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[54] **SYSTEM FOR POURING INTO FOUNDRY MOULDS**

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[51] **Int. Cl.** **B22d 5/02**

[58] **Field of Search**......164/130, 324, 325, 136, 326, 164/328, 336, 133, 323; 18/20 R

[56] **References Cited**

UNITED STATES PATENTS

2,581,898	1/1952	Alexander	164/326 X
2,834,986	5/1958	Bailey	164/326 X
3,122,800	3/1964	Naffziger	164/326 X

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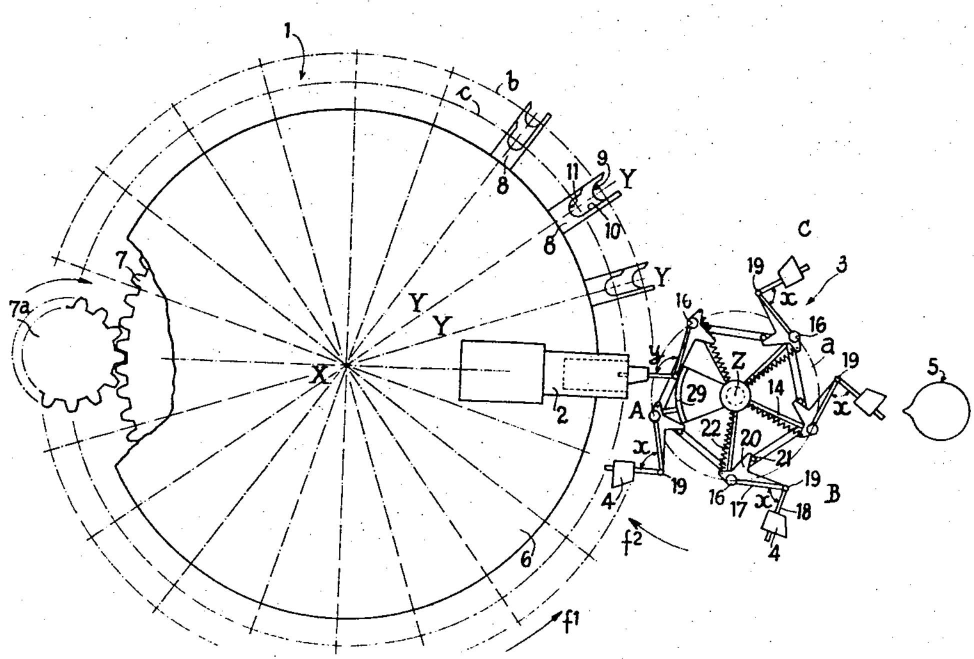
[57] **ABSTRACT**

System for mass-production pouring of metal into foundry moulds, disposed on a large rotary structure, by means of metering ladles carried by a small rotary structure. A metal supply ladle pours metal into the metering ladles one-by-one in the known manner. The number of metering ladles is smaller than the number of moulds but their circumferential spacing is the same. The small rotary structure is rotated in synchronism with the large rotary structure by a tooth and roller drive. Means are provided for correctly presenting the spouts of the metering ladles in front of the moulds and for pouring the metal.

