Sept. 26, 1967 R. J. DAIN 3,343,594

MULTIPLE BILLET CONTINUOUS CASTING MOLD

Filed Aug. 25, 1965 3 Sheets-Sheet 1

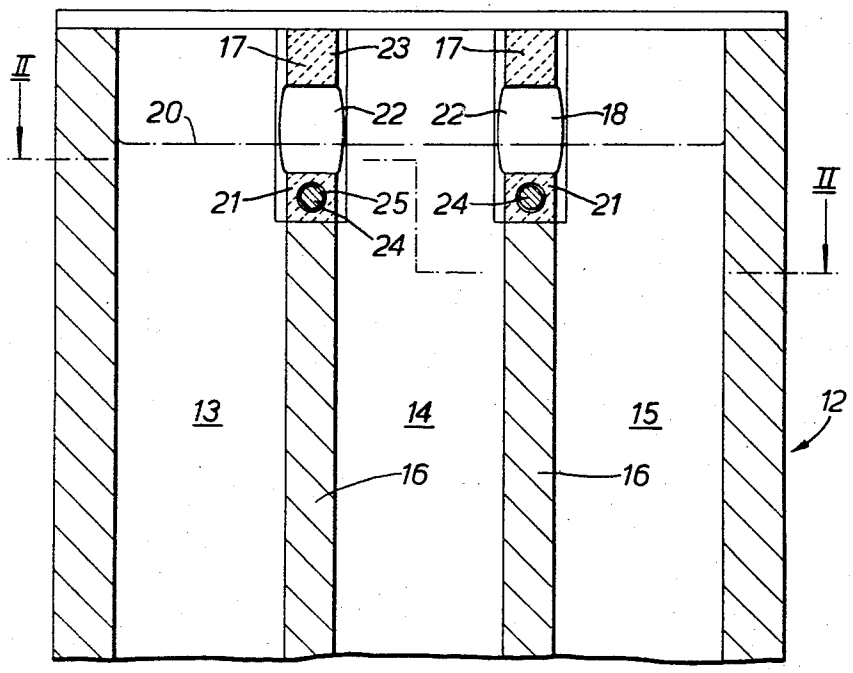


FIG. 1.

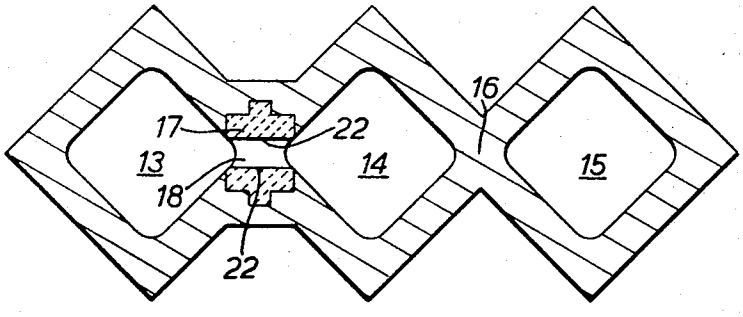


FIG. 2.

