



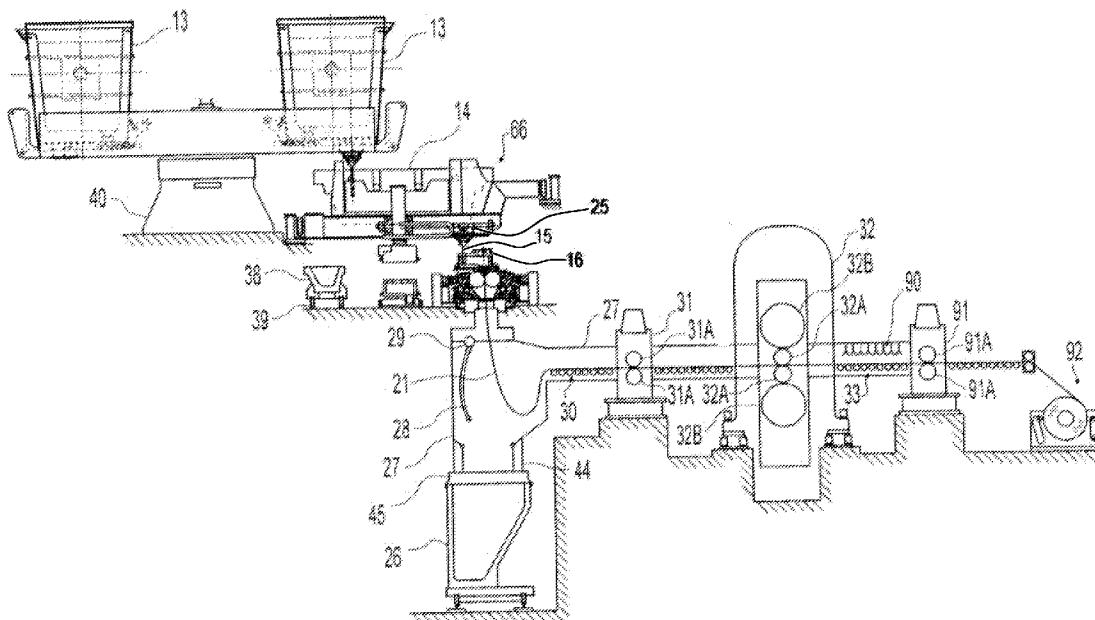
US 20140367065A1

(19) **United States**(12) **Patent Application Publication**
MCQUILLIS et al.(10) **Pub. No.: US 2014/0367065 A1**(43) **Pub. Date: Dec. 18, 2014**(54) **THIN ROLL STRIP CASTER AND METHOD OF OPERATING THE SAME**(71) Applicant: **NUCOR CORPORATION**, Charlotte, NC (US)(72) Inventors: **Gary MCQUILLIS**, Blytheville, AR (US); **William M. KOVAL**, Surprise, AZ (US)(73) Assignee: **NUCOR CORPORATION**, Charlotte, NC (US)(21) Appl. No.: **13/918,005**(22) Filed: **Jun. 14, 2013****Publication Classification**(51) **Int. Cl.**
B22D 11/16 (2006.01)
B22D 11/06 (2006.01)(52) **U.S. Cl.**CPC **B22D 11/168** (2013.01); **B22D 11/0622** (2013.01); **B22D 11/0637** (2013.01)USPC **164/451**; 164/463; 164/428; 164/151.2; 164/154.5; 164/150.1

(57)

ABSTRACT

A method of casting a thin strip is disclosed. The method includes assembling a pair of side dams adjacent end portions of counter-rotating casting rolls through which a strip of metal can be cast to permit a casting pool of molten metal to be formed supported by the casting surfaces of the casting rolls, assembling a metal delivery system above the casting rolls delivering molten metal to form a casting pool supported on the casting surfaces of the casting rolls above the nip and confined by the pair of side dams, assembling a mechanical screw drive to move axially the side dams toward the casting pool, counter-rotating the casting rolls such that the casting surfaces of the casting rolls each travel inwardly to produce a cast strip downwardly from the nip, and moving the side dams axially inward toward the casting pool at a rate of between 0.4 and 5.0 mm/hour by actuation of the mechanical screw.