6 Claims, 4 Drawing Figures



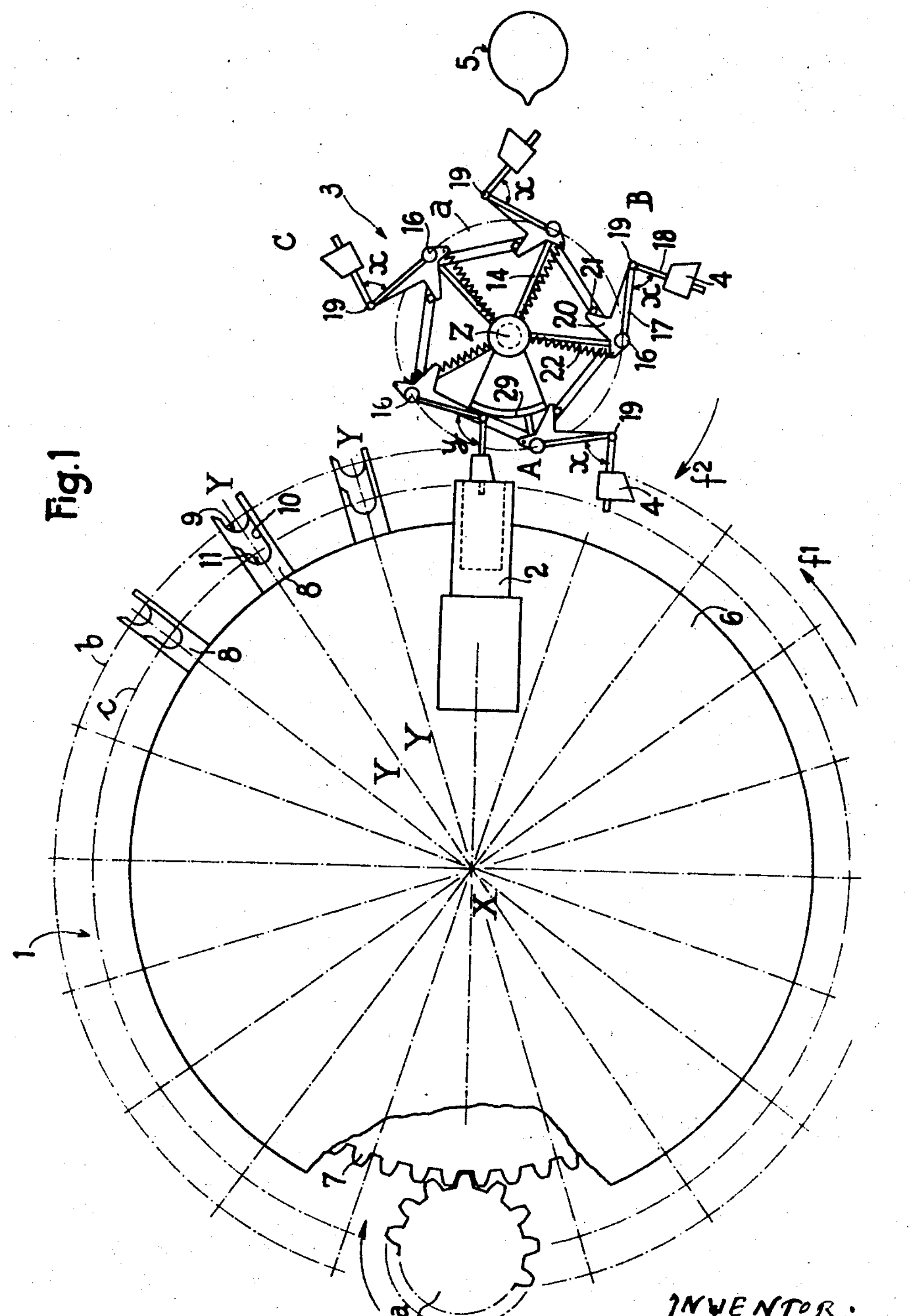


Fig.1

