(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 182 511**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85307655.2**

(22) Date of filing: **23.10.85**

(51) Int. Cl.⁴: **C 21 B 7/00**

(30) Priority: **30.10.84 GB 8427357**

(43) Date of publication of application: **28.05.86**
Bulletin 86/22

(84) Designated Contracting States: **DE GB IT SE**

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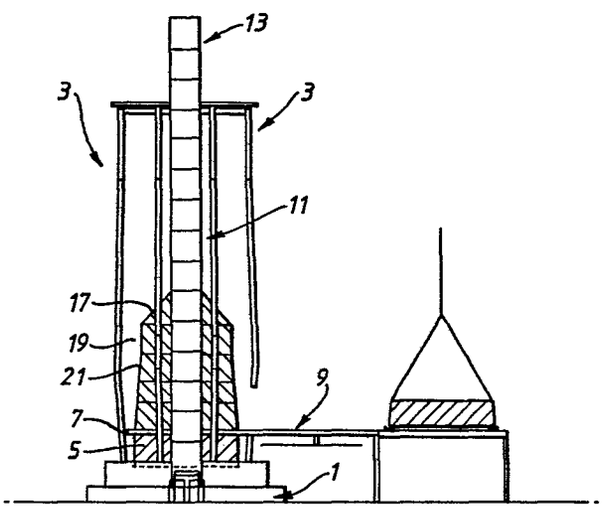
(54) The assembly of a blast furnace shell.

(57) A method of assembling or reconstructing a blast furnace shell comprising a plurality of annular parts, in which the top-most part is positioned on a support surface, and is then jacked up until the next part can be slid beneath it and the two parts welded together. The connected parts are then jacked up and the process continued until the assembly is complete.



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THE ASSEMBLY OF A BLAST FURNACE SHELL

Blast furnaces consist of an outer metal shell of generally cylindrical form arranged with its longitudinal axis vertical and with a lining of refractory material. The lining is fitted inside the cylindrical shell after the shell has been constructed. Heretofore, it has been usual to construct the shell by positioning the base of the shell on its foundation and welding curved metal plates in turn on to the base to form an annular section upstanding from the base. Further plates are welded in turn on to the previously formed section to form a second annular section. This is repeated until the entire shell has been assembled.

It will be appreciated that this is a relatively slow method of assembling the shell since the welds are produced on site and the welds are progressively formed at higher levels from the ground and, thus, safety of the welding operators and their equipment becomes more and more important.

When a blast furnace is being re-built on an existing foundation it is most essential that the re-build takes place as quickly as possible since it means that, while the furnace is out of action, the loss of iron is a financial burden to the furnace operator.

It is an object of the present invention to

provide a method of assembling the shell of a blast furnace which enables the shell to be assembled faster than the method referred to above.

According to the present invention, in a method of assembling the generally cylindrical shell of a blast furnace from at least three annular parts, the part which constitutes the uppermost part of the assembled shell is located on a support surface and is attached to a lifting beam on a lifting tower structure; the lifting beam is jacked upwardly relative to the tower structure to raise the part from the support surface for a distance sufficient to allow a second annular part of the shell to be positioned on the support surface beneath the raised uppermost part; the two parts are connected together one beneath the other; the lifting beam is jacked upwardly relative to the tower structure to raise the connected parts from the support surface for a distance sufficient to allow a third annular part to be positioned on the support surface beneath the raised connected parts; and the third annular part is connected to the raised connected parts; the steps being repeated until all the annular parts have been connected together to form the shell.

The annular parts can be formed away from the site and this simplifies the construction of these parts. When the part which is positioned on the

support surface is connected to the part or parts raised above it, this simplifies the connection process since it takes place at a fixed position.

The lifting tower structure may be a structure which is erected around the foundation of the blast furnace while the shell is assembled and, thereafter, is removed, or it may form part of the furnace tower which is already positioned on the foundation, particularly when the shell is of a re-built furnace.

As the furnace shell is formed from a limited number of annular parts, and since all but the last annular part are lifted on the last jacking operation, the load which has to be lifted is approaching the total weight of the blast furnace shell. To this end, a truck mounted crane or a tower crane having a boom arm is not usually capable of carrying such loads and the loads have to be lifted by a lifting beam jacked up a lifting tower structure. Such a device is described and claimed in British Patent No. 2053150.

In order that the invention may be more readily understood, it will now be described, by way of example only, with reference the accompanying drawings, in which:-

Figures 1 and 2 are diagrammatic side elevations, mutually at right angles, illustrating the

assembly of a blast furnace shell in accordance with one embodiment of the invention; and

Figures 3 and 4 are diagrammatic side elevations, mutually at right angles, of apparatus employing an alternative embodiment of the invention.