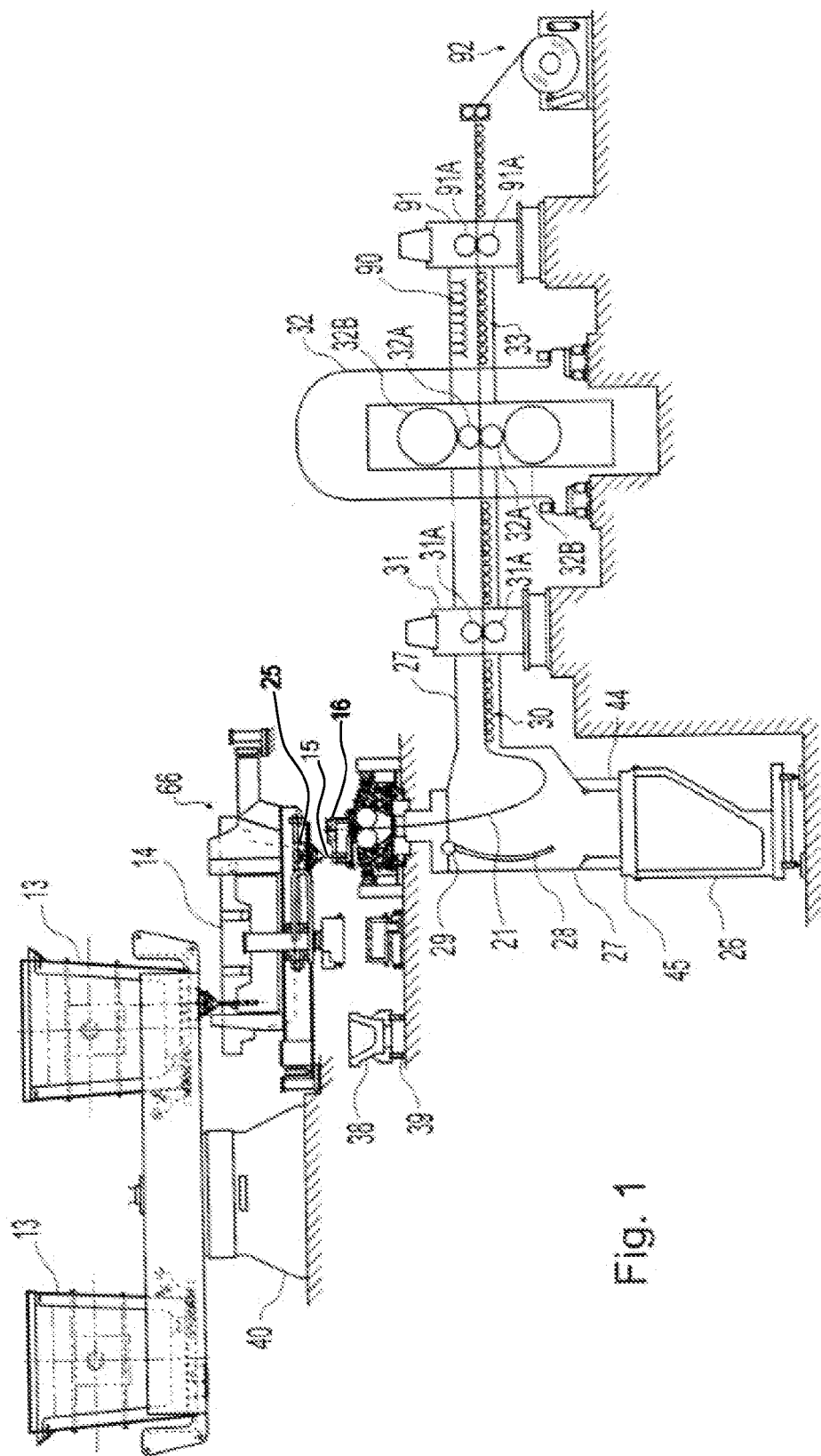


Fig. 1

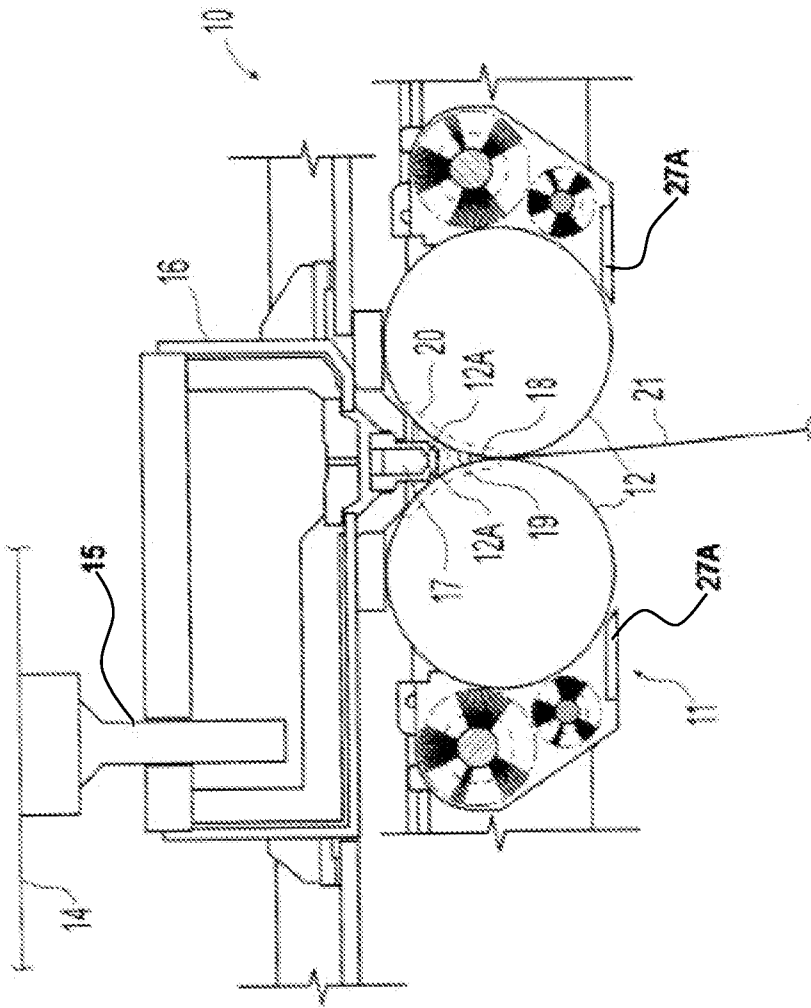


Fig. 2

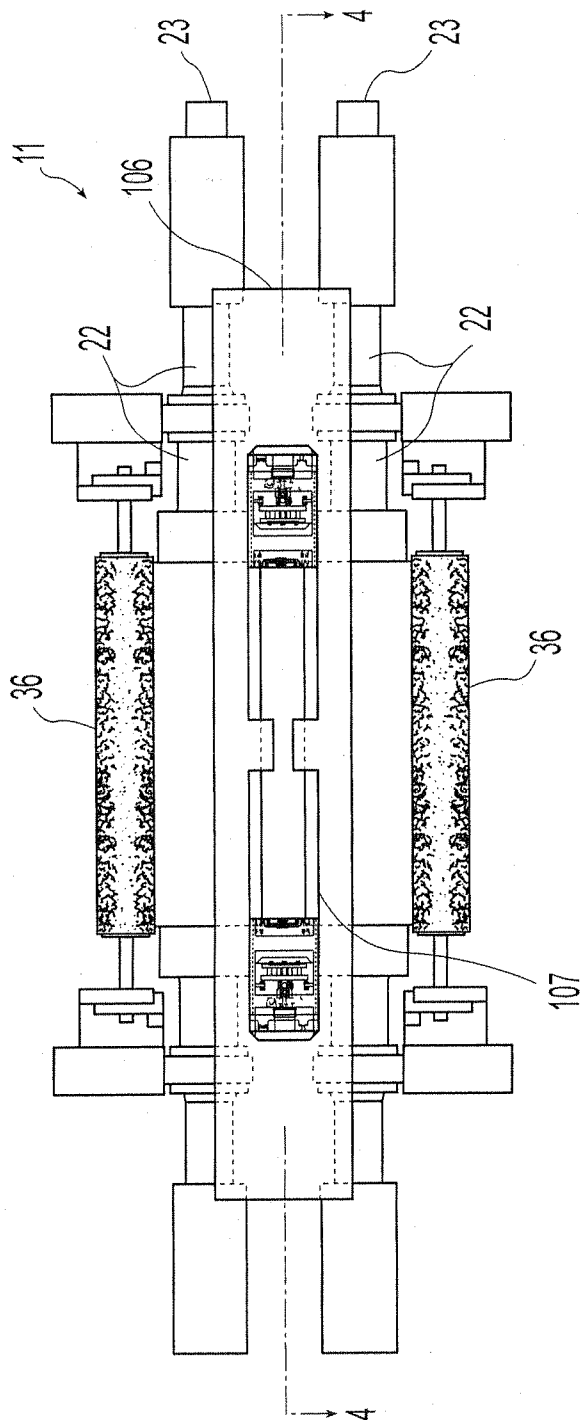