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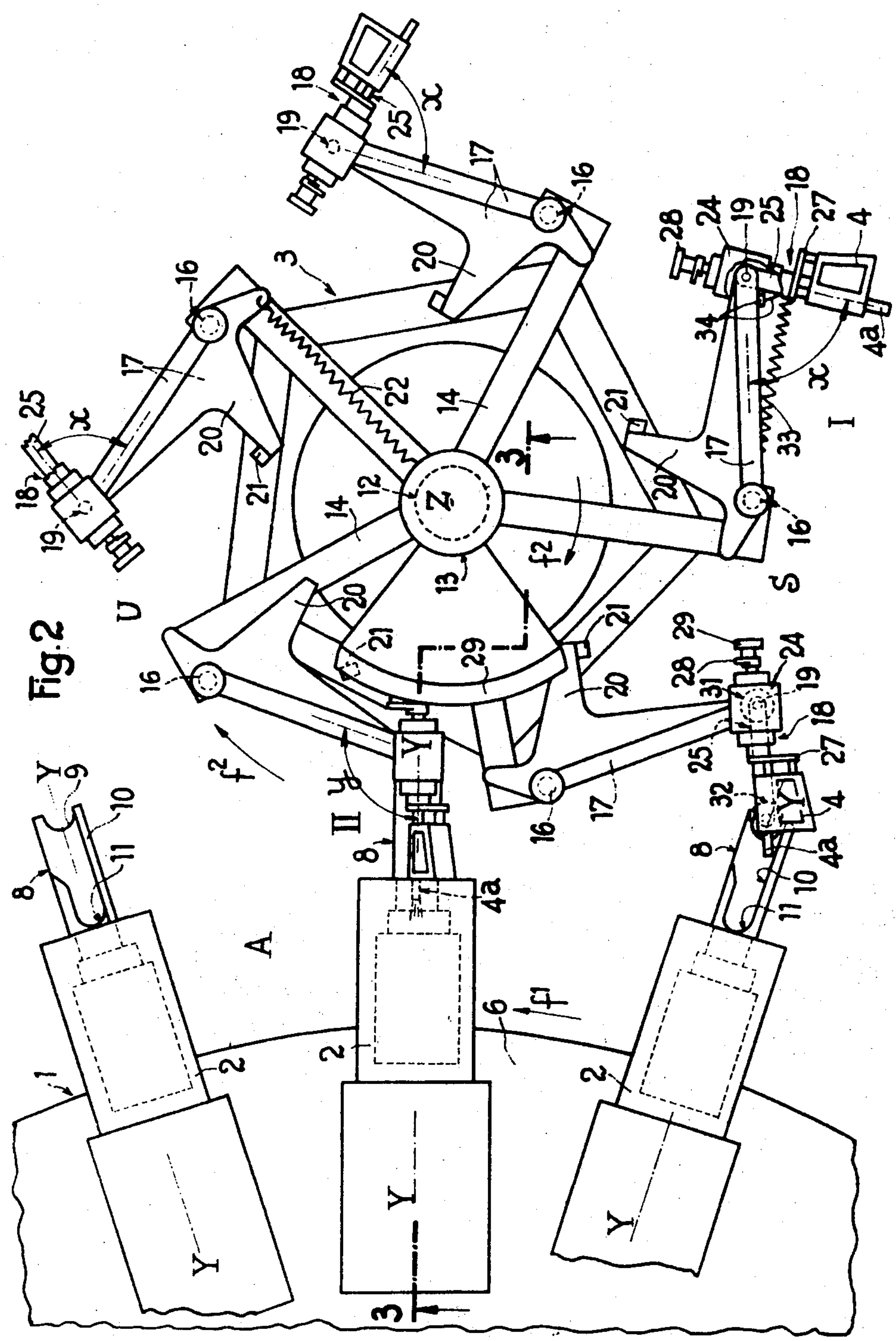

