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Gerding et al.

[11] **3,895,673**

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[54] **GAS COVER FOR CASTING MACHINE**

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[52] **U.S. Cl.** **164/259;** 164/276

[51] **Int. Cl.**[2] **B22D 27/00;** B22D 11/06

[58] **Field of Search** 164/64, 66, 87, 88, 253, 164/259, 276, 277, 278, 279

[56] **References Cited**

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[57] **ABSTRACT**

A protective gas cover assembly prevents contamination of a cast strip during initial formation and solidification. The cover assembly has at least one roll mounted and pivotable compartment. If more than one roll mounted compartment is utilized, each compartment is separately pivotable so that irregularities in the freshly cast strip or in the lower casting surface which tend to cause lifting of one portion of the cover will not lift other portions thereby improving the degree of protection afforded by the device and avoiding feedback of profile perturbations in the strip by lifting or straining the assembly. Therefore, in general, lifting movement of one cover compartment will not be transmitted to the other compartment.

16 Claims, 6 Drawing Figures

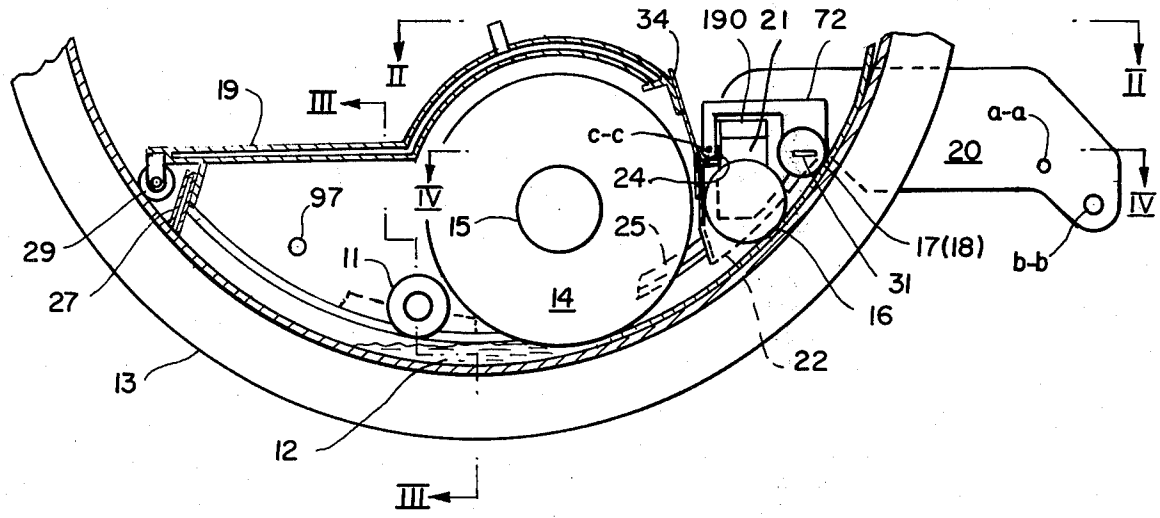


Fig. 1.

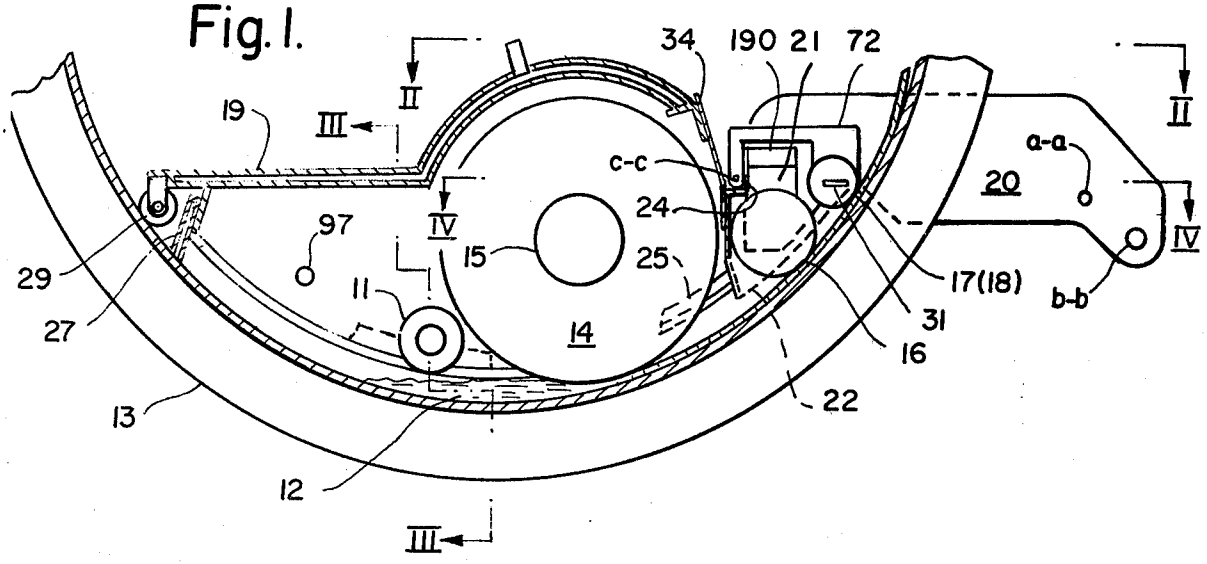


Fig. 5.

