Oct. 31, 1967 E. MÜLLER 3,349,835

CONTINUOUS HORIZONTAL STRIP-CASTING APPARATUS

Filed May 13, 1965 3 Sheets-Sheet 1

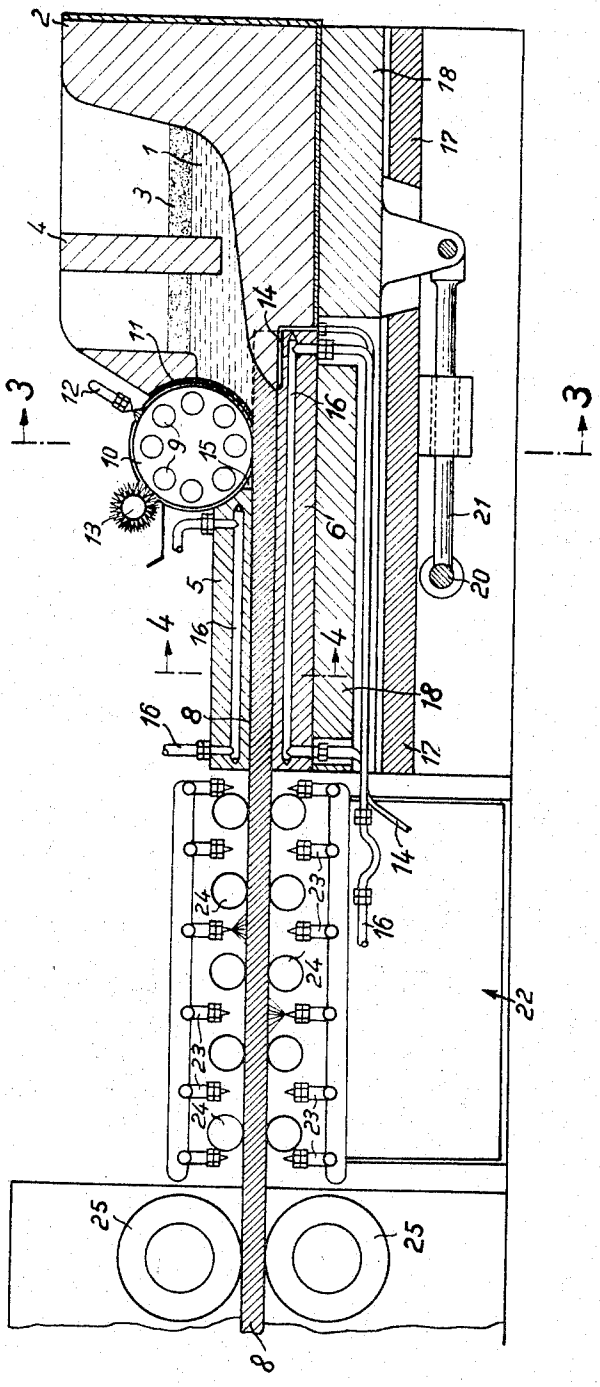


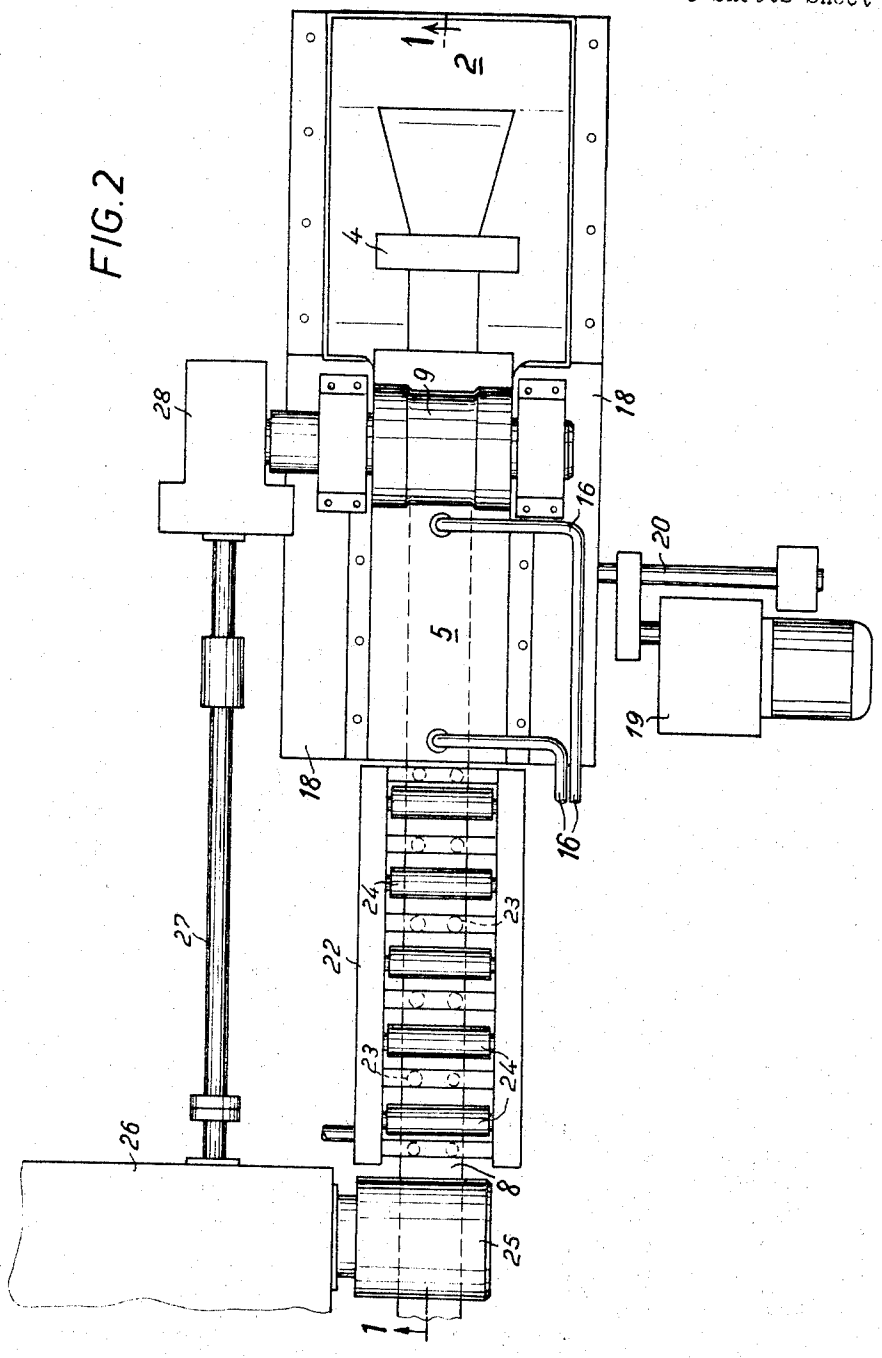
FIG. 1

Oct. 31, 1967 E. MÜLLER 3,349,835

CONTINUOUS HORIZONTAL STRIP-CASTING APPARATUS

Filed May 13, 1965 3 Sheets-Sheet 2

FIG. 2



Oct. 31, 1967 E. MÜLLER 3,349,835
CONTINUOUS HORIZONTAL STRIP-CASTING APPARATUS
Filed May 13, 1965 3 Sheets-Sheet 3