Fig.2

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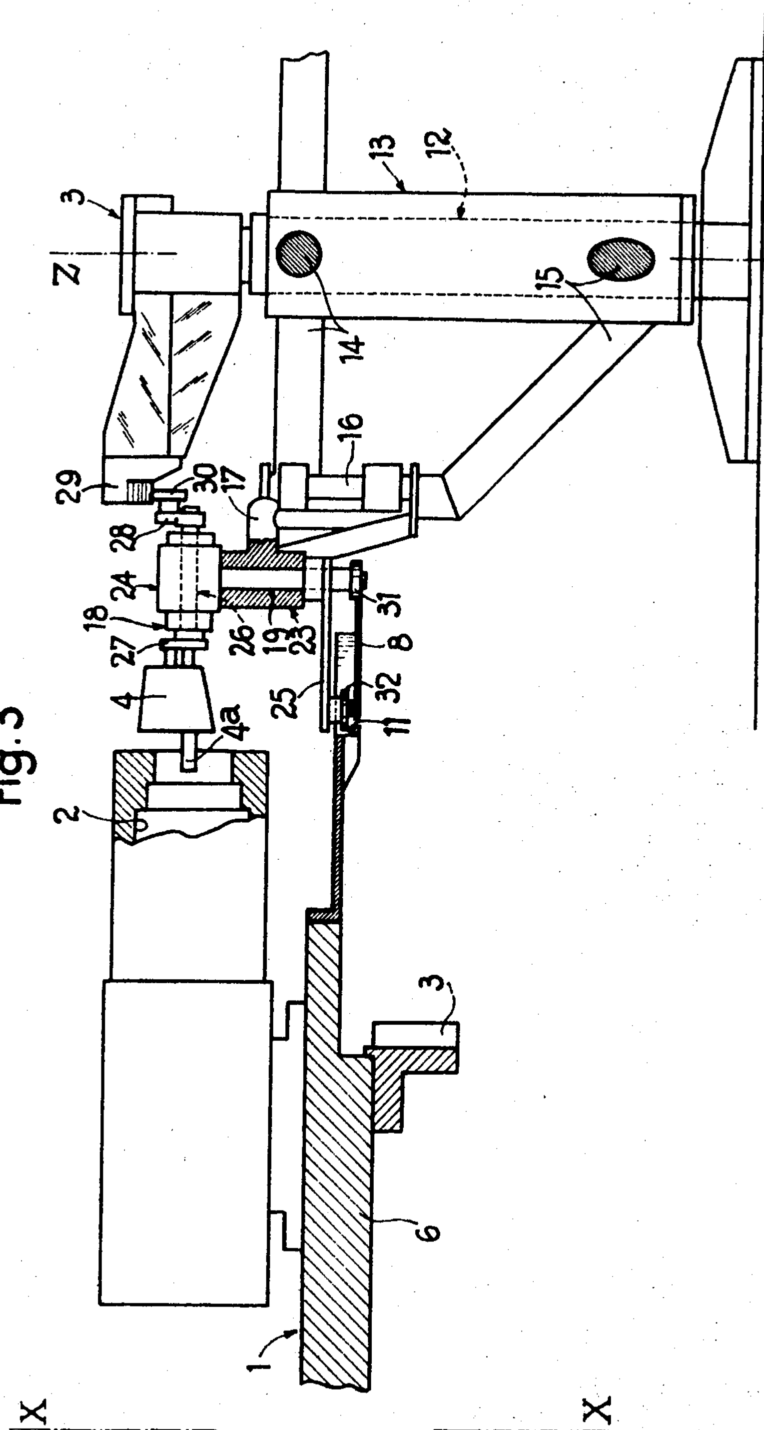