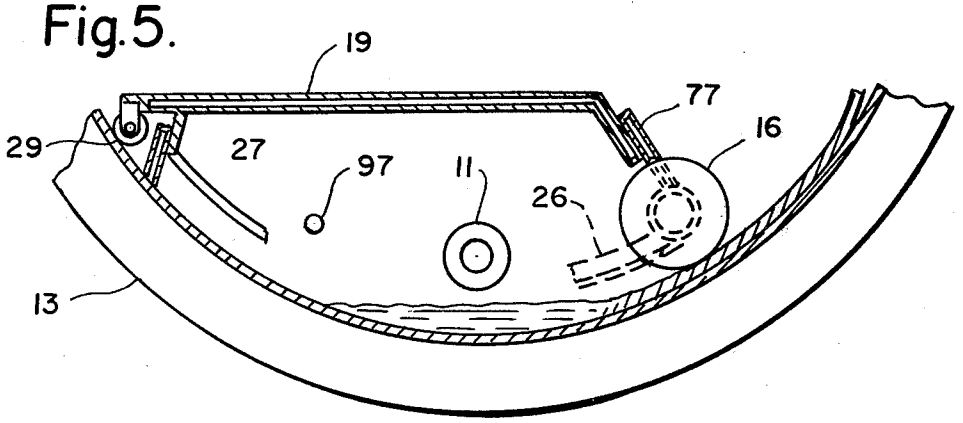


Fig. 6.

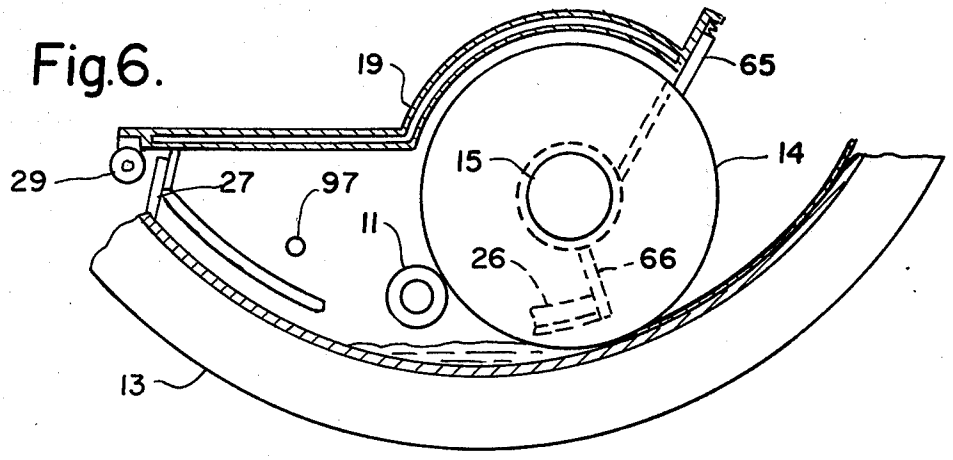


Fig.2.

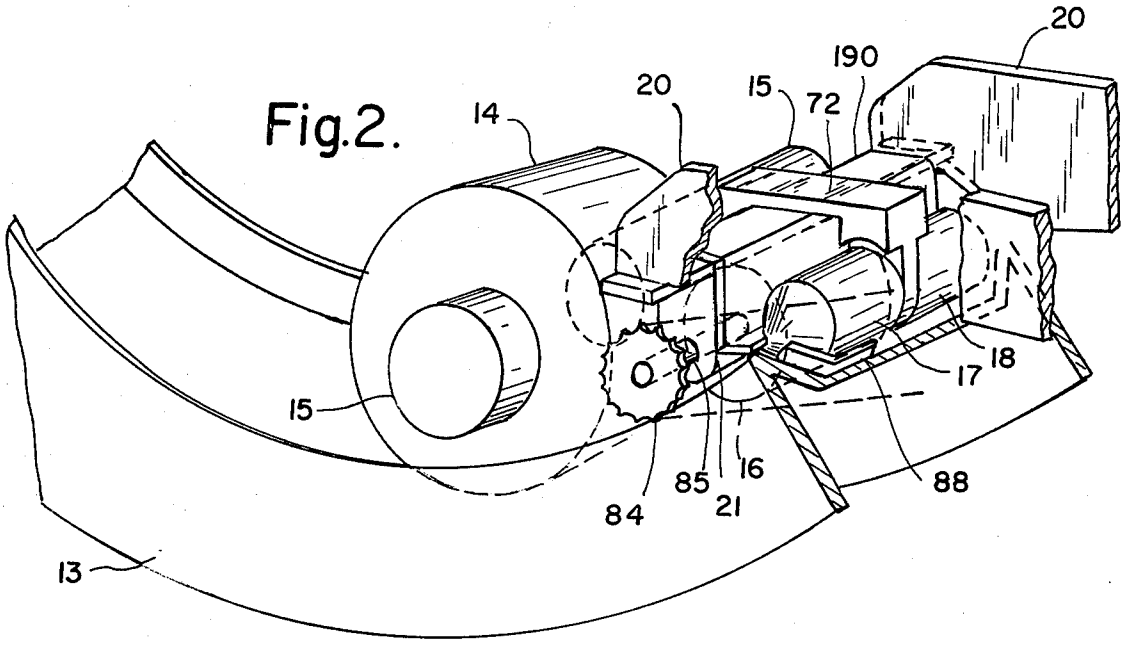


Fig.3.

