United States Patent [19]

Stockinger

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[54] **METHOD OF PROTECTING BUTT JOINTS OF PLATE MOLDS FOR CONTINUOUS CASTING**

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[21] Appl. No.: **127,838**

[30] **Foreign Application Priority Data**

Mar. 26, 1970 Sweden 4596/70

[52] **U.S. Cl.** **164/14,** 164/82

[51] **Int. Cl.** **B22d 11/02**

[58] **Field of Search** ..... 164/14, 73, 121, 164/268, 273 R, 280, 82; 249/82, 114

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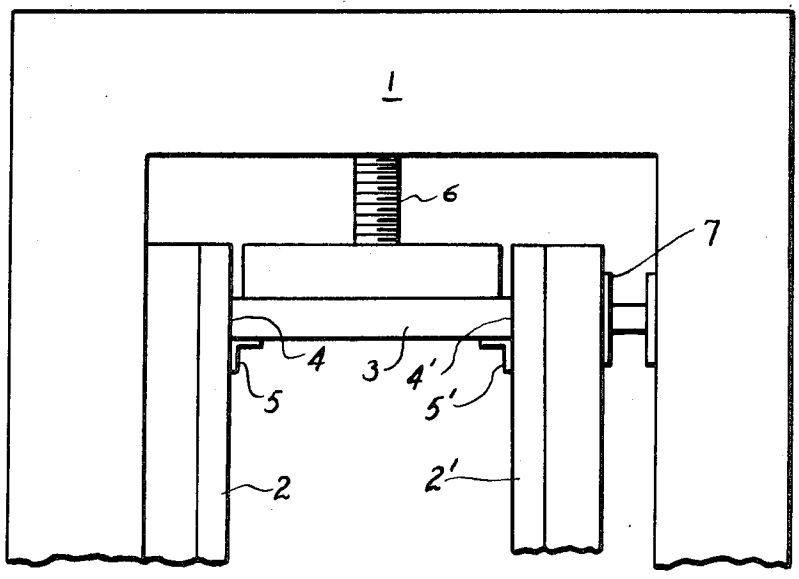
Primary Examiner—R. Spencer Annear

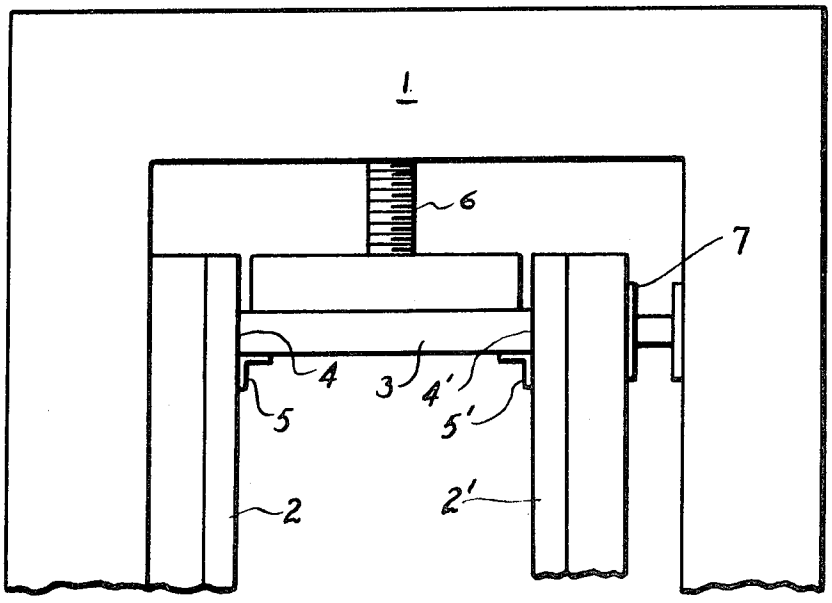
Attorney—Sandoe, Neill, Schottler & Wikstrom

[57] **ABSTRACT**

In a plate mold for continuous casting the gaps which may be formed at the butt joints between the longitudinal and transverse mold walls due to thermal expansion are sealed by covering the joints and the areas of the mold walls immediately adjacent the joints with a thin layer of protective material.

5 Claims, 1 Drawing Figure




1
6
7
4
3
4'
5
5'
2
2'

METHOD OF PROTECTING BUTT JOINTS OF PLATE MOLDS FOR CONTINUOUS CASTING

This invention relates to a method of covering and protecting the butt joints of plate molds used for continuous casting.

The mold cavity of such molds is enclosed by longitudinal and transverse plates, preferably made of copper. The transverse plates are usually clamped between the longitudinal plates and butt joints are formed between the side edges of the transverse mold walls and the surfaces of the longitudinal mold walls. Butt joints are also formed when the mold plates themselves are subdivided.

During casting with such molds differential thermal expansion of the copper plates may result in the formation of gaps at the butt joints between the copper plates. When this occurs, freshly poured metal may penetrate into these gaps and solidify therein, and the solidified shell of the continuous casting that is in the course of being formed may be damaged. This may lead to a metal breakout.

Furthermore, when a mold is being filled with molten metal at the beginning of the casting operation the rising level of the molten metal may cause a temporary differential thermal expansion of the mold walls which forms temporary gaps at the butt joints. These temporary gaps will tend to close after molten metal in the mold has reached its intended level and has thereby restored thermal equilibrium in the mold. Meanwhile, however, the penetration of molten metal into such temporary gaps is particularly undesirable because it prevents these gaps from closing when thermal equilibrium is restored.