Fig. 3

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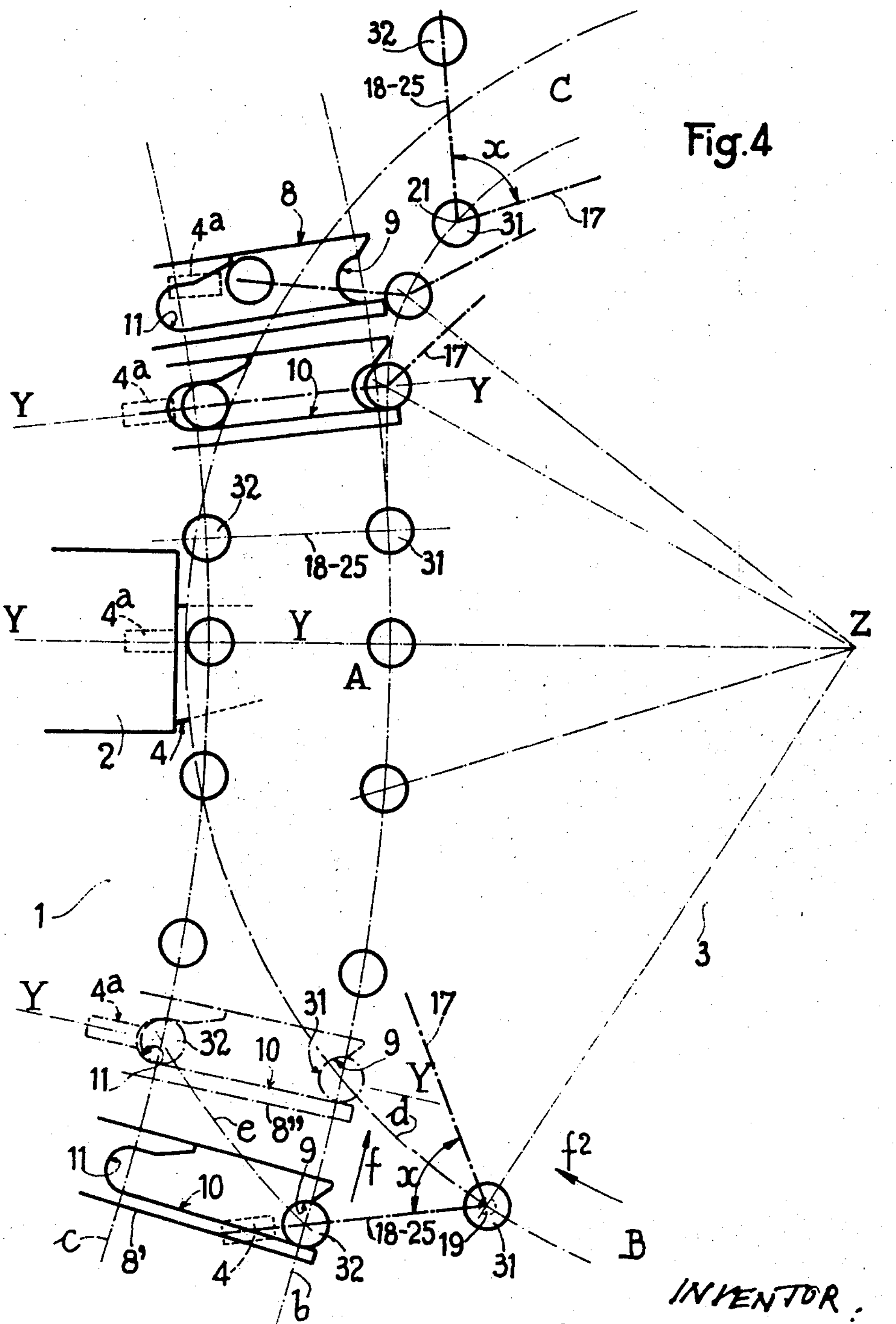
Fig.4



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SYSTEM FOR POURING INTO FOUNDRY MOULDS

The present invention relates to a foundry system for the mass-production pouring of metal into moulds, and in particular moulds arranged on a rotary support. More particularly, the invention concerns an improvement in the supply of molten metal to the moulds.

Foundry mould-carrying rotary structures or roundabouts are known which are supplied with molten metal by a single fixed casting ladle which may measure the amount of metal poured. The moulds carried by the rotary structure pass, one-by-one, in front of the ladle, the rotary structure rotating step-by-step with a stoppage of each mould in front of the ladle during a period required for the pouring of the molten metal. This arrangement is only suitable for rotary structures carrying a small number of moulds and for a limited production owing to the relatively low production rate.

Rotary structures are also known which carry, on one hand, a large number of moulds and, on the other hand, as many metering pouring ladles as there are moulds, each of the ladles having a metal capacity corresponding to the weight of the part to be cast. The metering ladles are filled by a larger ladle which is operated outside the rotary structure and accompanies each metering ladle in a short part of its circular path during the time required for filling the metering ladle and then returns to fill the following metering ladle, and so on. Each metering ladle is completely emptied into the corresponding mould. This system is suitable for mass-production but it has a drawback in that it is difficult to maintain the metering ladles at constant temperature owing to the excessive length of the circular path through which the metering ladles move in the course of the rotation of the rotary structure. Now, stability of the temperature of metering ladles is essential if the cast iron is to be stable and the good condition of the lining of the metering ladles is to be maintained. Further, this solution requires the maintenance of a large number of metering ladles.