FIG. 3

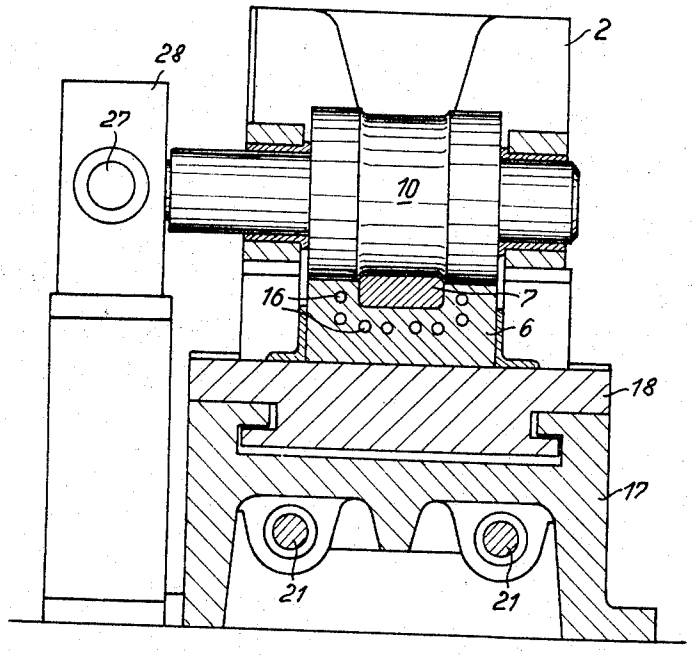
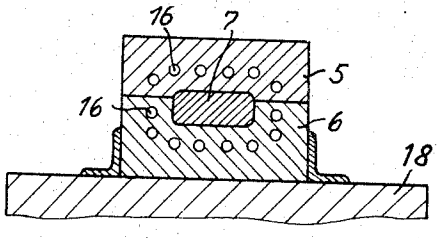


FIG. 4



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CONTINUOUS HORIZONTAL STRIP-CASTING APPARATUS

Erich Müller, Essen, Germany, assignor to Beteiligungs- und Patentverwaltungsgesellschaft mit Beschrankter Haftung, Essen, Germany, a corporation of Germany

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ABSTRACT OF THE DISCLOSURE

A strip-casting apparatus for casting of metals, which comprises a stationary frame and a substantially horizontal reciprocable continuous mold having an upper part and a lower part. The latter has a form complementary to the profile of the metal strip to be cast. An inlet funnel is disposed adjacent the mold and is adapted to feed liquid metal into the mold. The lower part of the mold extends to a lower part of the funnel. The mold has cooling conduits extending therethrough. A rotatable metal feeding roll is disposed above the lower part of the mold and has a plurality of cooling conduits. The surface of the metal feeding roll is formed complementary to the profile of the metal strip to be cast.

The present invention relates to a continuous strip-casting apparatus for casting of metal.

The known strip-casting apparatus is operated generally by means of vertically disposed molds. Depending upon the congealing or solidification conditions to which the metal to be cast has to be subjected, such arrangement requires often considerable structural heights, which require corresponding tall buildings. In order to avoid these structural heights, such arrangements have already been built into deep pits.

During strip casting of steel, wherein the structural height is much larger than during the working with other metals, caused by the long liquid funnel, it is also known already to bend over the cast strips into the horizontal direction under the transport rolls, an expedient which is possible due to the then still prevailing strip temperature.

Furthermore, an installation is known for the manufacture of metal bands, e.g. a copper band, in which installation the metal is crystallized onto a cooled rotating drum immersed into a liquid metal bath. It is, however, not possible to produce other semi-finished products as bands.

It is one object of the present invention to provide a strip-casting apparatus which avoids the drawbacks of the known structures.

It is another object of the present invention to provide a strip-casting apparatus for casting of metals, which is of a horizontal arrangement.

It is a further object of the present invention to provide a strip-casting apparatus, wherein the lower part of the mold, equipped with cooling conduits, extends up to the lower part of an inlet funnel and a metal feeding roller, provided with cooling conduits, is disposed in front of the shorter, upper part of the mold, which is formed according to the profile of the metal strip to be cast, the surface of the metal feeding roller being formed likewise according to the metal strip to be cast.