INVENTOR
A. J. Dain
BY
Holcomb, Wetherill & Brisebois
ATTORNEY

MULTIPLE BILLET CONTINUOUS CASTING MOLD

Filed Aug. 25, 1965 3 Sheets-Sheet 2

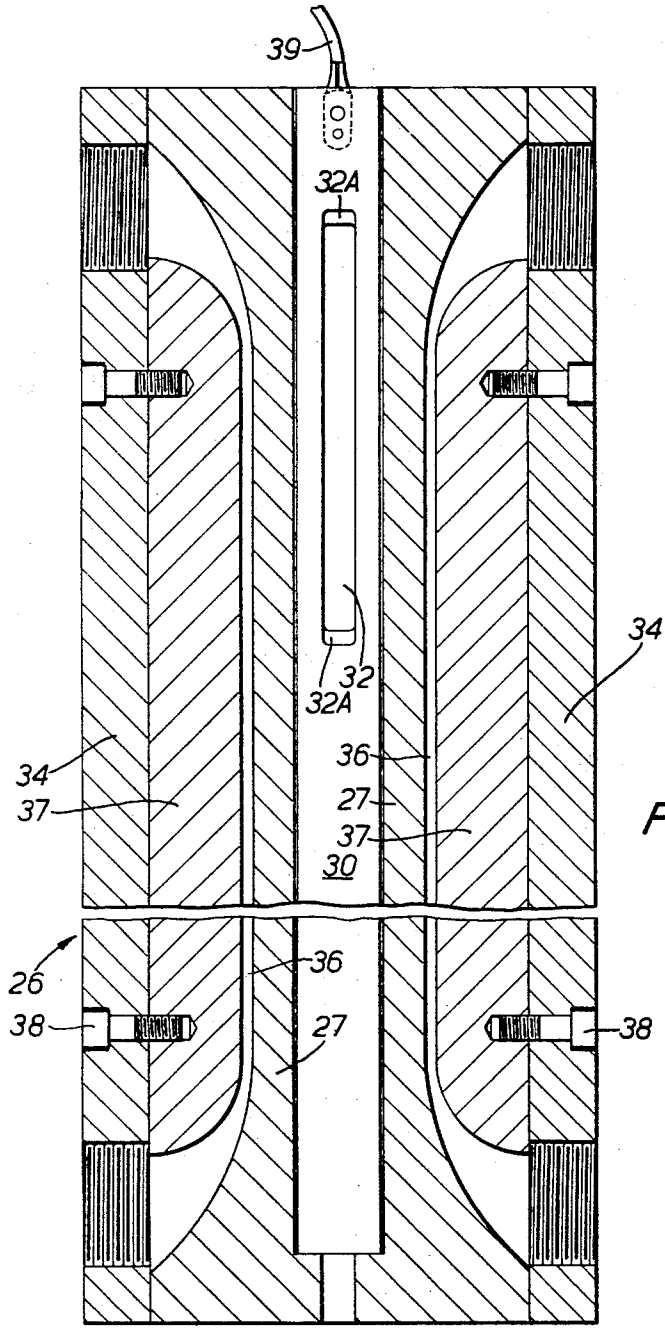


FIG. 3.