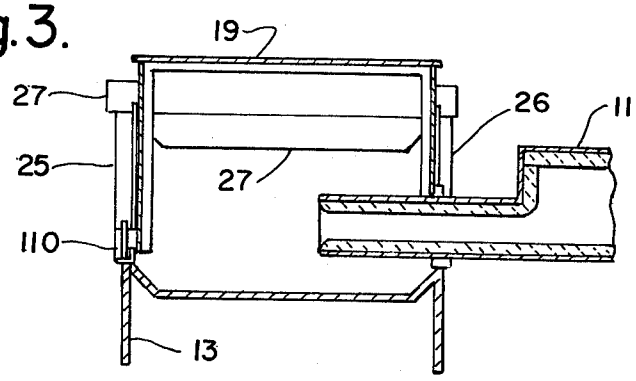
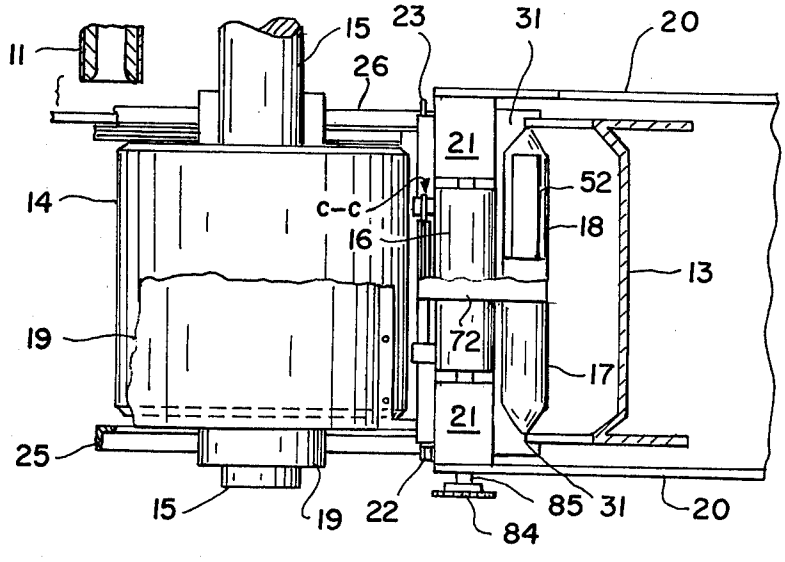


Fig.4.



GAS COVER FOR CASTING MACHINE

Our invention generally relates to a device which provides a protective atomosphere during the initial formation and solidification of strip cast by the so-called "Inside-The-Ring" casting process.

By the term "Inside-The-Ring" casting process, it is meant that process in which the concave inside surface of a rotating ring or a concave belt surface contains a pool of molten metal and is utilized as a casting surface to form a solid strip from the molten pool. The pool is replenished with molten material by a tundish, a launder or other appropriate feeding means.

A rotating drum or convex casting surface may be cooperatively employed with the concave casing surface. As the ring rotates during the process, a one-sided casting is continuously formed on the inside surface of the ring. In the event that a rotating drum is cooperatively employed, the rotating drum extends a predetermined distance into the molten pool which is contained on the inside surface of the ring. A one-sided casting is also formed on the drum surface. Because the respective one-sided castings are formed continguously to each other, the two castings are continuously joined or welded at the respective hot sides at the nip of the casting created between the drum and the ring. Typical examples of apparatus suitable for performing the Inside-The-Ring casting process are the various embodiments shown in U.S. Pat. No. 3,773,102. Ferrous or nonferrous metals maybe cast by such process. Steel is a particularly desirable material for the use of this casting process.

The continuous casting of molten metals under protective gaseous atmospheres in order to prevent oxidation or contamination of the metal is generally known in the metal casting art. Typical of such prior art methods are U.S. Pat. Nos. 2,099,208 and 3,284,859.

The invention generally comprises a protective gas cover assembly which is used in combination with a strip casting device having a rotatable concave lower casting member, such as the inside of a ring or a belt, and, optionally, a rotatable convex upper casting member, such as a drum. The casting device may also include a rotatable roll, such as a pressure roll, which serves to cause the cast strip to remain in contact with the ring surface and also may include a seal roll which may aid in preventing the infiltration of air at a position where the strip exits from the gas cover assembly. Of course, one could optionally utilize a single roll which would combine the functions of a pressure roll and a seal roll.