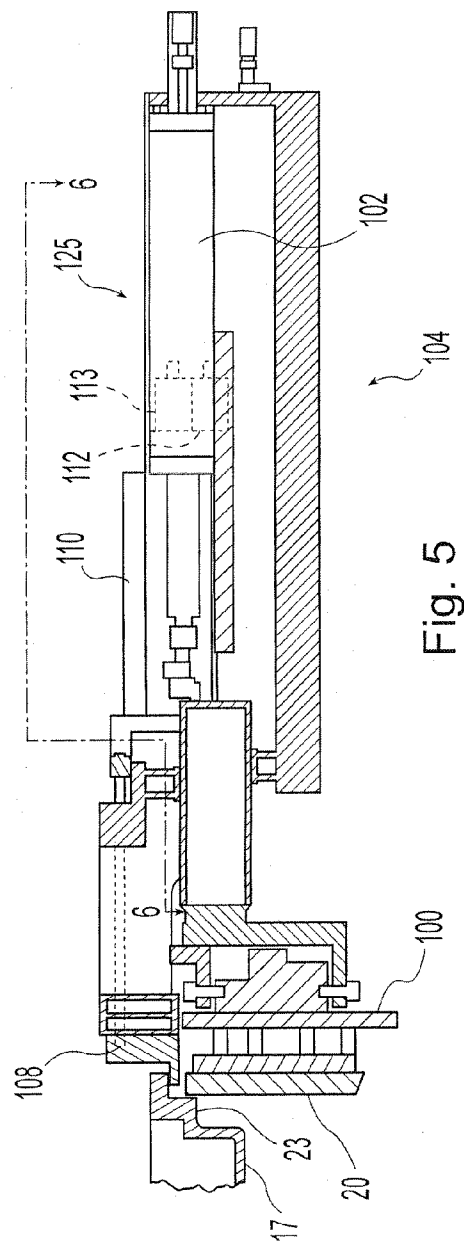
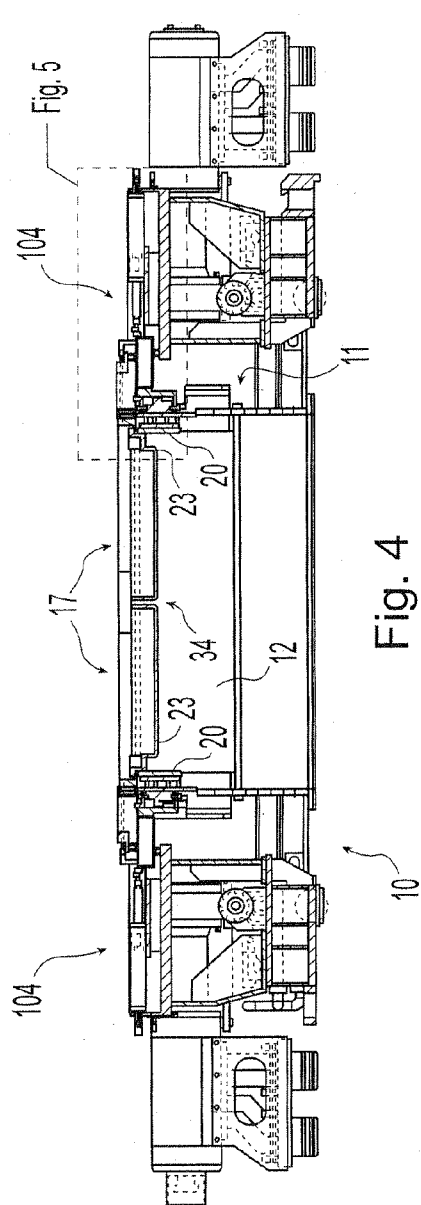
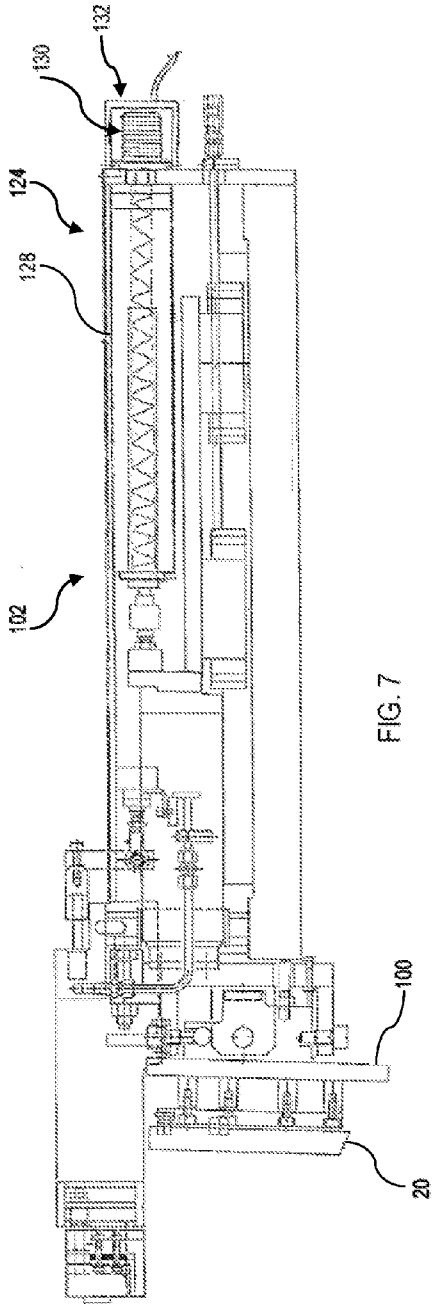
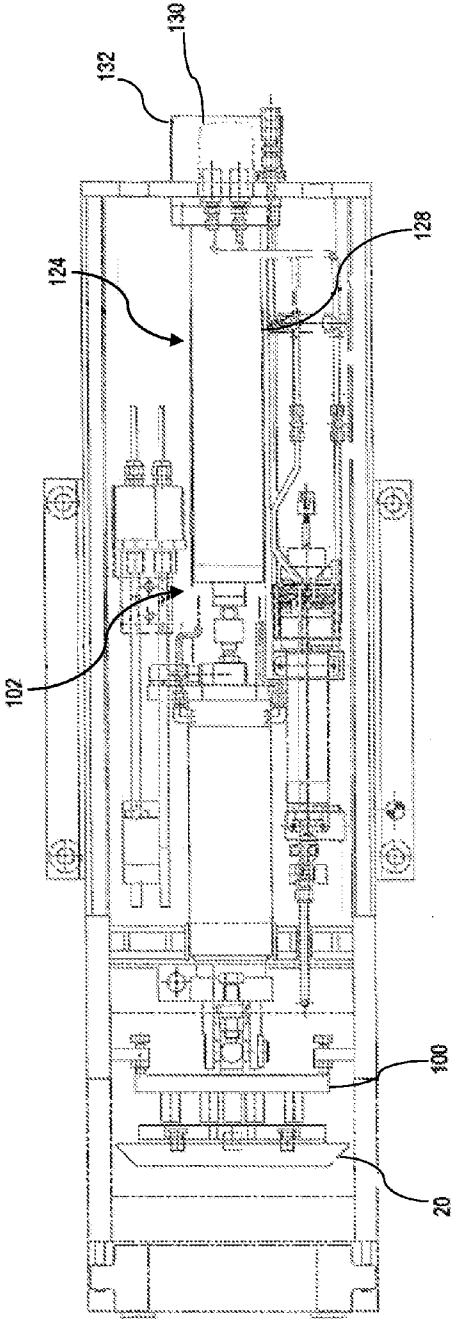