Further, although this solution has the advantage of an accelerated production rate with respect to the preceding solution, the production rate nonetheless remains limited since the speed of rotation of the rotary structure must itself be limited, if there is only a single metal supply ladle for the rotary structure, in order to allow enough time to fill the metering ladles which pass thereunder. If the production rate is to be increased it would be necessary to provide at least another supply ladle. This is not easy to arrange and in any case presents a danger to the personnel.

The object of the invention is to provide a system for pouring into foundry moulds which is so improved as to increase the production rate while diminishing the number of metering ladles in service and easily maintaining the metering ladles at constant temperature during the rotation of the moulds.

The invention provides a system for pouring into foundry moulds comprising, in combination with a large mould-carrying rotary structure on which the moulds are arranged to extend radially, a small rotary structure carrying metering ladles the number of which is less than the number of the moulds, the circumferential spacing of the ladles corresponding to that of the moulds, the small rotary structure being rotated in synchronism with the large rotary structure by interengaging means associated with the rotary structures, and a molten metal supply ladle independent of the two rotary structures provided in the known manner for supplying metal to the metering ladles.

With this arrangement, even if the speed of rotation of the large rotary structure is relatively high, it is easy to cause the supply ladle to accompany each metering ladle of the small rotary structure during the time required for filling the metering ladle and to cause the supply ladle to return for filling the following metering ladle owing to the short distance over which the supply ladle accompanies the metering ladle, which results from the small diameter of the small rotary structure.

As a result of the small diameter of the metering ladle rotary structure and the small number of metering ladles, the metering ladles are filled with molten metal much more often than in the arrangement described hereinbefore in which the number of metering ladles is equal to that of the moulds on the mould rotary structure. In the system according to the invention, the metering ladles remain empty only in a short circular path so that it is much easier to maintain them at a practically constant temperature, which is beneficial to the metallurgical casting conditions.

According to another important feature of the invention, owing to the necessity of causing the metering ladle pouring spouts to enter and withdraw from the moulds one by one, each metering ladle is mounted on the small rotary structure to pivot about a vertical axis between an oblique position with respect to the axis of the mould for presenting the ladle at the entrance of the mould and another position parallel to the axis of the mould in which the ladle enters the mould.

Owing to this feature, it is unnecessary to provide a piston-and-cylinder device for causing the metering ladle to enter and withdraw from the mould and the system is simplified.

Further features and advantages of the invention will be apparent from the ensuing description with reference to the accompanying drawings.

In the drawings:

FIG. 1 is a diagrammatic plan view of a system according to the invention;

FIG. 2 is a partial plan view of the system on an enlarged scale;

FIG. 3 is a partial elevational view, partly in section, taken along line 3—3 of FIG. 2;

FIG. 4 is a diagram in plan and in detail on a scale larger than that of FIGS. 2 and 3, showing the manner in which the two rotary structures are interengaged, the insertion of the metering ladles in the mould and the withdrawal of the ladles from the mould.

In the illustrated embodiment, the system comprises in combination a large rotary structure **1** carrying foundry moulds **2**, a small rotary structure **3** carrying metering ladles **4** and engaged with the rotary structure **1**, and an independent ladle **5** for supplying molten metal to the metering ladles.

The rotary structure **1** comprises a large plate **6** mounted to rotate about a vertical axis X—X. The plate **6** carries *n* foundry moulds **2** arranged on radially disposed axes Y—Y (FIG. **1**). The plate **6** carries a ring gear **7** which meshes with a gear pinion **7a** rotated by a motor-speed reducer unit (not shown).

The plate 6 is moreover provided with teeth 8 arranged in the form of a ring for driving the second rotary structure 3 carrying the ladles 4 for pouring the molten metal.