In one embodiment of our invention, the gas cover assembly comprises a single compartment. In this embodiment, a single strip casting is formed at the inner surface of the casting ring and then exits from the gas cover assembly by passing under a pressure roll located beyond the pool of molten material and which holds the freshly cast strip against the inside surface of the casting ring after it emerges from the pool of molten material. The gas cover assembly comprises an enclosure housing whiich is positioned over the lower portion of the casting ring and thus envelops the casting, the casting pool and portions of the tundish in such a manner so as to substantially seal such portions of the casting device from the surrounding atmosphere through contact with or in close fitting relationship with the casting ring and the drive shaft of the pressure roll. The pressure roll also serves as a seal in this instance. Although this embodiment is directed toward the production of a cast strip which has been frozen or solidified from one side only, it is within the scope of this embodiment to also provide a casting drum which is also sealably enclosed within the enclosure housing and thereby provides for the production of strip frozen or solidified from both sides of its thickness. Such drum does not provide support for the gas cover assembly. Suitable sealing means between the shaft or other drum support means and the compartment housing include rubbing flanges, flaps or the like. In general, the single compartment housing is supported by a tail skid roller at one end and by the pressure roll drive shaft at its other end. Support by the roll drive shaft is accomplished in such a manner that the enclosure housing may pivot or rotate slightly around said shaft rather than be lifted due to ring irregularities which cause lifting of the tail skid support roll. Such arrangement maximizes the effective seal of the system.

A second embodiment of our invention involves instances where strip is cast with the use of a casting ring and a casting drum. Protection of the molten material is secured with use of a single enclosure housing which is supported by a tail skid roll and pivotable about and supported by the drive shaft of said casing drum. While this embodiment functions in a generally equivalent manner to the first described embodiment, it is noted that protection is not provided for the freshly cast strip.

In another embodiment for strip cast with a casting ring and drum, the gas cover assembly is divided into two interconnected portions: a primary compartment and a secondary compartment. This embodiment has the advantage of protecting the strip for a longer time period than the second embodiment. The primary compartment comprises an enclosure housing which is positioned over the casting drum, the tundish or other appropriate feed means and the molten material pool in such a manner so as to substantially seal such portions of the casting apparatus from the surrounding atmosphere through contact with or in close fitting relationship with the casting ring and the drum shaft. The secondary compartment comprises an enclosure housing which is positioned over the pressure roll member and that portion of the freshly cast strip between the pool and the point where it ceases to be held in contact with the ring in such a manner so as to be adapted to substantially seal such portion of the casting apparatus and the strip from the surrounding atmosphere through contact with or close fitting relationship with the strip and ring casting surface. Both housings are at least partially supported by the ring casting surface. The primary compartment is also supported by the casting drum drive shaft. During operation, the primary compartment housing is pivoted about the drum drive shaft and may rotate slightly so as to permit the cover to flexibly contact the ring surface.

It is thus an object of our invention to provide a device which is capable of providing a protective atmosphere over molten and/or freshly cast material that is processed by apparatus suitable for perfecting the Inside-The-Ring casting technique.

It is a further objective to provide a protective system in which the protective nature of the atmosphere will not be sustantially diminished due to cover lifting or increased roll pressures caused by irregularities in the casting device or in the emerging strip. Such objective is enhanced through the use of a dual compartment sys-

tem in which the respective compartments are connected in a flexible or slidable manner and the compartments are individually pivotable.

It is yet a further objective of our invention to provide a device suitable for protecting material cast by the Inside-The-Ring process which can be easily removed or placed in an operative position.

These and other objectives and advantages will become more apparent to those skilled in the art from the foregoing description of the invention.

FIG. 1 depicts a front sectional view of a two-compartment gas cover assembly in combination with Inside-The-Ring casting apparatus comprising a casting ring, a casting drum, a pressure roll, and a sealing roll.

FIG. 2 depicts certain details of the Inside-The-Ring casting apparatus and the secondary compartment gas cover assembly of a two-compartment gas cover assembly. Certain portions of the apparatus are not shown for the sake of clarity.

FIG. 3 represents a cross-section through the primary compartment gas cover assembly taken along section III—III of FIG. 1.

FIG. 4 represents a top view taken along sections II—II and IV—IV of FIG. 1.

FIG. 5 represents a front sectional view of a one-compartment gas cover assembly in combination with Inside-The-Ring casting apparatus comprising a casting ring and a pressure roll.

FIG. 6 represents a front sectional view of a one-compartment gas cover assembly in combination with Inside-The-Ring casting apparatus comprising a casting ring and a casting drum.

The two-compartment gas cover assembly embodiment of our invention is roll mounted on or supported by the rotatable casting device at several locations. By virtue of the roll mounted support means the gas cover assembly remains relatively stationary while the casting device rotates during the casting process. Such arrangement provides a moving seal that automatically accommodates changes in emergent strip thickness. This type of seal has been found to be effective in both preventing the ingress of the outside atmosphere into the cover assembly and minimizing the escape of protective or inert gas to the outside atmosphere. Savings in the amount of gas necessary to adequately protect the molten metal and solidified strip is realized by this technique.

The primary compartment is supported at one end through roller contact with the inside surface of the casting ring and by the casting drum drive shaft toward its other end. Support for the secondary compartment is effected through a pivotally mounted housing which is mounted on a pressure roll. Contact with the moving upper surface of the emerging strip, and hence the inside surface of the casting ring, is maintained by use of a small auxiliary sealing roll pivotally mounted to the pressure roll bearing housing.

