 90 x 90 mm forgings by means of 90 x 700 mm forged plate electrodes whose thickness varied from 12 to 35 mm. The welding conditions were as follows: welding current - 1,200-6,000 amps and 30-40 v, electrode feed - 0.9-5.0 m/hr, depth of slag pool - 10-22 mm. АНФ-6 (ANF-6), АНФ-7 (ANF-7)

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32960
S/125/62/000/001/007/011
D036/D113

Electroslag welding of ...

and AHF-14 (ANF-14) welding fluxes were tried. The butt-joint gap varied from 30 to 42 mm. Preliminary tests showed that welding with large currents and low voltages caused hot crystallization cracks to form in the weld metal. Increasing the voltage when welding with ANF-6 flux sometimes led to the appearance of slight cold shuts and slag inclusions in the weld metal and along the fusion line. Perfect welds were obtained with ANF-14 and ANF-7 fluxes under the following welding conditions: welding current - 1,500-1,800 amps; electrode feed - 2-3.5 m/hr; idle-run voltage - 33 v; welding voltage - 30 v; gap - 36 mm; depth of slag pool - 22 mm; thickness of plate electrode - 12 mm. After heat treatment, the hardness of the weld metal approached that of the base metal. When a VZh100 electrode was used, the ultimate strength and yield limits of the weld metal at room temperature were 80% of the limits of the base metal; for extension and contraction this percentage was 50-60% and for toughness - 40%. At 650°C the ultimate strength of the weld metal was about 80% of that of the base metal, while the extension and contraction values of the weld metal approached those of the base metal. Tests for long-term heat-resistance showed that the weld metal was not inferior to the base metal in this respect. The conclusions made are as fol-

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Electroslag welding of ...

lows: (1) A technology has been developed for the electroslag welding of VZhl00 alloy. Cracks in the weld metal can be avoided only by adhering strictly to the welding conditions resulting in a relatively shallow and wide welding pool; (2) Hot cracks may appear in the weakness zone when welding VZhl00 alloy. Further research is needed to establish the necessity of preliminary electroslag remelting of the base metal to eliminate this tendency; (3) The long-term heat-resistance of the welds is equal to that of the base metal. Technician B.R. Kleynerman took part in the tests. There are 4 figures, 3 tables and 1 Soviet reference.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im Ye.O. Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" im.Ye.O. Paton of the AS UkrSSR)
(Safonnikov, A.N. and Medovar, B.I.)

SUBMITTED: March 16, 1961.

X

Card 3/3

SAFONNIKOV, A.N., inzh.

Investigating conditions of molten-slag acrless welding with a plate electrode and their effect on the dimensions of the seam in welding high-alloy steels and alloys. Mashinostroenie no.3:62-67 My-Je '62. (MIRA 15:7)

1. Institut elektrosvarki imeni Ye.O.Patona AN USSR.
(Electric welding)

SAFONNIKOV, A.N., inzh.

Investigation of conditions of molten-slag electric welding with a plate electrode and their effect on the size of seams in welding high-alloyed steels and alloys. Mashinostroenie no.4:57-60 Jl-Ag '62. (MIRA 15:9)

1. Institut elektrosvarki imeni Ye.O.Patona AN UkrSSR.
(Electric welding)

S/125/62/000/009/003/008
A006/A101

AUTHORS: Safonnikov, A. N., Nikitin Yu. P.

TITLE: Poor fusion in electric-slag welding of chrome-nickel austenite steels and alloys

PERIODICAL: Avtomaticheskaya svarka, no. 9, 1962, 27 - 36

TEXT: An illustration (fig 2) shows the mechanism of poor fusion, according to the concept that the wetting of growing crystals by slag depends on its surface and interface tension. To confirm this theory, the authors investigated the surface properties of fluoride-base welding fluxes (slags) and their interface tension along the boundary with austenite steels and alloys. Data published previously by Nikitin, Yesin, Mikiashvili, Popel' and other Soviet authors are used. The effect of oxygen ions on surface tension was also studied. Tabulated results obtained confirm the author's theory on the mechanism of poor fusion and show that it depends in electric-slag-welded joints of Cr-Ni steels and alloys, on the surface tension of slags, interface tension along the slag-metal boundary, and the ion percentage of oxygen in the slag. The probability of poor fusion decreases with higher values of the aforementioned characteristics; it decreases also with

Card 1/4

Poor fusion in electric-slag welding of...

a reduced charge density of the metal surface along the boundary with the flux, and with a decrease in the energy of the double layer along the slag-metal boundary. The presence of oxides in the flux promotes an increase in surface tension. Maximum effects are obtained by the addition of magnesium, calcium and aluminum oxides. Fluxes which prevent poor fusion, range in the following increasing order: ANF-1, ANF-7, ANF-6, ANF-14, ANF-8. There are 5 figures and 4 tables.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki imeni Ye. O. Patona AN USSR (Order of the Red Banner of Labor Institute of Electric Welding imeni Ye. O. Paton) (Safonnikov)
Ural'skiy politekhnicheskiy institut imeni S. M. Kirova (Ural Polytechnic Institute imeni S. M. Kirov) (Nikitin)

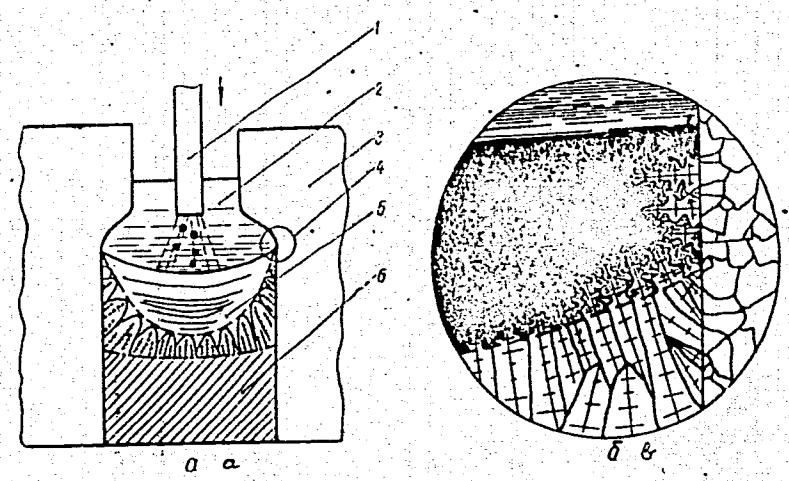
SUBMITTED: January 27, 1962

Figure 2: a - scheme of the electric slag welding process; 1 - plate electrode; 2 - slag pool; 3 - base metal edges; 4 - the "metal pool-slag pool-base metal edges" boundary, being the seat of poor fusion origination; 5 - metal pool; 6 - crystallized weld metal; b - slag with low surface tension - full wetting (poor

Poor fusion in electric-slag welding of...

fusion exists); c - slag with high surface tension - formation and emersion of globules (poor fusion is absent); g - formation of poor fusion in the weld.