It is known in the prior art to fill existing gaps at the butt joints of plate molds for the continuous casting of steel with plastic material. However, this procedure can be applied only after some castings have already been completed and after gaps have been formed which are visible at the butt joints. Furthermore, the location of gaps which do not form until after the mold is being filled with molten metal cannot be predicted, and such gaps cannot be protected by this method against the entry of molten metal. Moreover, use of this conventional method is likely to cause additional distortion of the mold walls and further enlargement of the gap due to thermal expansion of residues or incrustations of the plastic material in the gap. Such increase in the size of the gaps increases the wear on the mold plates and requires their replacement after a relatively short casting time.

Such conventional methods seek to repair damage which has occurred. It is the object of the present invention to provide a method of preventing such damage from occurring. This is done by preventing molten metal from entering into gaps that are likely to open up during continuous casting at the butt joints of plate molds by covering those joints which face the mold cavity with a thin layer of protective material before the pouring of metal begins.

This thin layer does not penetrate into the joint or gap as in the conventional method, but covers the joint, extending lengthwise thereof, and also covers a narrow area of the surface of each abutting mold plate immediately adjacent the joint.

This method prevents damage to the frozen shell of the solidifying casting and greatly reduces wear on mold plates. Thereby it increases the number of heats that can be cast in one mold before replacement or repair becomes necessary.

These thin covering layers may consist of various materials and may be applied in different ways. For instance, the regions immediately adjacent the butt joints can be coated with a liquid material such as a lacquer or varnish having high surface tension to prevent it from penetrating between the abutting surfaces. The liquid material should harden quickly to permit a rapid sequence of castings, and it must also retain a certain degree of flexibility after it has hardened. Suitable liquid materials of this nature are generally known as, for example, cellulose ester varnishes, or ZAPON-varnishes or two-component synthetic resin varnishes. The liquid material may be applied with a brush and may cover the butt joint between two mold plates and a strip of about 1 cm wide on the surfaces adjacent each side of the joint.

Alternatively an adhesive tape may be used as the protective material which covers the joint. Such tapes are very easy to handle and the joints can be covered with them cleanly and quickly with a minimum of work. Such tapes are preferably about 2 cms wide. They cover the joint over the full length of the joint and adhere to the surfaces of the walls immediately adjacent the joint. Such tapes may consist for instance of a high-melting-point alloy provided with an adhesive coating.

However, adhesive tape which is burned or melted away by the rising level of molten metal when the mold is first filled may also be used. Such a tape could be made of synthetic material. When using such tapes, splashing metal is kept away from any existing gaps by the tape. As the level of the metal pool in the mold rises, particularly when casting steel, local thermal expansion of the mold walls which may be caused thereby tends to temporarily close such existing gaps. However, since both the steel and any other material are also prevented from entering such gaps they can be closed without causing distortion of the mold plates. The tape which adheres to the water-cooled copper plates carbonizes slowly below the level of molten metal, and provides sufficient time for thermal equilibrium to be restored and for the formation of an adequately thick frozen shell on the casting. The plastic tape which is located above the level of molten metal in the mold does not burn because of the cooling effect of the mold plates and it therefore continues to provide protection against splashing metal as casting continues.

Instead of combustible tape a metal tape may be used which is melted by the rising level of molten metal in the mold. Such combustible or meltable tapes do not decrease the heat transfer from the casting to the mold plates.

In new molds in which the joints are fitted tightly the thin protective layer ensures that gaps which may open due to temporary thermal expansion when the mold is being filled with molten metal are kept free of metal so that they can reclose after the molten metal has risen to the desired level.

However, it is also feasible to replace the adhesive tapes by stretching a strip-shaped metal foil over the joints which neither burns nor melts.

A preferred embodiment of the invention is shown in the accompanying drawing in which the single FIGURE is a plan view of one end of a typical plate mold.

Referring to the drawing, the mold comprises a rectangular mold frame **1**, within which are mounted parallel longitudinal mold plates **2, 2'** which are spaced apart by transverse mold plates **3**, only one of which is shown. As shown, the end surfaces of the transverse plates **3** abut the surfaces of the longitudinal plates **2, 2'** to form butt joints **4, 4'**. These joints are each protected as previously described by a layer of protective material **5, 5'** such as a layer of varnish or adhesive tape which covers the joint and extends lengthwise of the joint and extends laterally over an area of the surface of each abutting mold plate immediately adjacent the joint. In such molds it is conventional to provide means such as screw **6** to adjust the transverse plate **3**, and the pressure foot **7** to apply pressure to hold the transverse plate **3** between the lontidudinal plates **2, 2'**.

I claim as my invention:

1. The method of protecting a butt joint of a plate mold having longitudinal and transverse abutting mold plates used for continuous casting which comprises covering the joint before beginning the pouring of metal into the mold with a layer of protective material having a thickness not substantially in excess of that of a metal foil, said layer extending lengthwise of the joint and covering the joint and extending laterally over an area of the surface of each abutting mold plate immediately adjacent the joint.

2. The method of claim **1** in which the joint is covered by an adhesive tape which adheres to the surface of each abutting mold plate immediately adjacent the joint.

3. The method of claim **2** in which the adhesive tape burns or melts away in the regions covered by molten metal as the mold is filled.

4. The method of claim **2** in which the adhesive tape consist of a high-melting-point alloy.

5. The method of claim **1** in which the joint is covered by a liquid material having a surface tension sufficient to prevent penetration into the joint.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,736,977 Dated June 5, 1973

Inventor(s) Walter Stockinger

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page, item "[30]", cancel "Sweden" and insert --Switzerland--.

Signed and sealed this 7th day of May 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.