Figures 1 and 2 illustrate the assembly of the shell of a blast furnace where the shell is for a re-built furnace on an existing foundation. The existing furnace foundation is referred to by reference numeral 1 and the shell is to be assembled within an existing furnace tower 3. The foundation 1 may be used as a support surface on which the parts of the shell are assembled but, alternatively, the hearth of the furnace, indicated by reference 5, can be positioned in place on the foundation 1 and a support surface 7 temporarily erected on the top of the hearth. A slideway 9 projects from the surface 7 to one side of the furnace.

A lifting tower structure 11, of the type disclosed in British Patent No. 2053150, has a pair of masts 13 and a lifting beam 15 extending between the masts. The beam is jacked upwardly relative to the tower structure by means not shown. The lifting tower structure is erected outside the furnace tower 3.

The annular part 17 of the shell which constitutes the uppermost part of the assembled shell

is located on the slideway 9 and is slid on to the support surface 7. In this position, it is connected to the beam 15 and the beam is jacked up relative to the masts 13 through a distance which is sufficient to enable the next annular part 19, which has previously been located on the slideway, to be pushed to a position on the support surface in which it is beneath the raised part 17. In this position, the part 19 is connected by welding to the part 17 so as to be positioned beneath it. The lifting beam 15 is then raised further to lift up the connected parts 17, 19 sufficiently to enable the next annular part 21 to be slid along the slideway 9 to the support surface beneath the raised parts 17, 19. The part 21 is then welded to the lower edge of the part 19 to form three connected parts. This method is repeated until all the annular parts of the shell have been positioned in turn on the support surface 7 and welded to the raised parts immediately above it. The entire shell is thus assembled. Once the assembly is completed, the lifting tower structure is dismantled along with the slideway 9.

In the arrangement shown in Figures 3 and 4, the shell is of a re-built blast furnace and the existing furnace tower 33 is sufficiently robust to be able to support the weight of the assembled shell. In

this end, it is not necessary for the masts of the lifting tower structure to be positioned outside the furnace tower, but shorter masts 35 can be assembled on the top of the furnace tower. A lifting beam 37 extends between the masts and is raised relative to the masts by jacking means not shown.

The annular part of the shell which constitutes the uppermost part of the shell is indicated by reference numeral 39 and is located on a support surface 41. The part 39 is connected by way of cables 43 to the lifting beam 37. The next annular part of the shell is carried by a movable lifting structure 45 on to a slideway 47 which extends to the support surface 41 and, after the first part 39 has been raised sufficiently high, the second part is slid beneath the first part and is welded to the underside thereof. The two connected parts are then lifted by way of the lifting beam sufficiently to allow the next annular part to be moved along the slideway 47 to a position between the raised parts and for it to be welded to the underside of the raised parts. These steps are continued until the entire shell has been assembled. Thereafter, the masts 35 are dismantled and removed from the furnace tower 33.

CLAIMS

1. A method of assembling the generally cylindrical shell of a blast furnace from at least three annular parts, the method comprising :

(a) erecting a lifting tower structure including a lifting beam, over the assembly position;

(b) positioning a first annular part of the shell on a support surface at the assembly position;

(c) attaching the said first part to the lifting beam;

(d) jacking up the lifting beam, relative to the tower structure, so as to raise the said first part sufficiently far from the surface to allow a second annular part of the shell to be positioned beneath the first;

(e) connecting the first and second parts together;

(f) jacking up the lifting beam relative to the structure so as to raise the connected parts from the support surface by a distance sufficient to allow a third annular part to be positioned on the support surface below the connected parts;

(g) connecting the third annular part to the already connected parts; and

(h) repeating steps (b) to (e) for each successive part until the shell has been completed.

2. A method according to claim 1 in which the said parts are connected by welding.

3. A method according to claim 1 or claim 2 in which the lifting tower structure is erected outside the furnace tower which is to enclose the completed furnace.

4. A method according to claim 1 or claim 2 in which the lifting tower structure is formed by mounting a mast assembly on top of the furnace tower which is to enclose the completed furnace.

5. A method according to any preceding claim in which the successive annular parts are moved into position by means of a slideway adjacent the said support surface.