Fig. 3





THIN ROLL STRIP CASTER AND METHOD OF OPERATING THE SAME

BACKGROUND AND SUMMARY

[0001] This invention relates to making thin strip and more particularly casting of thin strip by a twin roll caster.

[0002] It is known to cast metal strip by continuous casting in a twin roll caster. Molten metal is introduced between a pair of counter-rotating horizontal casting rolls, which are cooled so that metal shells solidify on the moving roll surfaces and are brought together at the nip between the rolls to produce solidified strip product delivered downwardly from the nip between the rolls. The term “nip” is used herein to refer to the general region at which the rolls are closest together. The molten metal may be poured from a ladle into a smaller vessel, or tundish, from which it flows through a transition piece to a metal delivery nozzle positioned above the nip, longitudinally between the casting rolls, which delivers the molten metal to the region above the nip to form a casting pool of molten metal. The casting pool of molten metal is supported on the casting surfaces of the rolls above the nip. The casting pool is typically confined at the ends of the casting rolls by side plates or side dams held in sliding engagement adjacent the ends of the casting rolls.

[0003] In casting thin strip by twin roll casting, as the casting campaign proceeds there is a need to move the side dams inward toward the casting pool to compensate for wear on the side dams and delivery nozzle. In the past, that was done by hydraulic actuators axially urging the side dams against the end portions of the casting rolls. The axial forces exerted inwardly on the hydraulic actuators had to be large enough, typically about 0.5 kN, to overcome the striction in movement by the hydraulic cylinder driving the side dams. Given the axial forces exerted outwardly by the casting pool on the side dams is a ferro-static head of only 25N, use of the hydraulic actuators resulted in excessive wear rates on the side dams resulting in excessive wear rates on the side dams. There remains a need for more direct and refined control of the consumption control or movement of the side dams to reduce the rate of side dam wear, with axial forces on the side dams corresponding to those needed to be reactive to ferro-static forces.

[0004] Disclosed is a method of casting thin strip provided an even advance of the side dams during the campaign improving the quality of cast strip produced. The method comprising the steps of: assembling a pair of counter-rotating casting rolls laterally forming a nip between circumferential casting surfaces of the cast rolls through which metal strip can be cast, assembling a pair of side dams adjacent end portions of the casting roll to permit a casting pool of molten metal to be formed supported by the casting surfaces of the casting rolls, assembling a metal delivery system above the casting rolls delivering molten metal to form a casting pool supported on the casting surfaces of the casting rolls above the nip confined by the pair of side dams, assembling a mechanical screw drive to move the side dams axially toward the casting pool at a rate of between 0.4 and 5.0 mm/hour with a mechanical screw, counter-rotating the casting rolls such that the casting surfaces of the casting rolls each travel inwardly toward the nip to produce a cast strip downwardly from the nip, and driving the mechanical screw to move the side dams axially inward toward the casting pool.

[0005] In the casting method, the side dams may be moved axially inward toward the casting pool at a rate between 1.0

and 2.5 mm/hour. Also, in the method of casting thin strip the drive of the mechanical screw may continually move the side dams inwardly toward the casting pool.