INVENTOR
R. J. Dain

BY
Holcomb, Dethmers & Bruchis

ATTORNEY

Sept. 26, 1967 R. J. DAIN 3,343,594

MULTIPLE BILLET CONTINUOUS CASTING MOLD

Filed Aug. 25, 1965 3 Sheets-Sheet 3

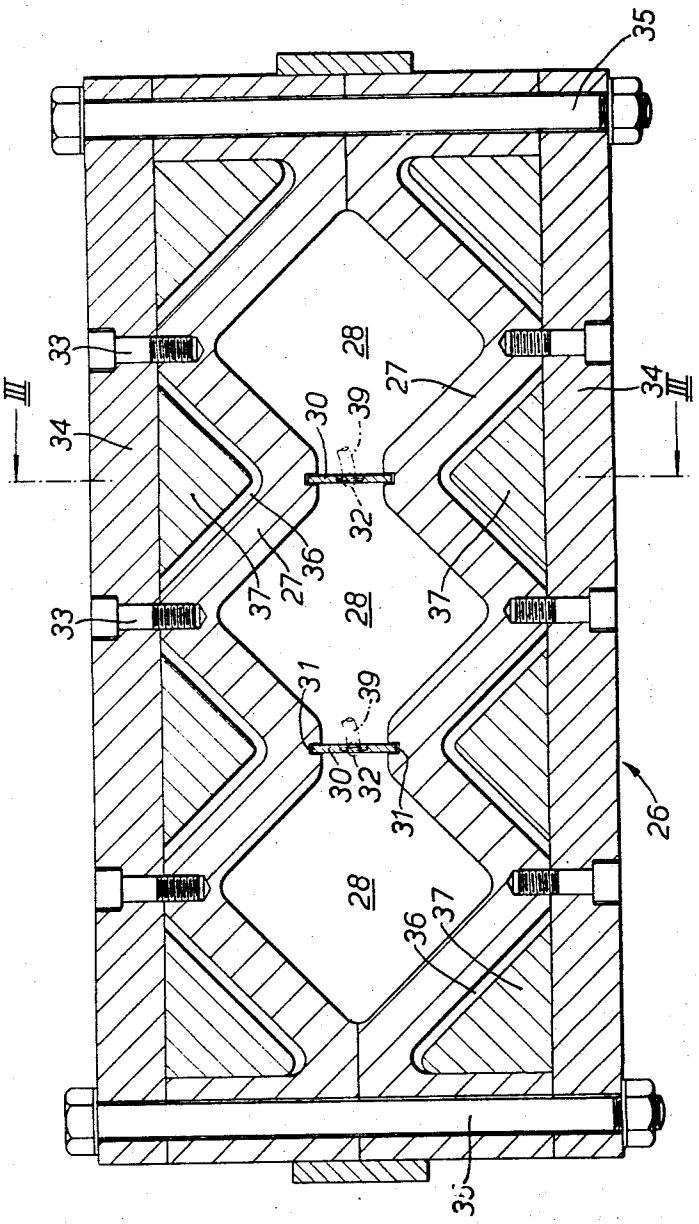


FIG. 4.

INVENTOR
R. J. Dain
BY
Holcombe, Wetherill & Brisebois
ATTORNEY

United States Patent Office 3,343,594 Patented Sept. 26, 1967

3,343,594

MULTIPLE BILLET CONTINUOUS CASTING MOLD

Richard James Dain, Tonbridge, England, assignor to Davy and United Engineering Company Limited, Sheffield, England

Filed Aug. 25, 1965, Ser. No. 482,377
Claims priority, application Great Britain, Aug. 31, 1964, 35,501/64
7 Claims. (Cl. 164—281)

ABSTRACT OF THE DISCLOSURE

A mould having a plurality of adjacent mould channels separated by partitions, each partition defining a connecting passage at the level of the meniscus of molten metal during casting whereby metal poured into one channel can flow through the connecting passage into an adjacent channel.

This invention relates to an open ended mould for continuous casting of metals and in particular to a mould having a plurality of adjacent cooled mould channels for producing at the same time a plurality of cast blocks. In multiple strand casting, the rates at which metal is delivered to each mould channel must be equal to balance the withdrawal rates of the cast blocks. It has been previously suggested, for example in British patent specification No. 820,582, to make a continuous casting mould in which the mould has a plurality of cooled mould channels, into which molten metal is poured directly, preferably into only one of the channels, and adjacent channels being connected throughout the length of the mould by passages of reduced width compared with the mould channels, so that adjacent issuing blocks are connected by a web, which must then be slit. This has overcome the difficulty of balancing the withdrawal rates of the cast product and reduced the number of operators necessary, but there is a certain expense involved in slitting the webs to separate the ingots.

The present invention comprises a reciprocable open ended mould formed from high heat conductivity material and having a plurality of adjacent mould channels the walls of which are adapted to be cooled, each channel being separated from the adjacent channel or channels by a partition or partitions, the cross-section of the mould being substantially the same at the end into which molten metal is poured as at the end from which the cast strands are withdrawn, the or each partition defining a connecting passage at the level of the meniscus of molten metal during casting whereby metal poured into one channel can flow through the connecting passage into an adjacent channel, at least the portion of the or each partition around a passage being formed of refractory or graphitic material, and heating means arranged to heat the portion of the or each partition around the passage.

Embodiments of continuous casting mould, in accordance with the invention, will now be described, by way of example only, with reference to the accompanying drawings of which:

FIGURE 1 is a vertical axial section through a first embodiment of mould,

FIGURE 2 is a section on the line II—II of FIGURE 1,

FIGURE 3 is a vertical section on the line III—III of FIGURE 4 through a second embodiment of mould,

FIGURE 4 is a horizontal section through the mould of FIGURE 3.