Figure 2

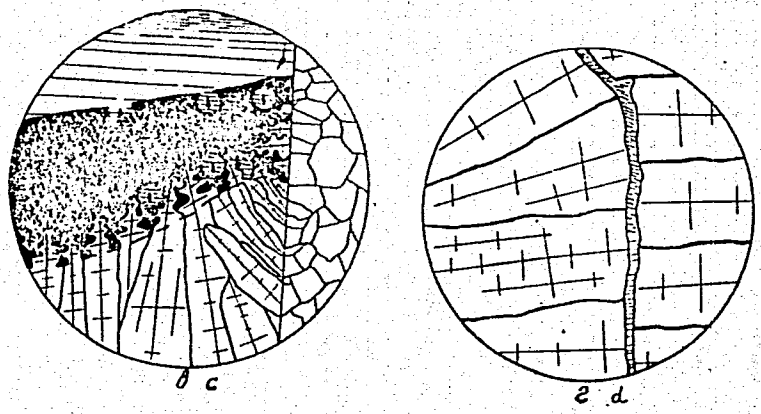


Card 3/4

Poor fusion in electric-slag welding of...

S/125/62/000/009/003/008
A006/A101

Figure 2 (continued)



Card 4/4

Z/056/63/020/003/005/005
E073/E135

AUTHOR: Safonnikov, A.N.

TITLE: Investigation of the electroslag welding conditions with a plate-shaped electrode, and their influence on the weld dimensions in welding high-alloy steels and alloys

PERIODICAL: Hutnictví a strojírenství. Přehled technické a hospodářské literatury, v.20, no.3, 1963, 153-154, abstract HS 63-1889. (Mashinostroyeniye, Kiev, no.4, 1962, 57-60)

TEXT: To improve the productivity during the welding of large circular components, simultaneous welding of several rings in one pass is recommended. When welding rings of a complex cross-section, it is necessary to use water-cooled copper damping devices.
4 figures. 17 references.

[Abstracter's note: Complete translation.]

Card 1/1

L 14422-63 EWP(k)/EWP(q)/EWT(m)/BDS AFFTC/ASD Pf-4 JD/HM

ACCESSION NR: AP3001117 S/0125/63/000/007/0029/0033

AUTHOR: Safonnikov, A. N.; Kontorovich, L. Ye. (Moscow); Khimushin, F. F. (Moscow)

TITLE: Electroslag welding of Kh10N20-type chromium-nickel steels (EI696, EI696A, EI696M) with a flat electrode

SOURCE: Avtomaticheskaya svarka, no. 7, 1963, 29-33

TOPIC TAGS: EI696 steel electroslag welding, EI696A steel electroslag welding, EI696M steel electroslag welding, EI696 steel weldability, 10—20-type steel welding, EI696 steel weld properties, EI696 steel rupture life

ABSTRACT: Forgings of EI696 (90 x 90 mm), EI696M (90 x 90 mm), and EI696A (120 x 120 mm) chromium-nickel steels were electroslag-welded with forged flat electrodes made of the same steels and EI435 and EI437B alloys [AISI Nimonic 75 and Nimonic 80A, respectively]. The fluxes used were ANF-7 and ANF-14, containing respectively 1.2 and 14.9% silicon dioxide, 78.4 and 61.4% calcium fluoride, and 2.6 and 4.6% aluminum oxide. (Flux ANF-14 also contained 7.0% MgO.) In welding with the EI696M electrode, hot cracks occurred in the welds when high current and high welding speed were employed. Lack of fusion was noted with the use of

Card 1/3

the ANF-7 flux. Welds made with EI435 electrodes were flawless. The EI696M parent metal, the EI696M electrode used, and the weld metal obtained with ANF-7 flux had roughly the same composition: 0.04—0.06% C, 0.32—0.43% Si, 0.38—0.48% Mn, 11.20—11.47% Cr, 23.2—23.6% Ni, 1.35—1.53% Mo, 2.04—2.88% Ti, 0.35—0.70% Al, and 0.015—0.020% B. Welding caused a slight loss of Ti and Al. After annealing at 1170C for 2 hr and aging at 750C for 16 hr, the room-temperature tensile strength of the weld metal, 78.4—90.8 kg/mm^2, and of the welded joint, 76.8—78.2 kg/mm^2, were lower than that of the parent metal (86.8—104.7 kg/mm^2). The corresponding figures for yield strength were 48.3—70.3, 48.0—48.8, and 62.4—70.2 kg/mm^2; for elongation, 12.0—17.2, 14.8—16.3, and 20.8—26.0%; and for reduction of area, 16.4—31.2, 24.9—35.5, and 19.7—30.3%. At 700C, the difference in properties was considerably less: the weld and the parent metal had, respectively, tensile strength of 72.6 and 69.2—76.0 kg/mm^2; elongation of 5.6 and 10.2—20.8%; and reduction of area of 13.6 and 14.7—28.0%. Compared with the hardness of the parent metal (HB 260) the weld-metal hardness in the as-welded condition was much lower; however, it rose to 180—200 HB after heat treatment (the specifications call for HB 265). Welds made with the EI437B electrode had a hardness of HB 220, which increased to HB 265 after heat

L 14422-63
ACCESSION NR: AP3001117

3

treatment. In stress-rupture tests at 700C, the joints welded with the EI435-alloy electrode had very poor heat resistance and rupture life under a stress of 30 kg/mm^2 was only 5 hr; the joints welded with the EI437B and EI696M electrodes under a stress of 40 kg/mm^2 had a rupture life of 63—76 hr and 152—281 hr (specifications call for 100 hr). Welding of EI696 and EI696A steels (which contain no molybdenum) produced sufficiently heat-resistant welds, provided the electrodes used were of the same composition as the steels being welded. The welds, however, were very susceptible to hot cracking, which could not be prevented by conventional means. It is possible that the weldability of these steels can be improved by the electroslag melting of the parent metal. Orig. art. has: 4 figures and 3 tables.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona AN USSR (Electric Welding Institute, AN USSR)

SUBMITTED: 16Mar61 DATE ACQ: 02Aug63 ENCL: 00

SUB CODE: MA, ML NO REF SOV: 001 OTHER: 000

Card 3/3

NIKITIN, Yu.P.; SAFONNIKOV, A.N.

Surface properties of welding fluxes. Sbor. nauch. trud. Ural. politekh. inst. no.126:68-72 '63 (MIRA 17:8)

1. Redaktor zhurnala "Sbornik nauchnykh trudov Ural'skogo politekhnicheskogo instituta imeni S.M. Kirova" (for Nikitin).

SAFONNIKOV, A.N.; YUNGER, S.V.