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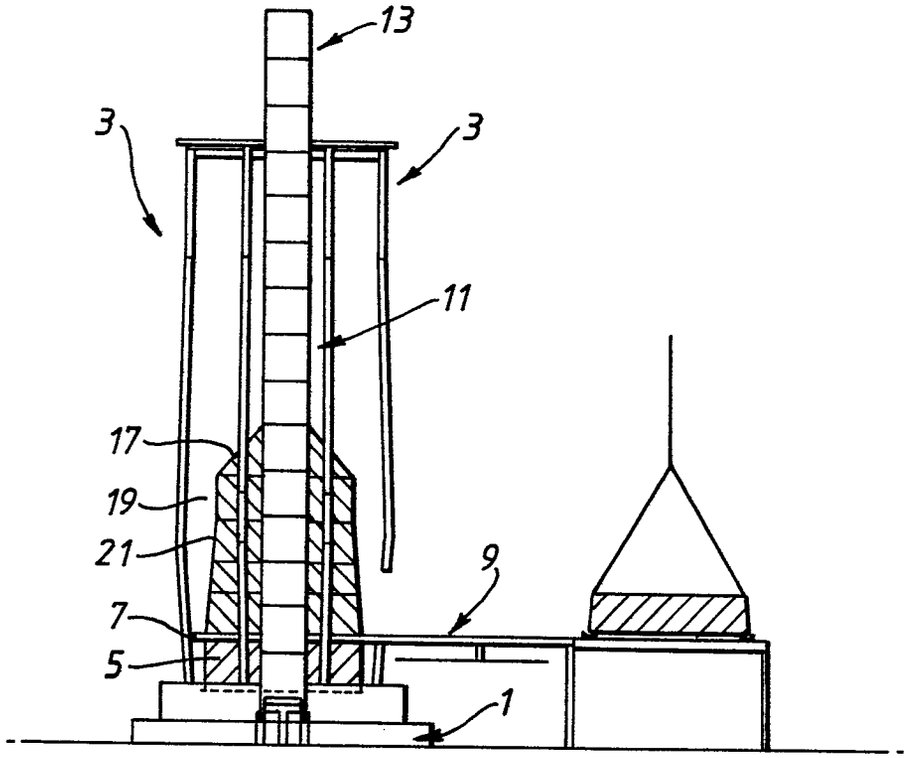

FIG. 1.

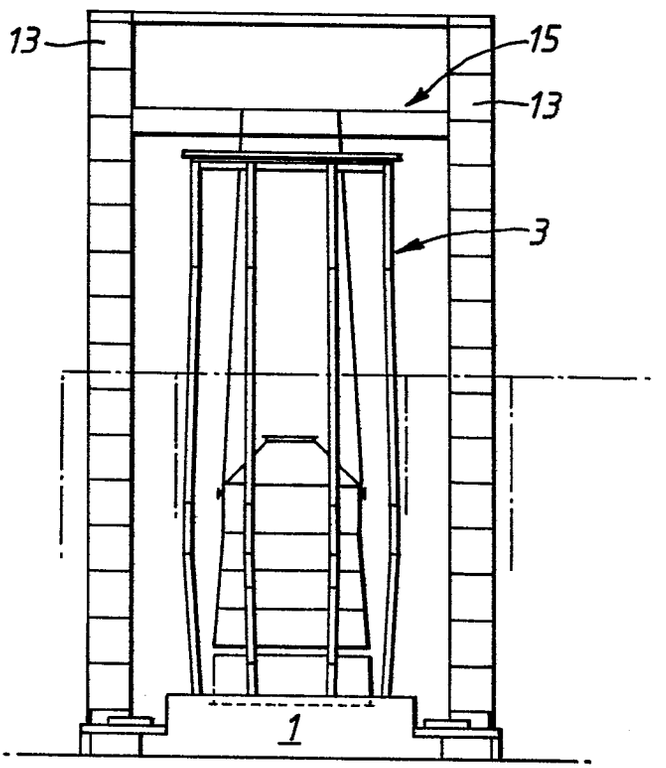

FIG. 2.

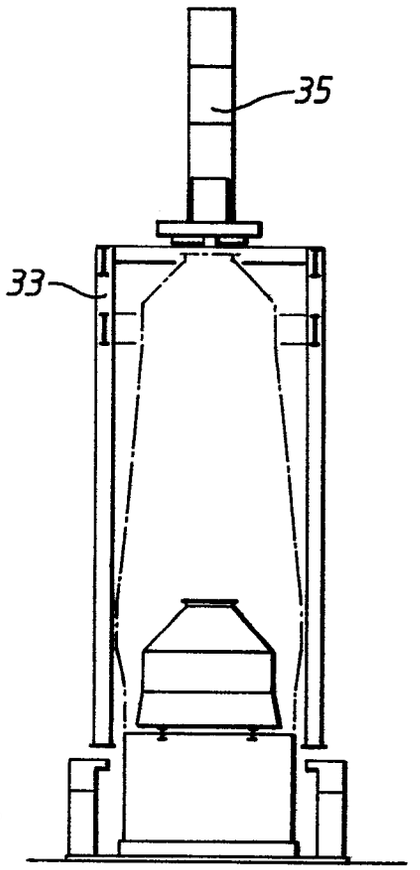

FIG. 3.