It is yet another object of the present invention to provide a strip-casting apparatus, wherein a packing of refractory, plastic and metal repelling mass is provided between the inlet funnel, the advanced lower part of the mold and the metal feeding roller, in order to protect

the metal feeding roller in front of the liquid metal and in the advanced lower part of the mold.

It is still another object of the present invention to provide a strip-casting apparatus which includes a brush arranged on the upper part of the periphery of the metal feeding roller adapted for the cleaning of the surface of the metal feeding roller and which provides simultaneously a spraying device for the application of the mold lubricant, while a feed conduit for the mold conduit is arranged in the advanced lower part of the mold.

It is also a further object of the present invention to provide a strip-casting apparatus which includes a lifter formed according to the profile of the metal strip between the metal strip and the metal feeding roller at the upper part of the mold, in order to prevent the surface of the metal strip, which surface is only thinly solidified due to the cooling effect of the cooled metal feeding roller, being broken up again by the metal feeding roller.

It is of advantage to provide a joint drive for the transport roller and the metal feeding roller, in order to obtain a synchronous rotational speed for both rollers. It is possible, however, to provide individual drives for the transport roller and for the metal feeding roller, and the synchronous rotational speed can be achieved by means of a common electrical control means.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is a longitudinal sectional view of a horizontal strip-casting apparatus according to the present invention along the lines **1—1** of FIG. 2;

FIG. 2 is a top plan view of the apparatus disclosed in FIG. 1;

FIG. 3 is a section along the lines **3—3** of FIG. 1; and

FIG. 4 is a fragmentary section along the lines **4—4** of FIG. 1.

Referring now to the drawings, the strip-casting apparatus comprises an inlet funnel **2** over which the liquid metal **1** is fed by means of a ladle (not shown) or by means of a teeming furnace in a free fall over a pouring device or over a direct connection (not shown) into the apparatus, which liquid metal **1** is covered by a protective mass **3**, in order to prevent oxidation. A skimmer **4** prevents that slag or oxides enter in an unwarranted manner the liquid metal **1**.

The mold, consisting of two parts **5** and **6**, which are rigidly connected together and which perform a reciprocating movement during the casting, is set-off in its upper part **5** at the entrance point for the liquid metal **1** corresponding to the profile of the metal feeding roll **10** over the upper part **5** of the mold, while the lower part **6** constituting the inlet part, is advanced to the inlet funnel **2**. The inlet funnel **2**, as well as the metal feeding roll **10**, perform the reciprocating movements of the mold during the casting by using any conventional means therefor.

The upper part **5** of the mold is, however, set-off along the center line of the profile, in case of the use of round cross-sections. The metal feeding roll **10**, equipped with cooling tubes **9**, is arranged in front of the set-off upper part **5** of the mold, which metal feeding roll **10** is formed according to the profile **7** of the metal strip **8**. The metal feeding roll **10** engages at its lower engaging point the surface of the metal strip **8**, rotates in the direction of movement of the latter and drives forwardly the latter in this manner.

The metal feeding roll **10** is sealed off toward the liquid metal **1** in the inlet funnel **2**, as well as in the advanced lower part **6** of the mold by means of a packing **11** made of a refractory, metal-repelling plastic mass. The mold lubricant, required for the sliding of the metal strip **8**

in the mold, is fed for the upper part of the metal strip **8** by means of a spraying device **12** to the metal feeding roll **10**, which is cleaned by a rotating brush **13**, and reaches with the latter the surface of the metal strip **8**. The mold lubricant for the lower part of the metal strip **8** is fed into the mold by means of a feeding conduit **14** terminating in the advanced part **6** of the mold.

In order to prevent the surface of the metal strip **8**, which is only thinly solidified, due to the cooling effect of the cooled metal feeding roll **10**, being broken up again by the metal feeding roll **10**, a lifter **15** is provided on the set-off edge of the upper part **5** of the mold.