The teeth 8 are arranged in a ring in radial planes containing the axis X—X and the axes Y—Y of the various moulds 2. The number of teeth is consequently equal to the number of moulds and each tooth 8 is located in alignment with a mould on the periphery of the plate 6 and extends considerably outwardly of the plate. Each tooth 8 is provided with a divergent peripheral recess 9 followed by a straight ramp 10 parallel to the corresponding axis Y—Y, and a divergent recess 11 located at the end of the ramp 10 and having a rounded shape similar to the peripheral recess 9. The teeth 8 are adapted to co-operate with rollers (described hereinafter) pertaining to the small rotary structure 3 in a zone in which the rotary structures 1 and 2 overlap, as shown in FIG. 4.

The rotary structure 3 carrying the metering ladles 4 comprises a fixed vertical journal 12 having an axis Z—Z parallel to the axis X—X. Rotatable on the journal 12 is a sleeve 13 to which are rigidly secured radially extending arms 14 which are suitably reinforced by struts 15 (FIG. 3) and are adapted to carry a metering ladle 4 as explained hereinafter. The number of arms 14, m, and consequently the number of ladles 4, is substantially less than the number of moulds 2, n. For example if $n=20, m=5$.

Mounted at the end of each arm 14 is a vertical pivot journal 16 whose axis is parallel to the axis Z—Z and describes around this axis a cylinder shown in dot-dash line at a in FIG. 1. Pivoted to each journal 16 is one end of an arm 17 which is part of a toggle carrying a metering ladle. The toggle comprises the arm 17 and another composite arm 18 which will be described in detail hereinafter and is pivoted to the other end of the arm 17 by another vertical journal 19. The arm 18 carries at its free end the corresponding ladle 4.

The arm 17 has a lateral depending portion 20 which is adapted to abut a stop member 2 (FIG. 2) carried by the chassis of the small rotary structure 3 under the action of a return spring 22 hooked between the arm 17 and the sleeve 13. There are as many stop members 21 evenly spaced around the axis Z—Z as there are arms 14. Each arm 17 pivots about a position roughly tangential to the circular path a (FIG. 1) in the course of the rotation of the rotary structure 3 about the axis Z—Z.

The first arm 17 carries rigidly at its other end a bushing 23 (FIG. 3) in which is rotatable the pivot journal 19 interconnecting the two arms 17, 18 of the toggle. The journal 19 is integral with the composite arm 18 which comprises a head 24 and a guide lever 25 which are fixed on the journal 19 on each side of the bushing 23.

Rotatable in the head 24 is a horizontal shaft 26 provided with two cranks 27 and 28 on each side of the head 24.

Rigidly secured to the crank 27 and in overhanging relation or cantilever fashion with respect to the axis of the shaft 26 is one of the pouring ladles 4. The latter is of known type adapted to tilt about the axis of its pouring spout 4a. As this ladle is connected to rotate with the shaft 26, the latter is coaxial with the spout 4a. The pouring ladle is moved between a lowered position I (FIG. 3) for receiving molten metal and a raised position II for pouring by rotating the shaft 26 by means of a fixed cam 29 which is carried, in the overlapping zone between the two rotary structures 1, 3, by the journal 12 of the rotary structure 3 and co-operates with a roller 30 carried by the crank 28. Thus the arrangement is such that in the filling position I (FIG. 2), the metal-receiving cavity of the metering ladle 4 is under the spout 4a whereas in the tilted pouring position II this cavity is above the spout 4a.

The lever 25 of the composite arm 18 is parallel to the shaft 26 and is adapted to guide the orientation of the metering ladle 4. For this purpose, the lever 25 carries, at one end, in the axial extension of the journal 19, a guide roller 31 which is centered on this journal and, at the other end, a second guide roller 32. These guide rollers 31 and 32 are adapted to respectively co-operate with the recesses 9 and 11 of the driving teeth 8 of the rotary structure 1 (as will be explained hereinafter) for the purpose of guiding the insertion of each metering ladle 4 into a mould 2.