Referring first to FIGURES 1 and 2, the mould **12**, which is intended for casting of metals, is made of a high

heat conductivity material such as copper or copper alloy or steel. The mould is formed with three adjacent mould channels **13**, **14** and **15**, separated from each other by partitions **16**, integral with the outer walls of the mould, and extending over the whole length of the mould except at the top. A removable window insert **17**, formed of refractory material, graphite or a graphitic substance, is located at the top of each partition to form an upward continuation of the partition and part of the side walls of the mould. Each insert **17** has a window **18** formed therein which provides a passage between adjacent mould channels at the level of the meniscus **20** of molten metal during casting, whereby metal can flow from the channel to the other above the level of the base **21** of the insert. The base **21** of each insert covers its associated conducting partition and prevents metal freezing onto the top of that partition, while the sides **22** of the insert prevent metal freezing onto the sides of the mould above the conducting partition. The base of each insert should be located so that the meniscus never falls below the refractory insert except during start up while the sides should project upwards for a sufficient distance that the meniscus never rises higher than the level of the insert. The top **23** of the insert is merely provided for strength. Each insert is removable and is replaceable since it will tend to wear away due to flow of metal through the window **18**. An electric heater element or electric induction coil **24** is located in a passage **25** in the base **21** of each insert to assist in the prevention of metal solidification in the interconnecting passages **18**. Such heating may also be provided in the side walls **22**. Each partition may be provided with 1 to 10 kw. electrical energy and preferably about 3 kw. energy.

It will be realised that the outer walls of the mould are continuously cooled during operation and that the mould is reciprocated by means conventional in the art.

The mould **26** shown in FIGURES 3 and 4 is formed from outer walls **27**, formed from high heat conductivity material, defining three adjacent mould channels **28**, separated from one another along substantially the whole length of the mould by partitions **30** which are made of refractory material, graphite or a graphitic substance. Each partition **30** is located in slots **31** in the walls **27** so that it can be easily removed from and replaced in the mould. The upper part of each partition **30** defines a passage **32** connecting adjacent channels **28** at the level of the meniscus of molten metal during casting. The upper and lower edges **33** of each passage are chamfered.

The outer walls **27** are formed in two parts each secured by bolts **33** to a backing plate **34** along the major dimension of the mould, the parts of the walls **27** and the backing plates **34** being bolted together by bolts **35**. Passages **36** for circulation of cooling water are provided between the outside of walls **27**, the backing plates **34** and triangular inserts **37** bolted by bolts **38** to the inside of the backing plates. An electric cable **39** is connected to the top of each partition to supply around 4 kw. energy to prevent metal freezing onto the web. A ground wire is connected to the mould wall **27**.

In operation, molten metal is poured into the top of the mould, preferably only into one channel, and flows through the passages **32** to equalise the levels in the channels, electrical heating is applied to the webs **30**, cooling water is circulated in the passages **36** and the mould is reciprocated by means conventional in the art.

I claim:

1. A reciprocable open ended mould formed from high heat conductivity material and having at least two mould channels the walls of which are adapted to be cooled, the cross section of the mould being substantially the same at the end into which molten metal is poured as at the end from which the cast strands are withdrawn, each two adjacent channels being separated by a partition de-

fining a connecting passage at the level of the meniscus of molten metal during casting whereby metal poured into one channel can flow through the passage into an adjacent channel, at least the portion of each partition around a passage being formed of refractory or graphitic material, and heating means arranged to heat the portion of each partition around the passage.

2. A mould according to claim 1 in which the top of each partition is formed as a separate removable insert of refractory or graphitic material having the passage therethrough, the bottom of each partition being integral with the outer walls of the mould.

3. A mould according to claim 1 in which each partition extends substantially the whole length of the mould, is formed from refractory or graphitic material and is removable from and replaceable in the mould.

4. A mould according to claim 3 in which the heating means comprises means for connecting an electrical voltage to each partition.

5. A mould according to claim 1 in which each heating means comprises an electric heating element passing through at least the portion of its partition below the passage.

6. A mould according to claim 1 in which each heating means comprises means for applying a voltage across a partition to pass a current through the partition.

7. A mould according to claim 1 in which each heating means is arranged to supply between 1 and 10 kw. energy, preferably between 3 and 5 kw. energy.

References Cited

UNITED STATES PATENTS

2,878,537	3/1959	Brennan	22—57.2

FOREIGN PATENTS

1,080,427	6/1954	France.
1,339,997	9/1963	France.
1,385,304	11/1964	France.
121,913	1959	Russia.

J. SPENCER OVERHOLSER, *Primary Examiner.*

R. S. ANNEAR, *Assistant Examiner.*