[0006] The method of casting thin strip may comprise actuating the mechanical screw to automatically move the side dams inwardly at a prescribed rate toward the casting pool. The prescribed rate is such as to maintain the depth of the groove formed in bottom portions of the side dams below the dimension typically less than 0.2 mm, where leakage of molten metal begins to occur during the casting campaign.

[0007] Also disclosed is a thin roll strip caster comprising a pair of counter-rotating casting rolls laterally forming a nip between circumferential casting surfaces of the rolls through which metal strip can be cast; a pair of side dams adjacent end portions of the casting roll to permit a casting pool of molten metal to be formed supported by the casting surfaces of the casting rolls; a metal delivery system above the casting rolls delivering molten metal to form a casting pool supported on the casting surfaces of the casting rolls above the nip and confined by the pair of side dams; and a mechanical screw drive for moving axially the side dams inward toward the casting pool at a rate of between 0.4 and 5.0 mm/hour by actuation of the mechanical screw, wherein the casting rolls may be counter-rotated such that the casting surfaces of the casting rolls each travel inwardly toward the nip to produce a cast strip downwardly from the nip.

[0008] In the thin strip caster, the side dams may be moved axially inward toward the casting pool at a rate between 1.0 and 2.5 mm/hour.

[0009] In the thin strip caster, the mechanical screw may move at a continuous rate. Alternatively, the mechanical screw may move at a variable rate.

[0010] The thin strip caster as recited above further comprising a sensor for detecting the position of the side dam.

[0011] In both the method of making thin cast strip and the thin strip caster as described, the sensor may communicate with the mechanical screw drive to adjust the position of the side dam.

[0012] In both the method of making thin cast strip and the thin strip caster as described, the sensor may be a position sensor and/or a force sensor, and the sensors may be positioned on one or both side dams. Also the side dams may move independently or together.

[0013] Other details, objects and advantages of the invention will become apparent as the following description of embodiments of the invention proceeds.

BRIEF DESCRIPTION OF DRAWINGS

[0014] The accompanying drawings illustrate the operation and practice of a thin strip caster, in which:

[0015] FIG. 1 is a diagrammatical side view of a twin roll caster system performing the present disclosure;

[0016] FIG. 2 is a partial sectional view through the casting rolls mounted in a roll cassette in the casting position of the twin roll caster of FIG. 1;

[0017] FIG. 3 is a diagrammatical plan view of the roll cassette of FIG. 2 removed from the twin roll caster;

[0018] FIG. 4 is a transverse partial sectional view through the portion marked 4-4 in FIG. 3;

[0019] FIG. 5 is an enlarged view of actuator assembly of the cassette assembly marked as detail 5 in FIG. 4;

[0020] FIG. 6 is a top plan view, partially in section, of actuator assembly of the carriage assembly of FIG. 5 with the side dam in a first position; and

[0021] FIG. 7 is a side plan view, partially in section, of the actuator assembly of FIG. 6 with the side dam in a first position.

DETAILED DESCRIPTION

[0022] Referring now to the drawings, there is illustrated in FIGS. 1 and 2 a portion of a twin roll caster for continuously casting thin steel strip that comprises a main machine frame that stands up from the factory floor and supports a roll cassette module 11 supporting a pair of counter-rotatable casting rolls 12 mounted therein. The casting rolls 12 having casting surfaces 12A laterally positioned to form a nip 18 there between. The casting rolls 12 are mounted in the roll cassette 11 for ease of operation and movement. The roll cassette facilitates rapid movement of the casting rolls ready for casting from a setup position into an operative casting position in the caster as a unit, and ready removal of the casting rolls from the casting position when the casting rolls are to be replaced. There is no particular configuration of the roll cassette that is desired, so long as it performs that function of facilitating movement and positioning of the casting rolls.

[0023] Molten metal is supplied from a ladle 13 through a metal delivery system including movable tundish 14 and transition piece or distributor 16. From the distributor 16, the molten metal flows to at least one metal delivery nozzle 17, or core nozzle, positioned between the casting rolls 12 above the nip 18. Molten metal discharged from the delivery nozzle 17 thus delivered forms a casting pool 19 of molten metal above the nip 18 supported on the casting surfaces 12A of the casting rolls 12. This casting pool 19 is confined in the casting area at the ends of the casting rolls 12 by a pair of confining side closures or side dams 20 (shown in dotted line in FIG. 2). The upper surface of the casting pool 19 (generally referred to as the “meniscus” level) may rise above the bottom portion of the delivery nozzle 17 so that the lower part of the delivery nozzle 17 is immersed in the casting pool 19. The casting area includes the addition of a protective atmosphere above the casting pool 19 to inhibit oxidation of the molten metal in the casting area.

[0024] The ladle 13 typically is of a conventional construction supported on a rotating turret 40. For metal delivery, the ladle 13 is positioned over a movable tundish 14 in the casting position to fill the tundish with molten metal. The movable tundish 14 may be positioned on a tundish car 66 capable of transferring the tundish from a heating station (not shown), where the tundish is heated to near a casting temperature, to the casting position. A tundish guide, such as rails, may be positioned beneath the tundish car 66 to enable moving the movable tundish 14 from the heating station to the casting position.

[0025] The movable tundish 14 may be fitted with a slide gate 25, actuable by a servo mechanism, to allow molten metal to flow from the tundish 14 through the slide gate 25, and then through a refractory outlet shroud 15 to a transition piece or distributor 16 in the casting position. From the distributor 16, the molten metal flows to the delivery nozzle 17 positioned between the casting rolls 12 above the nip 18.

[0026] The casting rolls 12 are internally water cooled so that as the casting rolls 12 are counter-rotated, shells solidify on the casting surfaces 12A as the casting surfaces 12A move into contact with and through the casting pool 19 with each revolution of the casting rolls 12. The shells are brought together at the nip 18 between the casting rolls 12 to produce a solidified thin cast strip product 21 delivered downwardly

from the nip 18. The gap between the casting rolls is such as to maintain separation between the solidified shells at the nip so that semi-solid or “mushy” metal is present in the space between the shells through the nip, and at least in part, is subsequently solidified between the solidified shells within the cast strip below the nip.