The components of above described system are arranged in such a manner that the lifting or movement of any one of the rolls will not cause a significant amount of lifting or movement of the other rolls. In the event that the casting apparatus is operated in a fashion which locks the rolls at a fixed height or range of heights, binding may also be avoided by our invention. This feature is especially important in the instance of possible movement of the casting drum caused by movement of the pressure roll because even a small movement of casting drum will cause a change in the resultant strip thickness as it emerges from the casting nip. Any such thickness perturbation would then cause a perturbation in the motion of the pressure roll when that portion of the strip passes under the pressure roll. If the respective housings are not mounted or supported independently, the induced change in thickness will in turn cause an additional thickness change because the casting drum will be lifted again. Such process could conceivably recur indefinitely. As may be seen, thickness control would rapidly become extremely difficult due to the highly interrelated effect of the casting drum and the pressure roll.

As previously discussed, the respective compartments are attached to each other so as to provide a continuous protective cover over the molten and the freshly solidified material. The primary compartment is mounted on bearings whose journals are portions of the casting drum drive shaft in a fashion which will permit a degree of relative torsional movement of the essentially stationary compartment housing about the rotatable drive shaft but which otherwise constrains the motions of the housing to those of the shaft. The secondary compartment housing is an integral portion of a pressure roll carriage and turns as a unit with the carriage about a remote pivot point except for a separate mounted seal roll to be described later. The independent mounting of the envelope surrounding each roll is an important feature of the device as strip or ring irregularities which cause movement of one compartment will not cause lifting movement in the other. Typical ring irregularities stem from warpage of the ring due to heating and cooling of the ring during operations or from other mechanically induced defects. Such arrangement reduces any tendency for contamination of the protective atmosphere through the ingress of the surrounding air.

Our invention functions to provide a stationary container for a blanket of protective gas over the molten metal pool contained in the casting ring, the freshly formed strip. Typical protective atmospheres include argon, nitrogen, spent combustion gases, etc. that will not significantly ozidize the molten material or the solidified strip. The gas cover assembly generally comprises two gas cover compartments; a primary and secondary compartment. The primary compartment covers the area of the inside ring surface which contains the molten pool, drum casting member, and the molten material feed means. Feed means typically include tundishes, launders, etc. The secondary compartment is connected to or in sealable contact with the primary compartment and serves to provide a protective atmosphere over the freshly cast strip as it passes along the inside of the ring surface is maintained through use of a roll which presses the strip against the ring surface.

Protective gas is conveniently introduced into the gas cover system through appropriate gas feed means such as a nozzle or the like. Because the seal is not perfect, a small amount of protective gas will escape at the various sealed interfaces of the gas cover assembly. However, as the contained gas is either continuously or intermittently replenished by the gas feed means, a slight positive pressure is maintained in the cover assembly.

As our invention involves the relative movements of various components, the sealing system of the gas cover assembly may be generally viewed in the context of effectively sealing all inputs and outputs to both of the

gas cover assembly compartments with the exception of the communication between the compartments where the protective or inert gas is free to circulate between the respective compartments.

There are certain interruptions to what is otherwise a hermitically sealed compartment which may be regarded as the inputs and outputs of the protective gas system. The inputs to the system are: the incoming protective gas stream, the gas feed means, the molten material feed means, the molten material stream, the casting drum shaft, and the incoming casting ring. As the gas and molten material feed means are stationary with respect to the gas cover assembly, any conventional sealing means is appropriate to secure the requisite seal. Examples of such means includes ceramic packing or mechanical seals of various types. The incoming gas and molten metal streams are, of course, self-sealing. In operation, the casting drum drive shaft is, in effect, a turning cylinder with regard to the stationary gas cover assembly. Because the shaft must turn relatively to the primary compartment housing and yet the area around the shaft must also be sealed from the atmosphere, a seal bearing is necessary. The incoming casting ring may be sealed with use of a sealing roll or sealing blade as set forth in a later portion of the description of our invention.

The outputs from the system are: the cast strip and the casting ring which exits beneath the cast strip. Sealing around the strip and ring exit area is accomplished through the use of sealing rolls.

It is further pointed out that the surfaces of the pressure roll and seal rolls may be considered as inputs to the secondary compartment in the sense that the surface of such members, during rotation, enter and exit from the gas cover assembly. If desired, an inert gas wiping system similar to that employed for the inner surface of the casting ring could be utilized for the purpose of removing adherent air from the roll surface prior to its reentry into the secondary compartment.

Finally, it is necessary to seal both of the compartments from the outside atmosphere at points along the interface between the respective housing compartments and the edges of the casting ring. Because the ring rotates relative to the gas cover assembly during the casting process, the seal is desirably of the type that permits relatively slight sliding contact between the respective members or is of a nature in which a small clearance is maintained between the respective members. We have chosen to utilize sealing members such as seal angles which are attached to the bottom portions of the primary and secondary housing members which are positioned in such a manner with respect to the sides of the casting ring so as to result in a substantially sealed relationship. Although we prefer to attach the seal angles to the gas cover assembly for reasons of simplicity, it is within the scope of our invention to attach the seal angles to the base of the casting machine as such arrangement would function in an equivalent manner.