The mold which is cooled by a coolant fed through conduits **16**, is secured to a lifting slide **18** mounted in the machine frame **17**, which lifting slide **18** is driven by a controllable drive **19** by means of the drive shaft **20** and the push- and connecting rods **21**.

The metal strip **8**, which is on the outside already completely solidified, moves from the indirect cooling zone in the mold into a zone **22** providing direct cooling by means of spraying nozzles **23**, by which the coolant is sprayed on, where the metal strip **8** is completely solidified and is maintained by non-driven support rolls **24** still in horizontal position.

Transport rolls **25**, which have the same rotational speed as the metal feeding roll **10**, caused by a common drive **26** or also by individual, yet common electrically controlled drives, move the metal strip **8** in dependency upon the profile **7** of the metal strip **8**, the type of metal cast and the casting speed from the mold to the further working stations.

In the joint drive **26** of the transport rolls **25** and of the metal feeding roll **10**, the drive of the metal feeding roll **10** takes place over the drive shaft **27** and any suitable transmission **28**.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A strip-casting apparatus for casting of metals, comprising

a stationary frame,

a substantially horizontal reciprocable continuous mold having an upper part and a lower part, said upper part being shorter than said lower part,

said lower part and said upper part of said mold having a form complementary to the profile of the metal-strip to be cast,

an inlet funnel disposed adjacent said mold and adapted to feed liquid metal into said mold,

said lower part of said mold extending to a lower part of said inlet funnel,

said mold having cooling conduits extending therethrough, a rotatable metal feeding roll disposed between said upper mold part and said inlet formed above said lower part of said mold,

said metal feeding roll having a plurality of cooling conduits,

the surface of said metal feeding roll being formed complementary to the profile of said metal strip to be cast, and means for performing a reciprocating movement of said mold, funnel and feeding roll.

2. The strip-casting apparatus, as set forth in claim **1**, which includes

packing means disposed between said inlet funnel, the advanced end portion of said lower part of said mold and said metal feeding roll.

3. The strip-casting apparatus, as set forth in claim **2**, in which

said packing means comprises a refractory, plastic, metal-repelling mass.

4. The strip-casting apparatus, as set forth in claim **1**, which includes

spraying means disposed adjacent said metal feeding roll adapted for applying a lubricant to the outer surface of said metal feeding roll.

5. The strip-casting apparatus, as set forth in claim **4**, which includes

feed means connected to said lower part of said mold for applying a lubricant thereto.

6. The strip-casting apparatus, as set forth in claim **1**, which includes

brush means disposed at the upper part of the periphery of said metal feeding roll adapted for cleaning the surface of said metal feeding roll.

7. The strip-casting apparatus, as set forth in claim **1**, which includes

lifting means disposed at the set-off edge of said upper part of said mold between said strip and said metal feeding roll,

said lifting means having a form complementary to the profile of said metal strip to be cast.

8. The strip-casting apparatus, as set forth in claim **1**, which comprises

direct cooling means for said metal strip to be cast disposed behind said mold and including spray nozzles for a coolant surrounding said metal strip and at least one pair of supporting roll means engaging said metal strip.

9. The strip-casting apparatus, as set forth in claim **8**, which includes

at least a pair of transport rolls behind said direct cooling means for discharging said strip from said apparatus.

10. The strip-casting apparatus, as set forth in claim **9**, which comprises

common drive means for rotating said metal feeding roll and said transport rolls at substantially synchronous speeds.

11. The strip-casting apparatus, as set forth in claim **10**, in which

said drive means includes a drive for said transport rolls and transmission means between said drive and said metal feeding roll, for rotating the latter.

12. The strip-casting apparatus, as set forth in claim **1**, which comprises

a slide reciprocable on said frame, and acted upon by said reciprocating means, and carrying said mold thereon.

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J. SPENCER OVERHOLSER, *Primary Examiner.*

R. D. BALDWIN, *Assistant Examiner.*