[0027] FIG. 1 shows the twin roll caster system producing the thin cast strip 21, which passes across a guide table 30 to a pinch roll stand 31, comprising pinch rolls 31A. Upon exiting the pinch roll stand 31, the thin cast strip may pass through a hot rolling mill 32, comprising a pair of work rolls 32A and backup rolls 32B, forming a gap capable of hot rolling the cast strip delivered from the casting rolls, where the cast strip is hot rolled to reduce the strip to a desired thickness, improve the strip surface, and improve the strip flatness. The work rolls 32A have work surfaces relating to the desired strip profile across the work rolls. The hot rolled cast strip then passes onto a run-out table 33, where it may be cooled by contact with a coolant, such as water, supplied via water jets 90 or other suitable means, and by convection and radiation. In any event, the hot rolled cast strip may then pass through a second pinch roll stand 91 to provide tension of the cast strip, and then to a coiler 92. The cast strip may be, produced typically, in thicknesses between about 0.3 and 2.0 millimeters in thickness before hot rolling.

[0028] At the start of the casting campaign, a short length of imperfect strip is typically produced as casting conditions stabilize. After continuous casting is established, the casting rolls are moved apart slightly and then brought together again to cause this leading end of the cast strip to break away forming a clean head end of the following cast strip. The imperfect material drops into a scrap receptacle 26, which is movable on a scrap receptacle guide. The scrap receptacle 26 is located in a scrap receiving position beneath the caster and forms part of a sealed enclosure 27 as described further below. At this time, a water-cooled apron 28 that normally hangs downwardly from a pivot 29 to one side in the enclosure 27 is swung into position to guide the clean end of the cast strip 21 onto the guide table 30 where it is fed to the pinch roll stand 31. The apron 28 is then retracted back to its hanging position to allow the cast strip 21 to hang in a loop beneath the casting rolls in enclosure 27 before it passes to the guide table 30 where the strip engages a succession of guide rollers.

[0029] An overflow container 38 may be provided beneath the movable tundish 14 to receive molten material that may spill from the tundish. As shown in FIG. 1, the overflow container 38 may be movable on rails 39 or another guide such that the overflow container 38 may be placed beneath the movable tundish 14 as desired in casting locations. Additionally, an overflow container (not shown) may be provided for the distributor 16 adjacent the distributor 16.

[0030] The sealed enclosure 27 is formed by a number of separate wall sections that fit together at various seal connections to form a continuous enclosure wall that permits control of the atmosphere within the enclosure. The enclosure 27 is typically water cooled. Additionally, the scrap receptacle 26 may be capable of attaching with the enclosure 27 so that the enclosure is capable of supporting a protective atmosphere immediately beneath the casting rolls 12 in the casting position. The enclosure 27 includes an opening in the lower portion of the enclosure, lower enclosure portion 44, providing an outlet for scrap to pass from the enclosure 27 into the scrap receptacle 26 in the scrap receiving position. The lower enclosure portion 44 may extend downwardly as a part of the

enclosure 27, the opening being positioned above the scrap receptacle 26 in the scrap receiving position. As used in the specification and claims herein, “seal,” “sealed,” “sealing,” and “sealingly” in reference to the scrap receptacle 26, enclosure 27, and related features may not be a complete seal so as to prevent leakage, but rather is usually less than a perfect seal as appropriate to allow control and support of the atmosphere within the enclosure as desired with some tolerable leakage.

[0031] A rim portion 45 may surround the opening of the lower enclosure portion 44 and may be movably positioned above the scrap receptacle, capable of sealingly engaged and/or attached to the scrap receptacle 26 in the scrap receiving position. The rim portion 45 may be movable between a sealing position in which the rim portion engages the scrap receptacle, and a clearance position in which the rim portion 45 is disengaged from the scrap receptacle. Alternately, the caster or the scrap receptacle may include a lifting mechanism to raise the scrap receptacle into sealing engagement with the rim portion 45 of the enclosure, and then lower the scrap receptacle into the clearance position. When sealed, the enclosure 27 and scrap receptacle 26 are filled with a desired gas, such as nitrogen, to reduce the amount of oxygen in the enclosure and provide a protective atmosphere for the cast strip.

[0032] The enclosure 27 may include an upper collar portion 27A supporting a protective atmosphere immediately beneath the casting rolls in the casting position. When the casting rolls 12 are in the casting position, the upper collar portion is moved to the extended position closing the space between a housing portion adjacent the casting rolls 12 and the enclosure 27, as shown in FIG. 2. The upper collar portion may be provided within or adjacent the enclosure 27 and adjacent the casting rolls, and may be moved by a plurality of actuators (not shown) such as servo-mechanisms, hydraulic mechanisms, pneumatic mechanisms, and rotating actuators.

[0033] As shown in FIG. 4, a pair of delivery nozzles 17 are formed as substantially identical segments made of a refractory material such as zirconia graphite, alumina graphite or any other suitable material. It must be understood that more than two delivery nozzles 17 may be used in any different sizes and shapes if desired. The delivery nozzles 17 need not be substantially identical in size and shape, although generally such is desirable to facilitate fabrication and installation.

[0034] As shown in FIG. 4, two delivery nozzles 17 may be provided, each capable of moving independently of the other above the casting rolls 12. Typically where two delivery nozzles 17 are used the nozzles 17 are disposed and supported in end-to-end relationship along the nip 18 with a gap 34 there between, so that each delivery nozzle 17 can be moved inwardly toward the other during a casting campaign as explained below. It must be understood, however, that any suitable number of delivery nozzles 17 may be used, including two delivery nozzles 17 as described below and including any additional number of nozzles 17 disposed therebetween. For example, there may be a central nozzle segment adjacent to outer nozzle segments on either side.

[0035] Each delivery nozzle 17 may be formed in one piece or multiple pieces. As shown in FIG. 4, each nozzle 17 includes an end wall 23 positioned nearest a confining side dam 20 as explained below. Each end wall 23 may be configured to achieve a particular desired molten metal flow in the triple point region between the casting rolls 12 and the respective side dam 20.