Conference on highly efficient methods of welding in chemical and petroleum machinery construction. Avtom. svar. 17 no.12: 84-87 D '64 (MIRA 18:2)

L 57085-65 EWT(d)/EWT(m)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(h)/EWP(z)/EWP(b)/EWP(l)/EWA(c) Pf-4 MJW/JD/HM

ACCESSION NR: AP5013361 UR/0314/65/000/005/0039/0042

621.791:669.15

AUTHOR: Safonnikov, A. N. (Candidate of technical sciences)

TITLE: Welding of large stainless steel parts having large cross sections

SOURCE: Khimicheskoye i neftyanoye mashinostroyeniye, no. 5, 1965, 39-42

TOPIC TAGS: electric welding, slag welding, welding / A 550 welding apparatus, TShS 3000 1 transformer, Kh18N10T steel

ABSTRACT: To permit welding of large ring- or flange-shaped parts made of Kh18N10T (which is hard to weld because of low heat conductivity), an electric slag welding apparatus was developed at the Institut elektrosvarki im. Ye. O. Patona AN UkrSSR (Electric Welding Institute, AN UkrSSR). It consists of a welding apparatus A-550 which uses strip electrodes 8-24 mm thick, normally of the same composition as the base metal, the same width as the thickness of the welded part and long enough to form the seam in a single pass, a transformer TShS-3000-1, and a rotating or stationary working table with water-cooled copper fixtures. The transformer capacity is $(8-12)10^4$ volt at 3000 amp (50%) with four-step regulation of the secondary voltage. A qualitative evaluation of the strip-electrode

Card 1/2

L 57085-65

ACCESSION NR: AP5013361

welding method is presented, based on experimental welding of ring shapes of 2-3.5 m diameter (0.2 x 0.35 m section). It was found that this method is superior to rod electrode welding because it provides a larger metal pool which requires lower operating voltages and results in a thicker seam. The seam width is primarily determined by operating voltage and depth of molten metal pool. The seam was found to have a better dispersion phase (after heat treatment) than the base metal. Heat treatment consisted of austenitization or annealing at 1148K for 14400 seconds. To further improve the seam properties, the electrode could be made of higher alloyed materials with subsequent heat treatment for the metal surrounding the weld. Orig. art. has: 4 figures and 4 tables.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona AN UkrSSR (Electric Welding Institute, AN UkrSSR)

SUBMITTED: 00 ENCL: 00 SUB CODE: IE, MM

NO REF SOV: 000 OTHER: 000

Card 2/2

L 63452-65 EPA(s)-2/EWT(m)/EWP(k)/EWA(c)/EWP(b)/T/EWA(d)/EWP(v)/EWP(t) JD/HM/HW

ACCESSION NR: AP5018700 UR/0125/65/000/007/0072/0072

621.791.756.042

AUTHOR: Safonnikov, A. N. (Candidate of technical sciences) 39 B

TITLE: Flat electrodes for welding thin stainless steel plate

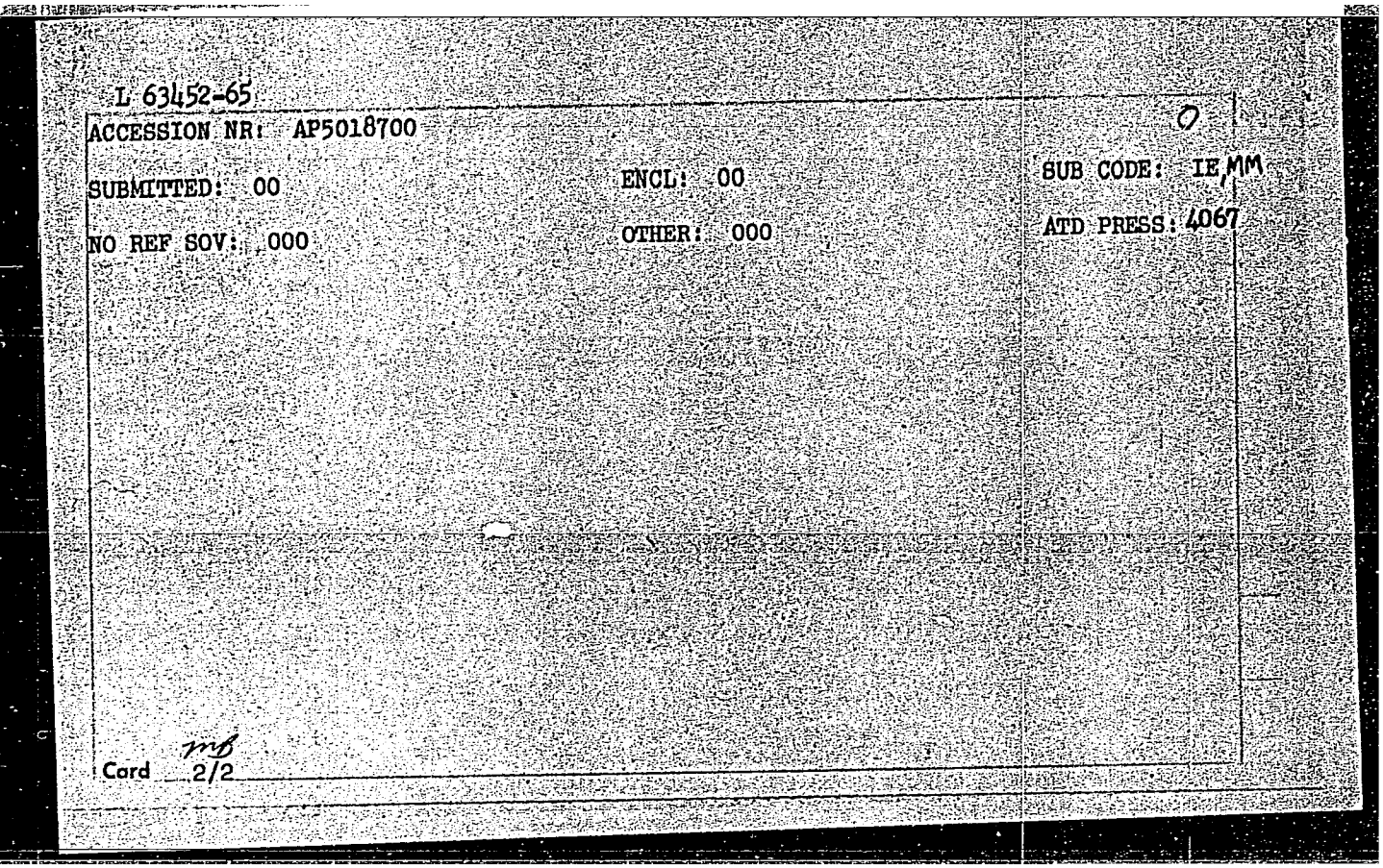
SOURCE: Avtomaticheskaya svarka, no. 7, 1965, 72

TOPIC TAGS: stainless steel, thin stainless steel plate, thin plate electroslag welding, electroslag welding technique

ABSTRACT: A new technique for electroslag welding of structures made of austenitic chromium-nickel steel and alloy plates less than 25 mm thick has been developed by the Electric Welding Institute im. Ye. O. Paton. A flat electrode is located in the plane of the parts being welded, with the electrode width perpendicular to the edges to be joined. High-quality joints of stainless steels and alloys, less than 25 mm thick and without weld reinforcement and edge defects, were obtained. Orig. art. has: 2 figures and 1 table. [MS]

ASSOCIATION: none

Card 1/2



L 63452-65

ACCESSION NR: AP5018700

SUBMITTED: 00 ENCL: 00 SUB CODE: IE,MM

NO REF SOV: 000 OTHER: 000 ATD PRESS: 4067

Card 2/2

L 52117-65 EPA(s)-2/EWP(k)/EWA(c)/EWT(m)/EWP(b)/T/EWP(v)/EWP(t) Pf-4 JD/HM

ACCESSION NR: AP5015365 UR/0286/65/000/009/0114/0114
621.791.042.2

AUTHOR: Medovar, B. I.; Safonnikov, A. N.; Nechayev, V. A.; Yunger, S. V.; Denisov, A. V.