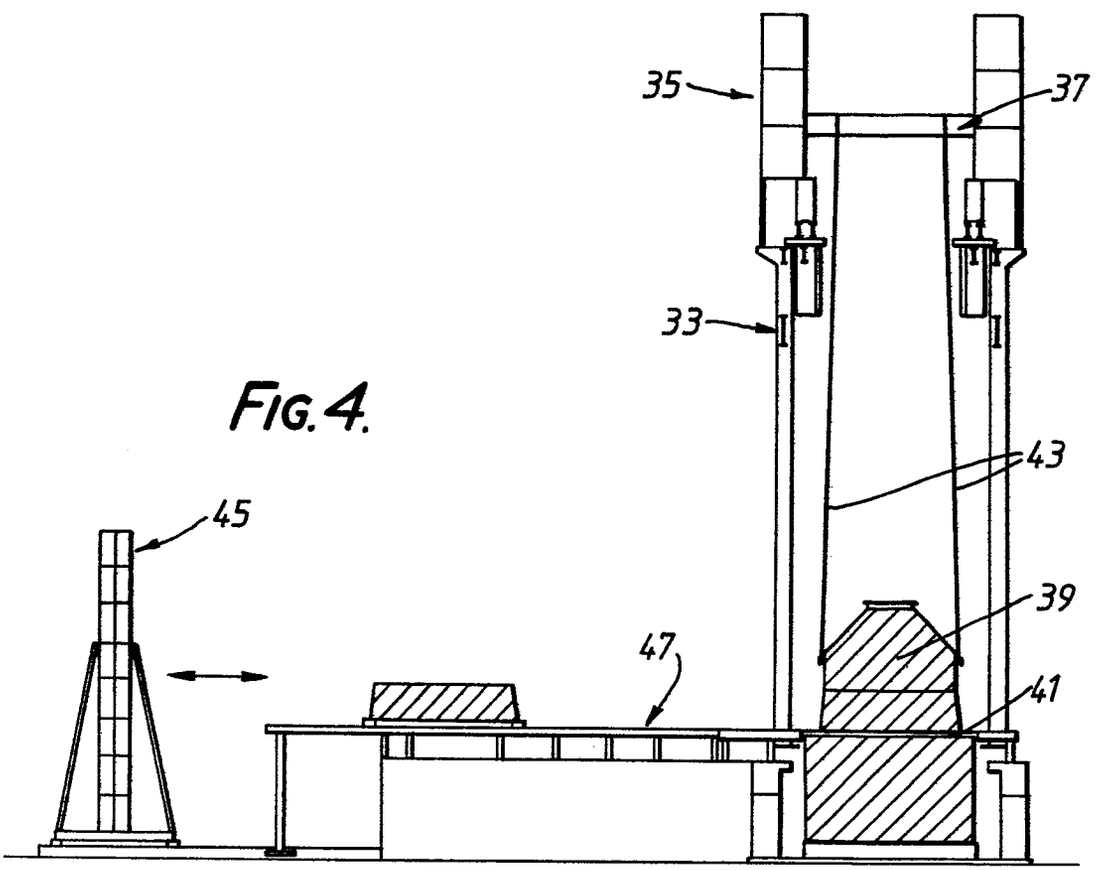

FIG. 4.

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EUROPEAN SEARCH REPORT

Application number

EP 85 30 7655

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-A-2 326 471 (SANKYO INC.) * Figures 1-33; claims 1-3; pages 8,9 *	1-5	C 21 B 7/00
A	PATENTS ABSTRACTS OF JAPAN, vol. 1, no. 91, 24th August 1977, page 1966 C 77; & JP - A - 52 52 808 (ISHIKAWAJIMA HARIMA JUKOGYO K.K.) 28-04-1977 * Abstract *	1-5	
A	PATENTS ABSTRACTS OF JAPAN, vol. 3, no. 79 (C-51), 6th July 1979, page 162 C 51; & JP - A - 54 57 408 (ISHIKAWAJIMA HARIMA JUKOGYO K.K.) 05-09-1979 * Abstract *	1-5	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	PATENTS ABSTRACTS OF JAPAN, vol. 2, no. 122, 13th October 1978, page 2445 C 78; & JP - A - 53 87 906 (SHIN NIPPON SEITETSU K.K.) 08-02-1978 * Abstract *	1-5	C 21 B
A	PATENTS ABSTRACTS OF JAPAN, vol. 2, no. 122, 13th October 1978, page 2445 C 78; & JP - A - 53 87 907 (SHIN NIPPON SEITETSU K.K.) 08-02-1978 * Abstract *	1-5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-03-1986	ELSEN D.B.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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