The cover assembly may also be constructed in such a manner to facilitate its removal for maintenance of emergency repairs. This may be accomplished by splitting housing **19** as shown in FIG. **1.**

FIG. **1** is a front view taken along the mid-section of the inventive gas cover assembly shown in combination with Inside-The-Ring casting apparatus. This Figure represents a preferred embodiment of the invention. Tundish or feed means **11** pours molten material, such as steel, into the inside of casting ring **13** so as to form molten pool **12.** The inner surface of casting ring **13** comprises a rotatable concave lower casting surface upon which molten material is solidified in the form of a strip. The rotation means for the lower casting surface are conventional and, thus, not indicated on the drawing. Molten material is also solidified in the form of a strip on the surface of drum **14.** Drum **14** comprises a rotatable convex upper casting surface which is supported by and rotatable about drive shaft **15.** The two strips formed by the respective casting surface members are joined or welded at the respective hot sides at the nip of the casting created between the casting members. Upon its formation, the unitary strip emerges from between the casting nip and passes along the inside of casting ring **13** where it passes under pressure roll **16** and sealing rolls **17** and **18.** Sealing rolls **17** and **18** are the two halves of a single split roll. Upon exit from sealing rolls **17** and **18,** the strip continues to pass along the inside surface of casting ring **13** until removal by spiraling is effected. Suitable apparatus for guiding the strip from the casting apparatus is illustrated in U.S. Pat. No. 3,756,304. Gas feed means **97** serves to provide a source of protective gas for the gas cover compartments.

Drum **14** is pivotable about point a-a and is essentially covered with primary gas cover compartment housing **19.** Compartment housing **19** is preferably adapted to be water cooled. pressure roll **16** is pivotable about point *b—b* by means of a carriage member which comprises pivot members **20,** cross bar **190,** and bearing housing **21.** The carriage number assembly is shown in more detail in FIG. **4.** Cross bar **190,** pivot member **20** and bearing housing **21** form a portion of the enclosure housing which covers the secondary compartment. Sealing rolls **17** and **18** are pivotable about point *c—c* by means of pivot housing member **72** which in turn is connected to cross bar **190** of the carriage through auxiliary sealing plate **24.** Sealing rolls **17** and **18** are provided with a close-fitting coped seal plate **31.** Seal plate **31,** cross frame **190,** two side plates **22** and **23** (one of which is not shown in FIG. **1**) and frontal plate **24** comprise the sealing means that substantially seal the secondary compartment from the surrounding atmosphere. Seal plate **31** may be constructed similarly to later described scrubber plate **27** in order to remove adherent air from the surface of rolls **17** and **18.** Side plates **22** and **23** slide against or are very closely spaced from the sides of casting ring **13** in substantially sealed relationship and may be provided with adjusting means such as bolting to minimize the spacings. In the event that one is casting a strip or relatively wide width, side plates **22** and **23** are preferably provided with spring-loading for purposes of expansion allowance.

Blade **34** which is affixed to primary compartment housing **19** slidingly contacts secondary compartment housing **24** so as to provide for interconnection of the two compartments. The ends of two curved side seal angles **25** and **26** (one of which is not shown in FIG. **1**) rub against or are closely promimate to the two side plates **22** and **23,** and along with scrubber plate **27,** and a flange ring around tundish **11** effectively seal the entire outer periphery of primary gas cover compartment housing **19.** It should also be understood that side plates **22** and **23** can be constructed so as to bear on the

edge of casting ring **13** in a manner such as seal angels **25** and **26.** Moreover, seal angles **25** and **26** can be constructed so as to seal against the sides of ring **13** so do side plates **22** and **23.** Scrubber plate **27** comprises means for scrubbing adherent air from the inside surface of entering casting ring **13.** Suitable scrubber means include a jet curtain of pressurized inert or protective gas which is directed against the ring surface and then is expended into the outside air so as to scrub adherent air from said casting surface. Scrubber plate **17,** as depicted in FIG. **1,** has two generally parallel blade sections which contain the jet curtain of protective gas and serve to direct the jet against the inside surface of casting ring **13.** The scrubbing action of scrubber plate **27** is enhanced by providing greater clearance between the blade which is located closer to tailskid roll **29** than the clearance between the other blade and is preferred for this reason. In this manner the major portion of the scrubbing gas is directed along the surface of casting ring **13** and expended to the outside atmosphere. Such procedure both scrubs the ring and seals the gas cover. Of course, it will be understood by those skilled in the art that scrubber plate **27** could be eliminated and replaced by a roll similar in construction to sealing roll **17** and **18** in the event one were willing to forego the advantages associated with scrubber plate **27.** In making such substitution, the new roll would both serve to support and seal the gas cover assembly. Hence, such roll would combine most of the functions of scrubber plate **27** and tailskid roll **29.**

The weight of primary gas cover compartment housing **19** is carried by bearings riding on stems **15** and by "tailskid" roll **29.** The bearing-stem assembly also functions as a sliding seal arrangement.