[0036] The side dams 20 may be made from a refractory material such as zirconia graphite, graphite alumina, boron nitride, boron nitride-zirconia, or other suitable composites. The side dams 20 have a face surface capable of physical contact with the casting rolls and molten metal in the casting pool.

[0037] A pair of side dam actuator assemblies, generally indicated at 104, are provided to position the side dams 20 and the delivery nozzles 17. As illustrated, the twin roll caster is generally symmetrical, although such is not required. Referring to FIGS. 5-7, a side dam actuator assembly 104 is illustrated and described below, with the other side dam actuator carriage assembly 104 being generally similar. Each side dam actuator assembly 104 is disposed at one end of the pair of casting rolls 12. Each side dam actuator assembly 104 may be mounted fixed relative to the machine frame, or may be moveable axially toward and away from the casting rolls 12 to enable the spacing between the side dam actuator assembly 104 and the casting rolls 12 to be adjusted. The side dam actuators 104 may be preset in final position before a casting campaign to suit the width of the casting rolls 12 for the strip to be cast, or the position of the actuator assembly 104 may be adjusted as desired during a casting campaign. The side dam actuator 104 may be positioned one at each end of the roll assembly and moveable toward and away from delivery nozzle 17 to enable the spacing between them to be adjusted. The actuator 104 may be positioned so as to extend horizontally above the casting rolls with the nozzles 17 positioned beneath the distributor 16 in the casting position and at a central position to receive the molten metal.

[0038] Each side dam actuator assembly 104 may be positioned so as to extend horizontally above the casting rolls with the nozzles 17 beneath the distributor 16 in the casting position and at a central position to receive the molten metal. Actuator assembly 104 includes a support frame 125. A nozzle bridge 108 is moveably connected to the support frame 125 and engages the delivery nozzles 17 for selective movement thereof. A nozzle actuator 110 is mounted to the support frame 125 and connected to the nozzle bridge 108 to move the nozzle bridge 108 and in turn move the delivery nozzles 17 to position the end wall 23 relative to the side dam 20. The nozzle actuator 110 is thus adapted to position the delivery nozzles 17 relative to the side dam 20. The nozzle actuator 110 is a conventional servo mechanism. It must be understood, however, that the nozzle actuator 110 may be a drive mechanism suitable to move and adjust delivery nozzles 17. For example, the nozzle actuator 110 may be a screw jack drive operated by an electric motor, a hydraulic mechanism, a pneumatic mechanism, a gear mechanisms, a cog, a drive chain mechanism, a pulley and cable mechanism, a drive screw mechanism, a jack actuator, a rack and pinion mechanism, an electro-mechanical actuator, an electric motor, a linear actuator, a rotating actuator, or any other suitable device.

[0039] A position sensor 113 senses the position of the delivery nozzles 17. The position sensor 113 is a linear displacement sensor to measure the change in position of the nozzle bridge 108 relative to the support frame 125. The position sensor 113 may be a sensor suitable to indicate any parameter representative of a position of the delivery nozzles 17. For example, the position sensor 113 may be a linear variable displacement transformer to respond to the extension of the nozzle actuator 110 to provide signals indicative of movement of the delivery nozzles 17, or an optical imaging

device for tracking the position of the delivery nozzles 17 or any other suitable device for determining the location of the delivery nozzles 17.

[0040] The side dam 20 is mounted to a plate holder 100 which is moveably connected to the support frame 125 and engages the side dam 20 for selective movement thereof. A side dam actuator 102 is mounted to the support frame 125 and connected to the plate holder 100 to move the plate holder 100 and in turn to move and position each side dam 20 relative to the end portions of the casting rolls 12. The side dam actuator 102 is thus adapted to position the side dam 20 and maintain a prescribed low side dam wear rate based on consumption control. The side dam actuator 102 is a screw drive positioned to drive the side dams 20 relative to the ends of the casting rolls 20 during casting.

[0041] A side dam position sensor 112 senses the position of the side dam 20. The side dam position sensor 112 is a linear displacement sensor to measure the actual change in position of the plate holder 100 relative to the support frame 125. The side dam position sensor 112 may be any sensor suitable to indicate any parameter representative of a position of the side dam 20. For example, the side dam position sensor 112 may be a linear variable displacement transducer to respond to the extension of the side dam actuator 102 to provide signals indicative of position of the side dam 20, or an optical imaging device for tracking the position of the side dam 20 or any other suitable device for determining the location of the side dam 20. The side dam position sensor 112 may also or alternatively include a force sensor, or load cell for determining the force urging the side dam 20 against the casting rolls 12 and providing electrical signals indicative of the force urging the side dam against the casting rolls.

[0042] In any case, the actuators 110 and 102 and the sensors 113 and 112 may be connected into a control system in the form of a circuit receiving control signals determined by measurement of the distance variation between the delivery nozzles 17 and the confining side dams 20, and between the side dams 20 and the casting rolls 12. For example, small water cooled video cameras may be installed on the nozzle bridge 108, or any other suitable structure, to directly observe the distance between the delivery nozzles 17 and the confining side dams 20 and the side dams 20 and the casting rolls 12, and to produce control signals to be fed to position encoders on the actuators 110 and 102. With any arrangement, precise control of the distance between the end walls 23 of the delivery nozzle 17 and the side dams 20 and the side dams 20 and the casting rolls 12 may be maintained. Moreover these distances can be accurately set and maintained by independent operation of the actuators 110 and 102 during casting. For example, the distance between the end wall 23 and the side dam 20 may be set so that a discharge of molten metal is positioned to a target area on the side dam 20 relative to the triple point regions.

[0043] During a casting campaign the control system of the twin roll caster is capable of actuating the side dam actuators 102 to control of side dam wear by continuously moving the side dams 20 against the ends of the casting rolls 12 in the axial direction, i.e. along the axis of the centerlines of the two casting rolls at a prescribed rate. If the side dam position were not varied, side dams 20 may develop a deep groove in the side dam near the nip by abrasion during the cast. This results in leakage of molten metal from the casting pool. The control system, however, receives position from direct feedback of

the actuator 102 to control the position of the side dam relative to the end portions of the ends of the casting rolls 12.