TITLE: Welding rod. Class 49, No. 170828

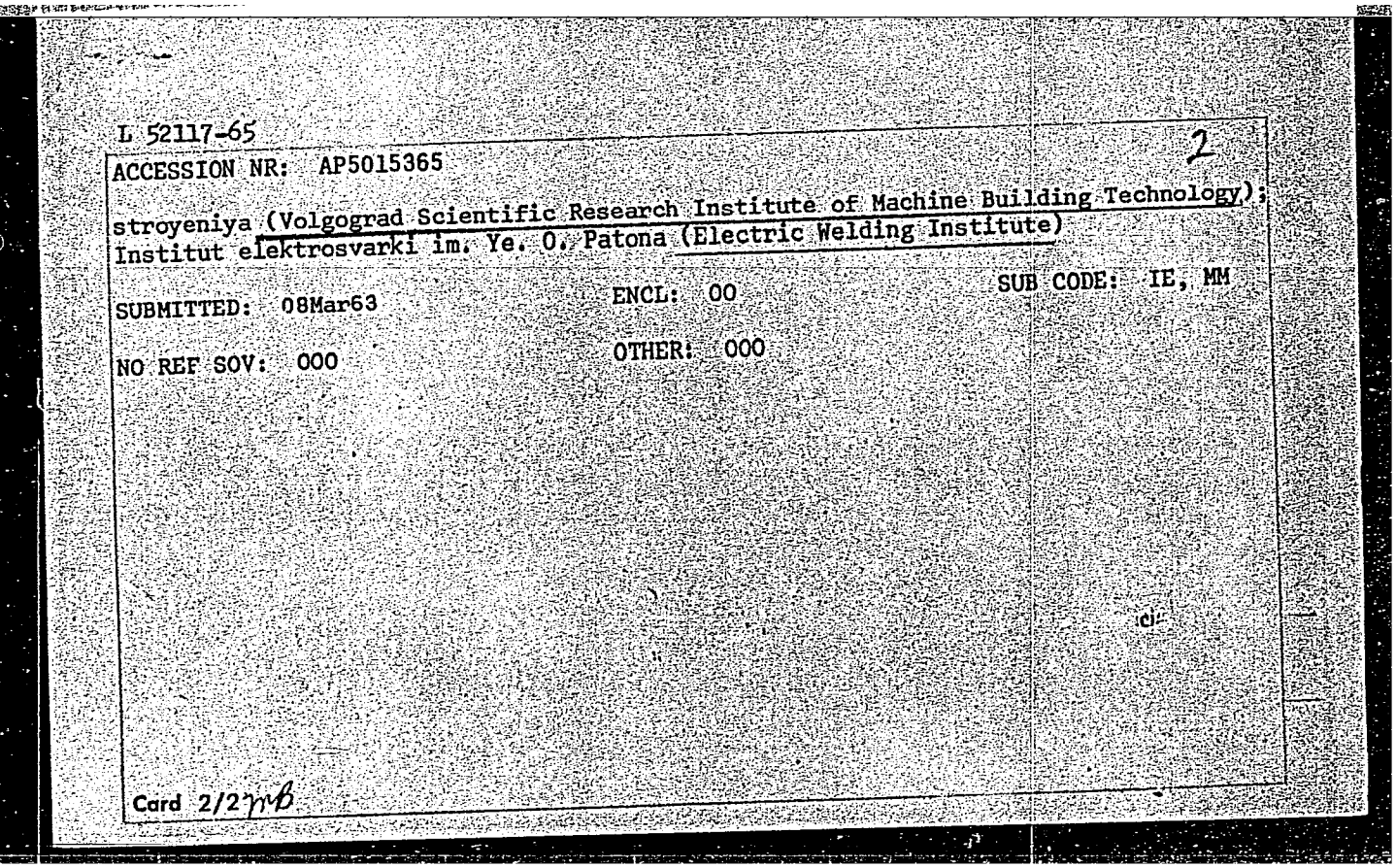
SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 9, 1965, 114

TOPIC TAGS: welding, welding rod

ABSTRACT: This Author's Certificate introduces a rod for closed arc welding. The rod contains carbon, manganese, silicon, chromium, nickel, titanium, aluminum, niobium, sulfur, phosphorous, and iron. The quality of the welded joint is improved by using the following percent proportions of components: carbon--no more than 0.09; silicon--no more than 0.8; manganese--1-2; chromium--17-19; nickel--9-10.5; titanium-1.0-1.4; aluminum--0.3-0.5; niobium--0.6-0.8; sulfur-no more than 0.018; phosphorous--no more than 0.03; remainder--iron.

ASSOCIATION: Volgogradskiy Nauchno-issledovatel'skiy institut tekhnologii machino-

Card 1/2



L 52117-65

ACCESSION NR: AP5015365 2

stroyeniya (Volgograd Scientific Research Institute of Machine Building Technology);
Institut elektrosvarki im. Ye. O. Patona (Electric Welding Institute)

SUBMITTED: 08Mar63 ENCL: 00 SUB CODE: IE, MM

NO REF SOV: 000 OTHER: 000

Card 2/2 mb

L 65221-65 EWT(m)/EWP(w)/EWA(d)/EWP(v)/T-2/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(c)/ETC(m) IJP(c) MJW/JD/WW/HM/EM

ACCESSION NR: AP5021808 UR/0114/65/000/008/0037/0039

621.791.7; 66 9[illegible]

AUTHOR: Safonnikov, A. N. (Candidate of technical sciences)

TITLE: Welding of austenitic steels with a high carbon content

SOURCE: Energomashinostroyeniye, no. 8, 1965, 37-39

TOPIC TAGS: electroslag welding, austenite steel, carbon steel, welding electrode/ 4Kh12N8G8MFB steel

ABSTRACT: 4Kh12N8G8MFB austenite-carbide steels are widely used in the fabrication of turbine disks, ring products, and fastening fixtures, and, following proper heat treatment (which includes quenching from 1150°C and double aging to assure a more stable heat resistance as a result of dispersion hardening due to the formation of a carbide phase), they can be used to replace certain other, more expensive steels. In this connection the authors present the results of an investigation of the electroslag welding, by means of a plate electrode, of 100 mm thick rings of 4Kh12N8G8MFB steel. The welding can be performed with the aid of standard equipment and techniques; it may lead to the appearance

Card 1/2

L 65221-65

ACCESSION NR: AP5021808

of crystallization cracks due to the dendritic segregation of carbon, but these can be eliminated by postheating. Optimal welding regime, for the case of a plate electrode, is as follows: cross section of steel, 100x100 mm; cross section of electrode, 10x100 mm; current, 1800 a; electrode feed rate, 2.7 m/hr; voltage, 28 v; fluxing agent, ANF-1 in the amount of 300 g; depth of slag pool, 10-12 mm. The hardness of the weld metal can be increased to the hardness of the base metal by means of postheating, and its other mechanical properties also are not inferior to those of the base metal. The microstructure of the weld is macrocrystalline. It is concluded that the electroslag welding of steels of the 4Kh12N8G6MFB type by means of a plate electrode can be recommended, provided that the welding regime is strictly followed. Orig. art. has: 4 figures, 2 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: MM, IE

NO REF SOV: 002 OTHER: 000

Card 2/2

L 65193-65 EWT(m)/EEC(k)-2/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(c)
ACCESSION NR: AP5021226 MJW/JD/HW/HW/WB UR/0125/65/000/008/0073/0074
621.791.75

AUTHOR: Safonnikov, A. N. (Candidate of technical sciences)