The several pivot points: aa, bb, and cc, and the contact point of roll **29** on the inside of casting ring **13** function collectively to permit slight relative movement of major parts such as drum **14,** pressure roll **16,** sealing rolls **17** and **18,** and primary gas cover compartment housing **19** relative to each other and to the auxiliary sealing parts such as seal plate **31,** side plates **22** and **23,** frontal plate **24,** side seal angles **25** and **26,** and scrubber plate **27.** The sliding contact of blade **34** with various secondary compartment members also cooperates to permit such relative movements to occur without an appreciable increase of the total leakage area. The overall design of the gas cover assembly permits relatively small amounts of protective gas to be employed during operation of the device. Sufficient gas should be continuously or intermittently introduced into the gas cover assembly interior so that a slight positive pressure is maintained and thereby, aid in preventing the ingress of the surrounding atmosphere into the various portions of the gas cover assembly.

FIG. **2** depicts certain details of the Inside-The-Ring casting apparatus and gas cover assembly which are not shown in FIG. **1.** As may be apparent from FIGS. **2** and **4,** structural member **190** is attached to pivot member **20** so as to form a C-shaped frame. Bearing housings **21** are mounted on the C-shaped frame and bear shaft **85** which in turn carries pressure roll **16** and drive sprocket **84.** This view also illustrates the mode of exit of emerging cast strip **88** from the secondary compartment. As indicated in FIG. **4,** coped plates **31** are attached to structural member **190** in order to provide a seal around the periphery of sealing rolls **17** and **18** and the edges of casting ring **13.** End seals **22** and **23** are omitted from FIG. **2** for the sake of clarity. The other members shown in FIG. **2** are also depicted in FIG. **1** and perform the same function as previously described.

From the view illustrated in FIG. **2,** it is apparent that the shaft and pressure roll are mechanically supported by boundaries of the secondary compartment. This is, of course, not the situation with the casting drum and the primary compartment where the entire support of the drum comes from its shaft. Thus, it may be seen that secondary compartment supports the rotatable shaft and the primary compartment is supported by the rotatable drive shaft.

FIG. **3** is a side view of the invention taken along section III—III of FIG. **1.** As shown in this Figure, casting ring **13** is channel shaped and is in sliding contact with seal lips **25** and **26** in order to effectively seal such area while the ring passes through the respective compartments. While an effective seal may be maintained by positioning the ring and compartment housings in such a manner that a nominal clearance is obtained, it has been found that the use of seal contact members such as sealing lips **25** and **26** results in a more effective seal. It has also been found that the use of a series of spring members such as spring members **110** spaced along the areas of contact is of further benefit to the ultimate performance of the sealing arrangement. Spring loaded sealing lips **25** and **26** should be loosely mounted due to the fact that the flexibility of the sealing arrangement is enhanced. The other illustrated members have been previously described.

FIG. **4** is a top view of the invention taken along sections II—II and IV—IV of FIG. **1** for the purpose of illustrating different portions of our apparatus. Section II—II comprises the top portion of the Figure and Section IV—IV comprises the bottom portion. The illustrated members have been described elsewhere.

FIG. **5** represents a sectional front view of a single compartment gas cover assembly that is suitable for use in combination with Inside-The-Ring casting apparatus which may or may not include a casting drum. This embodiment comprises a single roller supported enclosure housing which is supported directly by a casting ring and pressure roll. The commonly numbered components are the same as and function similarly to those illustrated in FIG. **1.** As is evident from this drawing, the gas cover assembly compartment utilized sealing member **77** to seal against roll **16** through movable contact with or close proximity to the sides and shaft of roll **16.** Additional sealing is effected by seal angles **25** and **26** (one of which is not shown) which are placed in movable contact with or in close proximity to the roll shaft.

FIG. **6** depicts a sectional front view of a single compartment gas cover assembly that is suitable for use in combination with Inside-The-Ring casting apparatus which does not contain a pressure roll. Alternatively, such gas cover assembly obviously could also be adapted for an Inside-The-Ring device which included a pressure roll. The various commonly numbered gas cover assembly and casting device members depicted in this Figure are the same and function similarly to those illustrated in FIG. **1.** Spring loaded seating member **65** seals against the upper sides of casting drum **14** and drum drive shaft **15** in order to substantially seal a portion of the single compartment. Sealing member **66** is utilized to seal against the lower sides of roll **14** and its drive shaft as well as against seal members **25** and

26. Sealing is effected through movable contact or close proximity.

It should be further borne in mind that one may combine the respective functions of the pressure and seal rolls by using one instead of two rolls. Such substitution is considered to be within the scope of our invention and would be understood to be so by one skilled in the art.

We claim:

1. A gas cover assembly in combination with a strip casting device, said strip casting device including a rotatable concave lower casting member, a rotatable roll having a drive shaft for causing cast strip material to remain in contact with said rotatable concave lower casting member upon strip formation, and feed means for feeding liquid material onto said rotatable concave lower casting member; said gas cover assembly comprising:

a. a gas cover compartment enclosure housing positioned over at least a portion of said feed means and located so as to be in substantially sealed relationship with said rotatable concave lower casting member, said drive shaft of the rotatable roll, and said feed means, said gas cover enclosure housing in rollable contact with and supported by a portion of said rotatable concave lower casting member and in pivotal contact with and supported by the drive shaft of said rotatable roll; and

b. gas feed means for feeding a protective gas into said gas cover compartment.