[0044] The side dam actuator 102 is shown in further detail in FIGS. 6-7. The side dam actuator is a mechanical screw drive 124 including a screw 126 contained within a screw casing 128 and an electrically powered motor 130 for advancing or retracting the screw 126. The screw 126 may be advanced or retracted by rotating or counter-rotating the electrically powered motor 130, advancing or retracting the plate holder 100 and adjusting the position of the side dams 20. A water-cooled cover 132 may be placed adjacent to or around the motor 130 to provide cooling to the motor and prevent overheating.

[0045] During a casting campaign, the side dams 20 may be advanced toward the casting pool by operation of the motor 130 to rotate the screw 126 of the screw drive 124 in a clockwise or counter-clockwise direction. The screw 126 and motor 130 allows for fine control of the position of the side dam 20. The screw 126 has a thread pitch and the motor 130 has a rotational speed so that the side dam 20 is each advanced between 0.4 and 5.0 mm/hour during operation. The side dam may advance at a rate between 1.0 and 2.5 mm/hour.

[0046] The screw 126 may have various thread pitch values depending on the desired sensitivity of the side dam 20 position and adjustment speed. The motor 130 may be a single speed motor or may have an adjustable speed controlled by varying the current or voltage applied to the motor. The side walls may be advanced at a continuous or variable rate by maintaining or adjusting the speed of the motor. Finally, the side dam position sensor 112 may communicate with the motor 130 to provide feedback regarding the position of the side dam 20 and improve accuracy.

[0047] The screw drive 124 is useful for controlling the rate of side dam wear by varying the rate of change of position of the side dams relative to the end portion of the casting rolls, while inhibiting leakage of molten metal from the casting pool. By electrical control of the mechanical motor 130, the rate of wear of side dams 20 may be adjusted by changing the axial rate of movement of the side dams to control refractory consumption. This wear rate is substantially below the wear rate achievable with hydraulic actuators and substantially increases production capability of the caster by reducing the down time in change out of side dams during the casting campaign.

[0048] Alternatively, the screw drive 124 may be automatically controlled by a control system receive data from the sensors recording the distance between the end of delivery nozzle 17 and the side dam 20 so that screw drive 124 and in turn screw 126 can be automatically controlled responsive to wear of the side dams 20 and the end of delivery nozzle 17.

[0049] While the principle and mode of operation of this invention have been explained and illustrated with regard to particular embodiments, it must be understood, however, that this invention may be practiced otherwise than as specifically explained and illustrated without departing from its spirit or scope.

What is claimed is:

1. A method of casting thin strip comprising the steps of:
assembling a pair of counter-rotating casting rolls laterally forming a nip between circumferential casting surfaces of the rolls through which metal strip can be cast,

assembling a pair of side dams adjacent end portions of the casting roll to permit a casting pool of molten metal to be formed supported by the casting surfaces of the casting rolls,

assembling a metal delivery system above the casting rolls delivering molten metal to form a casting pool supported on the casting surfaces of the casting rolls above the nip and confined by the pair of side dams,

assembling a mechanical screw drive to move axially the side dams toward the casting pool,

counter-rotating the casting rolls such that the casting surfaces of the casting rolls each travel inwardly toward the nip to produce a cast strip downwardly from the nip, and moving the side dams axially inward toward the casting pool at a rate of between 0.4 and 5.0 mm/hour by actuation of the mechanical screw.

2. The method of casting thin strip as claimed in claim 1 comprising in addition a sensor to measure wear rate of the said dams, and actuating the mechanical screw to automatically to move the side dams inwardly toward the casting pool in response to the measured wear rate exerted on the side dams.

3. The method of casting thin strip as claimed in claim 1 where the mechanical screw moves at a continuous rate inwardly toward the casting pool.

4. The method of casting thin strip as claimed in claim 1 where the mechanical screw moves at a variable rate inwardly toward the casting pool.

5. The method of casting thin strip as claimed in claim 1 where the mechanical screw moves at a rate of between 1.0 and 2.5 mm/hour.

6. The method of casting thin strip as claimed in claim 1 comprising in addition a sensor to measure force exerted on the said dams, and actuating the mechanical screw to automatically to move the side dams inwardly toward the casting pool in response to the measured force exerted on the side dams.

7. A thin roll strip caster comprising:

a pair of counter-rotating casting rolls laterally forming a nip between circumferential casting surfaces of the rolls through which metal strip can be cast;

a pair of side dams adjacent end portions of the casting roll to permit a casting pool of molten metal to be formed supported by the casting surfaces of the casting rolls;

a metal delivery system above the casting rolls delivering molten metal to form a casting pool supported on the casting surfaces of the casting rolls above the nip and confined by the pair of side dams; and

a mechanical screw drive for moving axially the side dams inward toward the casting pool at a rate of between 0.4 and 5.0 mm/hour by actuation of the mechanical screw, wherein the casting rolls may be counter-rotated such that the casting surfaces of the casting rolls each travel inwardly toward the nip to produce a cast strip downwardly from the nip.

8. The thin strip caster as claimed in claim 7 where the side dams are moved axially inward toward the casting pool at a rate between 1.0 and 2.5 mm/hour.

9. The thin strip caster as claimed in claim 7 where the mechanical screw moves at a continuous rate.

10. The thin strip caster as claimed in claim 7 where the mechanical screw moves at a variable rate.

11. The thin strip caster as claimed in claim 7 further comprising a sensor for detecting the position of the side dam.

12. The thin strip caster as claimed in claim 7 wherein the sensor communicates with the mechanical screw drive to adjust the position of the side dam.

13. The thin strip caster as claimed in claim 12 where the sensor is a position sensor.

14. The thin strip caster as claimed in claim 12 where the sensor is a force sensor.

15. The thin strip caster as claimed in claim 12 comprising a sensor on each side dam.

16. The thin strip caster as claimed in claim 15 where the side dams move independently.

17. The thin strip caster as claimed in claim 15 where the side dams move together.

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