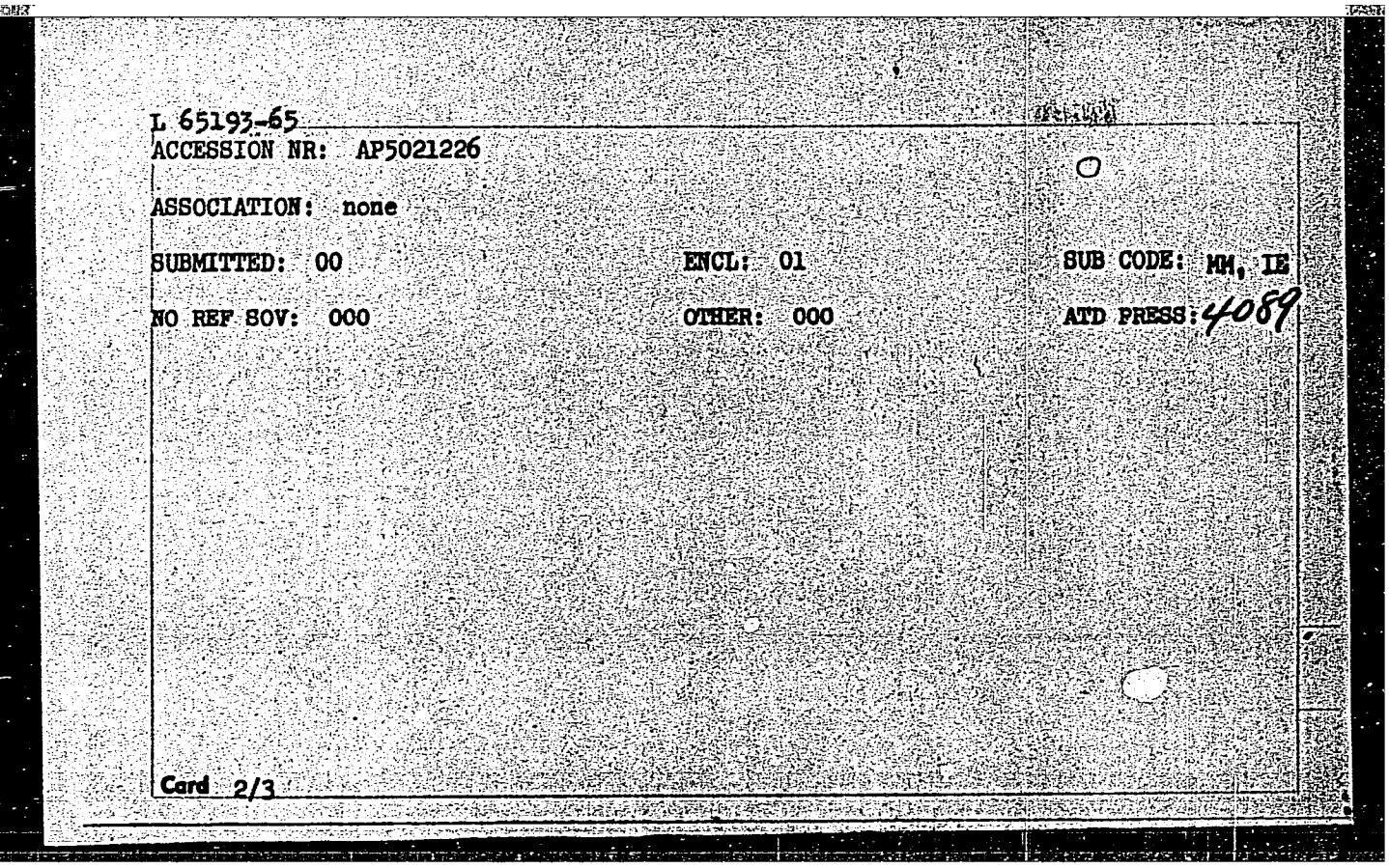
TITLE: Electroslag welding of Kh18N9T austenitic steel

SOURCE: Avtomaticheskaya svarka, no. 8, 1965, 73-74

TOPIC TAGS: electroslag welding, welding technology, stainless steel, austenitic steel, steel welding, steel property

ABSTRACT: The Electric Welding Institute im. Ye. O. Paton has developed the technology of electroslag welding by flat electrode used for the production of Kh18N9T steel flanges and box-type designs with corner joints. Welding recommendations for austenitic stainless steel using an ANF-7 flux are given in Table 1. The corrosion resistance of the weld metal was studied after austenitizing at 1100C, holding for 1 hr, and solution annealing at 875C for 4 hr. The specimens were tested after heat treatment and additional heating to 475, 650, and 900C for 1.5, 2, 2.5, and 3 hr. The experiments showed that welds are not susceptible to intercrystalline corrosion. However, corrosion traces were observed in specimens which were additionally heated to 475C. The room-temperature impact strength of welds varied from 16.1 to 22.1 mkg/cm^2. Orig. art. has: 2 figures and 2 tables. [AZ]