2. The combination as recited in claim 1, which further includes:

a rotatable convex upper casting member located within said gas cover compartment enclosure housing.

3. The combination as recited in claims 1, which further includes:

means for wiping adherent air from the inside surface of said rotatable concave lower casting member at a position proximate to that where said primary gas cover enclosure housing is in rollable contact with said rotatable lower concave casting member and for sealing a portion of said primary gas cover enclosure housing.

4. The combination as recited in claim 1, which further includes:

roller means connected to said gas cover compartment in contact with said concave lower casting member for supporting said gas cover compartment.

5. A gas cover assembly in combination with a strip casting device, said strip casting device including a rotatable concave lower casting member, a rotatable convex upper casting member having a drive shaft, and feed means for feeding liquid material onto said rotatable concave lower casting member; said gas cover assembly comprising:

a. a gas cover compartment enclosure housing positioned over at least a portion of said rotatable convex upper casting member and at least a portion of said feed means and located so as to be in substantially sealed relationship with said rotatable concave lower casting member, said rotatable convex upper casting member, the drive shaft of said rotatable convex upper casting member, and said feed means, said gas cover enclosure housing in rollable contact with and supported by a portion of said rotatable concave lower casting member and in pivotal contact with and supported by the drive shaft of said rotatable convex upper casting member; and

b. gas feed means for feeding a protective gas into said gas cover compartment.

6. The combination as recited in claim 5, which further includes:

means for wiping adherent air from the inside surface of said rotatable concave lower casting member at a position proximate to that where said primary gas cover enclosure housing is in rollable contact with said rotatable lower concave casting member and for sealing a portion of said primary gas cover enclosure housing.

7. The combination as recited in claim 5, which further includes:

roller means connected to said gas cover compartment in contact with said concave lower casting member for supporting said gas cover compartment.

8. A gas cover assembly in combination with a strip casting device, said strip casting device including a rotatable concave lower casting member, a rotatable convex upper casting member having a drive shaft, a rotatable roll for causing cast strip material to remain in contact with said rotatable concave lower casting member upon strip formation, and feed means for feeding liquid material onto said rotatable concave lower casting member, said gas cover assembly comprising:

a. a primary gas cover compartment comprising an enclosure housing positioned over said convex upper casting member and at least a portion of said feed means and located so as to be in substantially sealed relationship with said rotatable concave lower casting member, said drive shaft of the upper convex casting member and said feed means, said primary gas cover enclosure housing in rollable contact with and supported by a portion of said rotatable concave lower casting member and in pivotal contact with and supported by the drive shaft of said rotatable convex upper casting member;

b. a secondary gas cover compartment comprising an enclosure housing located so as to be in substantially sealed contact with said primary gas cover compartment enclosure housing and located so as to be in substantially sealed relationship with said rotatable concave lower casting member and said rotatable roll, said secondary gas cover enclosure housing in rollable contact with and supported by a portion of said rotatable concave lower casting member; and

c. gas feed means for feeding a protective gas into at least one of said gas cover compartments.

9. The combination as recited in claim 8, wherein:

said secondary gas cover compartment enclosure housing is in slidable contact with said primary gas cover compartment enclosure housing whereby movement of one of said enclosure housings will not cause appreciable movement of the other enclosure housing.

10. The combination as recited in claim 8, which further includes:

means for wiping adherent air from the inside surface of said rotatable concave lower casting member at a position proximate to that where said primary gas cover enclosure housing is in rollable contact with

said rotatable lower concave casting member and for sealing a portion of said primary gas cover enclosure housing.

11. The combination as recited in claim **10**, wherein: said wiping and sealing means comprise means for directing a jet of protective gas against and along said rotatable concave lower casting member.

12. The combination as recited in claim **11**, wherein: said wiping and sealing means further comprise two generally parallel blades which are adapted to direct a jet curtain of protective gas against and along said rotatable concave lower casting member, one of said blades being located a greater distance from the surface of said rotatable concave lower casting member than the other blade whereby said wiping and sealing means are adapted to direct a greater portion of said protective gas along said rotatable concave lower casting member in the direction of said blade located a greater distance from said rotatable concave lower casting member.

13. The combination as recited in claim **8**, wherein: said secondary gas cover compartment enclosure housing is positioned over a rotatable roll adapted for pressing a cast strip against said rotatable concave lower casting member.

14. The combination as recited in claim **8**, which further includes:

roller means connected to said primary gas cover compartment and in contact with said concave lower casting member for supporting said primary gas cover compartment.

15. The combination as recited in claim **8**, which further includes:

roller means connected to said secondary gas cover compartment enclosure housing and adapted to be placed in contact with a freshly cast strip borne on said concave lower casting member for supporting said secondary gas cover compartment and for sealing a portion of said secondary gas cover compartment enclosure housing.

16. The combination as recited in claim **13**, which further includes:

roller means connected to said secondary gas cover compartment enclosure housing and adapted to be placed in contact with a freshly cast strip borne on said concave lower casting member for supporting said secondary gas cover compartment and for sealing a portion of said secondary gas cover compartment enclosure housing.

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