Card 1/3



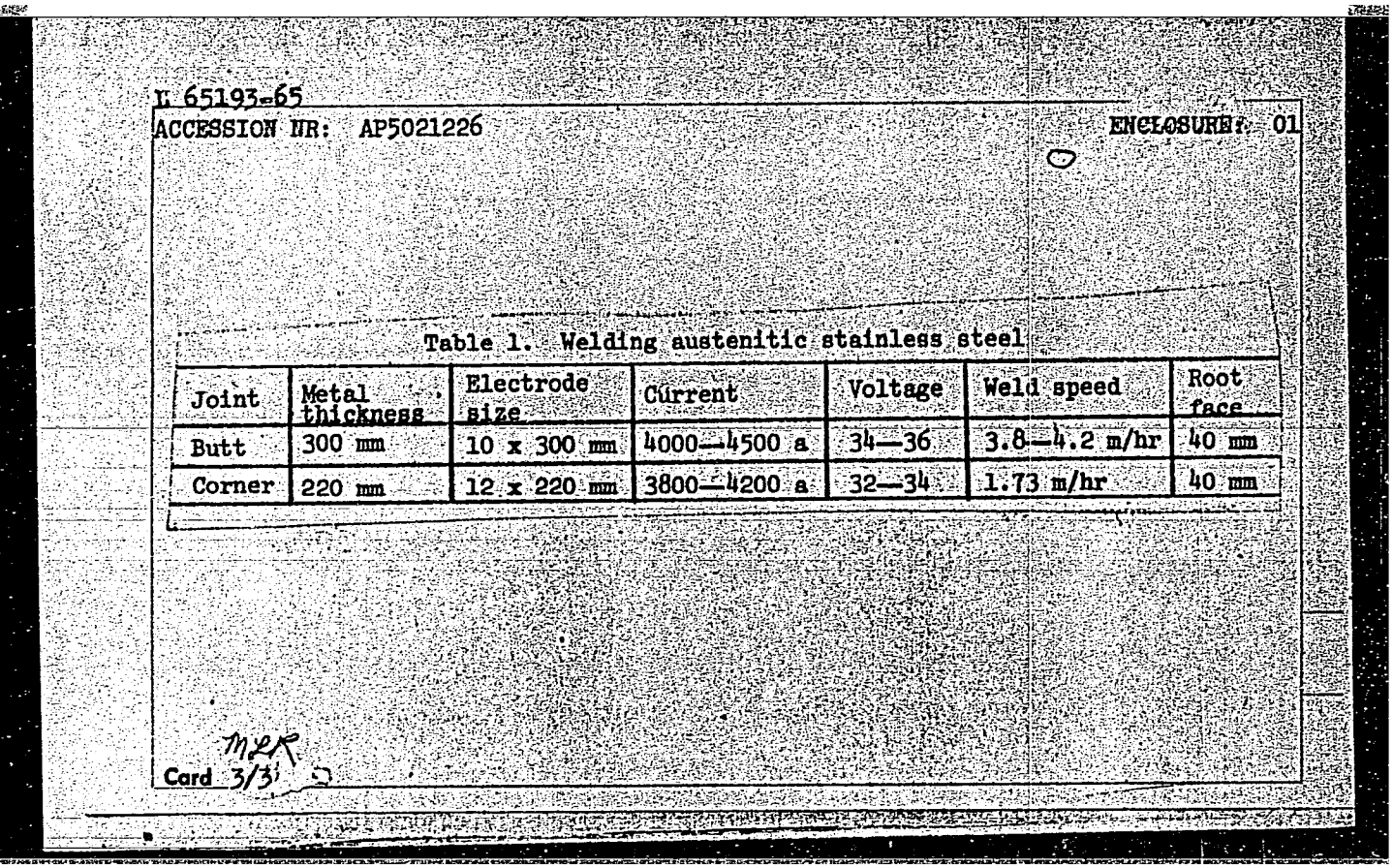
L 65193-65
ACCESSION NR: AP5021226

ASSOCIATION: none

SUBMITTED: 00 ENCL: 01 SUB CODE: MM, IE

NO REF SOV: 000 OTHER: 000 ATD PRESS: 4089

Card 2/3



L 65193-65
ACCESSION NR: AP5021226 ENCLOSURE: 01

Table 1. Welding austenitic stainless steel

Joint	Metal thickness	Electrode size	Current	Voltage	Weld speed	Root face
Butt	300 mm	10 x 300 mm	4000—4500 a	34—36	3.8—4.2 m/hr	40 mm
Corner	220 mm	12 x 220 mm	3800—4200 a	32—34	1.73 m/hr	40 mm

MLR
Card 3/3

L 20446-66 EWT(m)/EWA(d)/EWP(t) LIP(c) JD

ACC NR: AP6008816 (N) SOURCE CODE: UR/0135/66/000/003/0028/0030

AUTHOR: Safonnikov, A. N. (Candidate of technical sciences); Pobol', A. A. 32 B

ORG: Institute of Electric Welding im. Ye. O. Paton (Institut elektrosvarki)

TITLE: Electroslag welding of large austenitic chromium-nickel steel rings

SOURCE: Svarochnoye proizvodstvo, no. 3, 1966, 28-30

TOPIC TAGS: austenitic steel, chromium steel, nickel containing steel, steel ring, ring welding, electroslag welding

ABSTRACT: Conventional forging and rolling of large stainless-steel rings with a cross-section up to 900 cm^2 presents serious difficulties and sometimes is simply impossible. Therefore, a method for making such rings by electroslag welding has been developed and introduced into practice. According to this method the ring is assembled from several forged or rolled segments which are bent to a required radius. A mold is built around each joint. The welding is done with a flat electrode and a calcium fluoride-calcium oxide flux. With careful assembly the deformations can be kept to a minimum. The method can be used for rings of any diameter and cross section. Rings of the same diameter can be put on top of each other and welded as a single ring. The method has been successfully used in welding OKh18N10T steel rings 3000 and 900 mm in diameter with respective cross sections of 195 x 195 and 60 x 110 mm, and Kh18N10T steel rings with cross sections of 220 x 220 and

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ACC NR: AP6008816 O

250 x 300 mm. The mechanical properties and corrosion resistance of the welds were equal to those of the parent materials. Orig. art. has: 5 figures and 5 tables. [DV]

SUB CODE: 13, 11/ SUBM DATE: none/ ORIG REF: 002/ ATD PRESS: 4222

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L 20477-66 EWT(m)/EWP(v)/T/EWP(t)/EWP(k) JD/HM (N)
ACC NR: AP5023087 SOURCE CODE: UR/0125/65/000/009/0074/0076

58
B

AUTHOR: Safonnikov, A.N. (Candidate of technical sciences)

ORG: none

TITLE: Some problems in electroslag welding with heavy gage electrodes

SOURCE: Avtomaticheskaya svarka, no. 9, 1965, 74-76

TOPIC TAGS: electroslag welding, electrode, strong magnetic field, crack propagation, welding technology, martensitic steel, heat resistant steel, allotropic transformation

ABSTRACT: The effects of strong electric fields, forming around an electrode, on the stability of the welding process and of allotropic transformation on the tendency to crack propagation in joints are discussed. It is shown that the sticking of an electrode to the edges of a joint during welding is due to the motion the electrode receives from the ferromagnetic material of the joint under the action of the magnetic field. This sticking of the electrode which disrupts the stability of the welding process can be prevented in electroslag welding with heavy gage electrodes by applying the current to an insulated metallic pocket instead of directly to the ferromagnetic material of the joint. It is also shown that the propagation of cracks in heat resistant pearlite and martensitic steels as well as in other materials can be pre-

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vented by slow cooling of the joint and by decreasing the allotropic transformation rate during the cooling. The welding must be carried out in closed equipment filled with heat insulating materials, such as plain quartz sand heated to 300-500°C which has been found effective in most cases. Orig. art. has: 3 figures.

SUB CODE: 13, 11 SUBM DATE: none

Card 2/2 Lgc

ACC NR: AP7004203 SOURCE CODE: UR/0125/67/000/001/0076/0078

AUTHOR: Safonnikov, A. N.

ORG: none

TITLE: Electroslag welding of Kh17N13M3T steel

SOURCE: Avtomaticheskaya svarka, no. 1, 1967, 76-78

TOPIC TAGS: stainless steel, electroslag welding, chemical plant equipment, corrosion resistance /Kh17N13M3T stainless steel, ANF-7 welding flux, ANF-14 welding flux

ABSTRACT: The recent intensification of technological processes in the chemical industry requires investigating the suitability of thicker plates of stainless steel of the Kh17N13M3T type as a material for welded joints of chemical apparatus. Accordingly, the article deals with the effect of additional alloying (with Cu and Ni) and heat treatment on the corrosion and mechanical properties of weld metal in welded joints of 60 mm thick plate steel Kh17N13M3T welded with the aid of plate electrodes and ANF-7 and ANF-14 welding fluxes. It is found that the metal electrodes of the same chemical composition — Kh17N3M3T (nickel) electrodes — in combination with ANF-7 flux display satisfactory impact strength and sufficient resistance

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to intercrystalline corrosion even after heating to 875°C for 3 hr. In some cases additional treatment with Cu (Kh18N10T electrodes) also is effective. Orig. art. has: 3 tables.

SUB CODE: 13, 11 / SUBM DATE: none

Card 2/2

SAFONOV, A.

Increase the use of control devices for receiving bank deposits. Den. i kred. 18 no.9:73-74 S '60. (MIRA 13:8)

1. Glavnyy bukhgalter Gorlovskogo otdeleniya Gosbanka Stalinskoy oblasti.
(Stalino Province--Deposit banking--Equipment and supplies)

SAFONOV, A.
25694

V Doline Khakmary. Kolkhozy V Bashkirii. Ocherk. Vsb: Lit. Bashkiriya. UFA, 1948, s. 67-73

SO: LETOPIS NO. 30, 1948

SAFONOV, A.; Inzh.

USSR (600)
Cooling Towers. Building a wooden cooling tower by the method of large sectional installations. Biul. stroi. tekh. 9 no. 4, 1952. Trest Liskhimpromstroy

SOURCE: Monthly List of Russian Accessions, Library of Congress, August 1952. Unclassified.

LALETIN, A.; SAFONOV, A.

In a field of communist labor. Neftianik 6 no.7:4-6 Jl '61.
(MIRA 14:7)

(Bashkiria—Oil fields—Production methods)

MALKOV, G.; SAFONOV, A., inzh.

Plan for a single construction supply center in the Omsk Economic District. Na stroi. Ros. no.7:24-25 Jl '61. (MIRA 14:8)

1. Direktor proyektnogo instituta No.2 Ministerstva stoitel'stva RSFSR (for Malkov).
(Omsk Province--Building materials)

SAFONOV, A., dotsent; BOS'KO, V., assistent; VATIPKO, B.

Estimating the extent of the wear of the hull plating of the ship by ultrasonic testing. Mor. flot 25 no.10:32-34 O '65. (MIRA 18:11)

1. Zaveduyushchiy kafedroy "Oborudovaniye i tekhnologiya svarochnogo proizvodstva" Nikolayevskogo korablestroitel'nogo instituta imeni admirala S.O. Makarova (for Safonov). 2. Kafedra "Oborudovaniye i tekhnologiya svarochnogo proizvodstva" Nikolayevskogo korablestroitel'nogo instituta imeni admirala S.O. Makarova (for Bos'ko). 3. Glavnyy inzh. Nikolayevskogo chernomorskogo remontno-mekhanicheskogo zavoda (for Vatipko).

ZHUKOV, N.A.; MYTAREV, A.G.; PARAMONOV, A.I.; SAFONOV, A.A.; SILKIN, N.P.; SLUTSKIY, Ya.L.; FROLKOV, P.P.; KUZNETSOVA, L.G., red.

[Centralized repair of hydraulic systems; work practice of the Mikhailov Regional Association of "Sel'khoztekhnika" of Ryazan Province] TSentralizovannyi remont gidrosistem; opyt raboty Mikhailovskogo raionnogo ob"edineniia "Sel'khoztekhnika" Riazanskoi oblasti. Moskva, Biuro tekhn. informatsii, 1964. 14 p. (Peredovoi opyt i predlozheniia. Seriia 1. Remont mashinnotraktornogo parka) (MIRA 18:5)

DAVYDOV, Samuil Uriyevich; KOPYLOVA, Anastasiya Korneyevna; SAFONOV, Anatoliy Fedorovich; CHURILIN, I.N., red.; POLYACHEK, Ya.G., red.; SHVETSOV, V.G., red. izd-va; KOZLENKOVA, Ye.I., tekhn. red.

[Technology, sanitation and hygiene of sausage production] Tekhnologiia, sanitariia i gigiena kolbasnogo proizvodstva. Moskva, Izd-vo TSentrosoiuza, 1962. 151 p. (MIRA 15:4)
(Sausages) (Meat industry—Hygienic aspects)

1. SAFONOV, A.G.

2. USSR (600)

4. Fishes-Diseases And Pests

7. New Method for controlling the carp louse., Ryb.khoz., 28, No.11, 1952

9. Monthly List of Russian Accessions, Library of Congress, February 1953. Unclassified.

SAFONOV, A. G.

Fishes

Utilizing surface film of a kerosene mixture as a means of combatting insects harmful to fish. Zool. zhur., 31, No. 4, 1952.

Monthly List of Russian Accessions, Library of Congress October 1952 UNCLASSIFIED.

SAFONOV, A.G.

New vaginal syringe-catheter for the insemination of cows. Zhivotnovodstvo 21 no.11:75-76 N '59 (MIRA 13:3)

1. Glavnyy inspektor po zhivotnovodstvu sel'skokhozyaystvennoy inspektsii Fastovskogo rayona Kiyevskoy oblasti.
(Artificial insemination) (Syringes)

SAFONOV, A.G., kand. med. nauk; KOVALEVSKIY, Ye.I., kand. med. nauk

Ways and means for the complete eradication of trachoma in the U.S.S.R. Vest. oft. 76 no.5:3-7 S-O '63.
(MIRA 17:1)

1. Ministerstvo zdravookhraneniya SSSR i kafedra glaznykh bolezney II Moskovskogo meditsinskogo instituta imeni Pirogova.

SAFONOV, A.G.

Results of activities of the commission on rural public health. Sovet. zdravookhr. 11 no.1:49-53 Jan-Feb 52. (CIML 21:4)

1. Head of the Administration of Rural Therapeutic Institutions of the Ministry of Public Health RSFSR.

1. SAFONOV, A.G.

2. USSR (600)

4. Medicine, Rural

7. Dispensary method of servicing the rural population, Sov.zdrav. 12 no. 3, 1953.

9. Monthly List of Russian Accessions, Library of Congress, APRIL 1953, Uncl.

37185. SAFONOV, A. G. Organizatsiia mediko-sanitarnogo obsluzhivaniia naseleniia kraĭnego severa. (Sovetskoe zdravookhranenie, Sept.–Oct. 1954. god 13, no. 5, p. 3–9) Text in Russian. ***Title tr.:*** Organization of the medical-health services of the population in the far North.

Contains account, in general terms, of the problems of the great distance of these areas from large medical centers; specialization and specialists, etc.; territorial and provincial hospitals at Krasnoyarsk, Tyumen, etc., mobile specialized units (for eye diseases, skin diseases, TB., etc.); proper training of medical assistants (fel'dsher), and midwives; communication among the different institutions, etc. Yamalo-nenetskiy and Khanty-Mansiyskiy districts are mentioned. ***Copy seen:*** DSG.

nachal'nik otdela sel'skikh lechebno-profilakticheskikh uchrezhdeniy Ministerstva Zdravookhraneniya RSFSR.

SAFONOV, A.G.

Organization of control of trachoma. Vest.oft. 33 no.3:21-28 My-Je '54. (MLRA 7:6)

1. Nach. otdela sel'skikh lechebno-profilakticheskikh uchrezhdeniy Ministerstva zdravookhraneniya RSFSR.
(TRACHOMA, prevention and control,
*Russia)

SAFONOV, A.G.

[Organization and work methods of a surgical feldsher-midwife center in a village] Organizatsiia i metody raboty fel'dsher-skogo-akusherskogo punkta na sele. Moskva, 1955. 64 p. (MLRA 9:5)
(MEDICINE, RURAL)

SAFONOV, A.G. (Moskva)

Organization of control of endemic goiter. Probl. endokr. i gorm. 1 no.2:44-51 Mr-Ap '55. (MLRA 8:10)

(GOITER,
endemic, control in Russia)

SAFONOV, A.G.

Results of dispensary service for the rural population in the R.S.F.S.R. in the years 1952-1954. Sov.med.19 no.7:67-76 Jl '55. (MLRA 8:10)

1. Nachal'nik otdela meditsinskoy pomoshchi sel'skomu naseleniyu Ministerstva zdravookhraneniya RSFSR.

(NATIONAL HEALTH PROGRAMS
in Russia, med.care for rural population)
(RURAL CONDITIONS
in Russia, med. care)

SAFONOV, A.G.

Work of organizational and methodological consultation rooms in district, territory, and republic hospitals. Zdrav.Ros.Feder. 1 no.2: 21-26 F '57. (MLRA 10:7)

1. Nachal'nik Glavnogo lechebno-profilakticheskogo upravleniya Ministerstva zdravookhraneniya RSFSR.
(HOSPITALS, RURAL)

SAFONOV, A.G.

Therapeutic and profphylactic services for the people of the R.S.F.S.R. Zdrav.Ros.Feder. 1 no.11:3-15 N '57. (MIRA 10:12)

1. Nachal'nik Glavnogo lechebno-profilakticheskogo upravleniya Ministerstva zdravookhraneniya RSFSR.
(PUBLIC HEALTH)

GAGAYEVA, M.A.; SAFONOV, A.G., red.; POGOSKINA, M.V., tekhn.red.

[Child care in the rural medical district] Child care in the rural medical district. Moskva, Gos.izd-vo med.lit-ry Medgiz, 1960. 60 p. (MIRA 14:2)

(INFANTS--CARE AND HYGIENE)

SAFONOV, A.G.

All-Union Conference on Dispensary and Polyclinic care of the people. Zdrav. Ros. Feder. 4 no.3:43-47 Mr '60. (MIRA 13:5)
(MEDICAL CARE)

KOLYBINA, Ol'ga Dmitriyevna; SAFONOV, A.G., red.; POGOSKINA, M.V., tekhn. red.

[Principles of a therapeutic and prophylactic regimen] Osnovy lechebno-okhranitel'nogo rezhima. Moskva, Medgiz, 1961. 106 p. (MIRA 15:1)

(HOSPITALS) (THERAPEUTICS)

CHUMAK, M.M.; VISHNEVSKAYA, I.I.; SAFONOV, A.G., red.; BALDINA, N.P., tekhn. red.

[Rural medical service in the U.S.S.R.] Meditsinskoe obsluzhivanie sel'skogo naseleniia SSSR. Moskva, Medgiz, 1961. 171 p. (MIRA 15:2)

(PUBLIC HEALTH, RURAL)

SAFONOV, Aleksey Georgiyevich; KAL'YU, P.I., red.; POGOSKINA, M.V., tekhn. red.; MATVEYEVA, M.M., tekhn. red.

[Medical care in the R.S.F.S.R.] Meditsinskaia pomoshch' naseleniiu v RSFSR. Moskva, Medgiz, 1961. 366 p. (MIRA 15:2)
(MEDICAL CARE)

SAFONOV, A. G.

Present status and prospects for the development of urological aid for the population of the U.S.S.R. Urologiia no.6:6-11 '61. (MIRA 15:4)

1. Nachal'nik Upravleniya spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.

(UROLOGY)

SAFONOV, A.G.

State and tasks of the control of rheumatic fever in the U.S.S.R. Vop.revm. 1 no.3:6-11 Jl-S '61. (MIRA 16:4)

1. Nachal'nik Upravleniya spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.
(RHEUMATIC FEVER)

SAFONOV, A.G. (Moskva)

Ways of further improvement of first medical aid. Sov. zdrav. 20 no.9:3-10 '61. (MIRA 14:12)

1. Nachal'nik Upravleniya spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.
(FIRST AID IN ILLNESS AND INJURY)

SAFONOV, A.G. (Moskva)

Further development in the organizational forms of the public health system. Sov. zdrav. 20 no.10:5-13 '61. (MIRA 14:9)

1. Nachal'nik Upravleniya spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.
(PUBLIC HEALTH)

SAFONOV, A.G.

Current status and problems of medical exercise therapy in the U.S.S.R. Sov.med. 25 no.12:15-21 D '61. (MIRA 15:2)

1. Nachal'nik Upravleniya spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.
(EXERCISE THERAPY)

SAFONOV, A.G., red.; RYBASOV, V.A., red.; KRAKOVSKIY, N.I., red.; PETROVA, N.K., tekhn. red.

[Textbook for the training of nurses] Uchebnik dlia podgotovki meditsinskikh sester. Moskva, Medgiz, 1962. 715 p.
(MIRA 15:6)

(NURSES AND NURSING—HANDBOOKS, MANUALS, ETC.)

SAFONOV, A.G. (Moskva)

Basic trends in the development of a network of preventive medical institutions and the requirements for standard designs. Sov.zdrav. 21 no.10:14-21 '62. (MIRA 15:10)

1. Nachal'nik Upravleniye spetsializirovannoy meditsinskoy pomoshchi Ministerstva zdravookhraneniya SSSR.
(MEDICAL CENTERS)

SAFONOV, A.G. (Moskva)

Current state and problems of extended surgical aid for patients with pulmonary tuberculosis. Probl. tub. 40 no.6: 3-10 '62. (MIRA 16:12)

SAFONOV, A.G. (Moskva, ul. Kostyakova, d.8., kv. 218)

Measures for further development and improvement of traumatological and orthopedic service for the population of the U.S.S.R. Ortop., travm. i protez. 25 no.2:3-12 F '64. (MIRA 18:1)

1. Chlen kollegii Ministerstva zdravookhraneniya SSSR.

BOGDANOV, F.R., prof., red.; VOLKOV, M.V., prof., red.; KAZ'MIN, A.I., st.nauchn. sotr., red.; DVORKIN, A.M., st. nauchn. sotr., red.; NOVACHENKO, N.P., prof., red.; SAFONOV, A.G., red.; CHAKLIN, V.D.(Moskva), red.

[Materials of the Congress of Traumatologists and Orthopedists of the U.S.S.R., September 17-21, 1963] Materialy S"ezda travmatologov ortopedov SSSR. Vses.nauchn.med. ob-vo travmatologov-ortopedov, 1963. 211 p. (MIRA 18:4)

1. S"yezd travmatologov ortopedov SSSR. 1st, 1963. 2. Ministerstvo zdravookhraneniya SSSR(for Safonov).

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Samsonov, Vladimir Georgiyevich; Kharakhash, Viktor Georgiyevich; Mironenko, Nikolay Ivanovich; Safonov, Aleksandr Ivanovich; Pesikov, Ruvim Semenovich; Alekseyev, Nikolay Nikolayevich

Anticorrosion plastic coatings (Protivokorrozionnyye plastmassovyye pokrytiya) Kiev, Izd-vo "Tekhnika," 1965. 89 p. illus., biblio. 5000 copies printed.

TOPIC TAGS: material control, plastic coating, corrosion inhibition

PURPOSE AND COVERAGE: The booklet deals with the problems of using polymeric materials for anticorrosion protection of the inner surfaces of tubes, pipelines, and valves. The use of these materials makes it possible to economize on nonferrous metals and stainless steel, as well as to increase the useful life of ferrous metals. Technological methods are described, and economic data on the protection of equipment with polymeric materials are presented. The booklet is intended for specialists in the chemical and food industries who deal with the problems of anticorrosion protection of plant apparatus. There are 47 references, of which 43 are Soviet.

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