The arms 17 and 18 of each toggle are biased towards each other by a return spring 33 which interconnects the arms. The latter form therebetween, under the action of the spring 33, a minimum acute angle x determined by an abutment 34 (FIG. 2).

However, owing to the journal 19 and in opposition to the action of the spring 33, the composite arm 18 and consequently the metering ladle 4 are capable of undergoing, by the opening of the toggle beyond the angle x, a certain movement during their displacement between the position I (FIG. 2) in which the corresponding metering ladle 4 is presented before it enters a mould 2, and the position II for causing the ladle to enter the mould 2. In the position I, the ladle 4 is oblique with respect to a radius of the small rotary structure 3 and with respect to a radius of the large rotary structure 1 and therefore with respect to the axis Y—Y of each mould 2. In the position II, the ladle 4 is roughly radial with respect to the small rotary structure 3 and located on the axis Y—Y of a mould 2 in the overlapping zone of the two rotary structures. The angle x has then assumed a larger value y.

The rotary structure 3 therefore comprises with the rotary structure 1 an overlapping or interaction zone A (FIGS. 1 and 4) in which the pouring is carried out and, with respect to the zone A, a zone B upstream of the zone A for filling the metering ladles 4 and obliquely presenting these ladles, and a downstream zone C for reconditioning the metering ladles after the pouring and for returning the ladles to the oblique presenting position.

The ladles 4 are filled with liquid or molten metal, for example molten iron, by the exterior supply ladle 5 (FIG. 1) which has a capacity much greater than each metering ladle 4 and is placed in the ladle filling zone B.

The system operates in the following manner:

The rotary structure 1 carrying the moulds 2 is rotated in the direction of arrow f^1. During this rotation, the recesses 9 and 11 of the teeth 8 of the rotary structure 1 describe circular paths b and c partly shown in dot-dash lines in FIG. 1.

The metering ladles 4 are normally in the position I which is oblique with respect to the radii of the rotary structure 3 and the angles of the toggles (17,18) have the value x so that these ladles make this angle x with the corresponding arm 17 owing to the abutment at 34 between the arms 17 and 18 under the action of the spring 33.

The arms 17 of these toggles are applied against the stop members 21 by the return springs 22 so that these arms 17 are presented in the overlapping zone A between the rotary structures 1 and 3 in a position roughly tangential to the circular path a along which the axes of the journal 16 move. The rotary structure 3 is rotated by the rotary structure 1 in the direction of arrow f^2 owing to the engagement of the roller 32 in the recess 9 of one of the teeth 8 of the rotary structure 1. This roller 32 transmits to the rotary structure 3 a thrust exerted thereon by the tooth 8 through the roughly tangential arm 17 of the corresponding toggle and the journal 16. In other words, the arm 17 transmits torque to the rotary structure 3.

More particularly, each metering ladle 4 enters a mould 2 in the following manner:

Upstream of the overlapping zone A of the rotary structures, that is, in the zone B of presentation of the metering ladles, each metering ladle 4 is in the position I (FIG. 2). Its guide lever 25 makes an angle x with the arm 17 (FIGS. 2 and 3). In this zone, the rollers 31, 32 describe paths d and e (FIG. 4) about the axis of rotation Z—Z. These circular paths intersect the circular paths b and c of the recesses 9 and 11 of the teeth 8 of the rotary structure 1. When the roller 32 reaches the peripheral recess 9 of a tooth 8 and then engages the straight ramp 10 of a tooth located at 8′ (FIG. 4), it tends to cause rotation of the lever 25, and consequently the whole of the composite arm 18, about the axis of the journal 19, but this is impossible, since the toggle closed to the angle x in fact constitutes a rigid assembly owing to the mutual abutment of the arms 17 and 18 at 34. The tangential force exerted by the tooth 8 on this toggle is therefore transmitted to the journal 16 and thus produces a torque tending to rotate the small rotary structure 3 carrying the ladles 4 about the axis Z—Z of its center journal 12. This rotary structure 3 therefore rotates in the direction of arrow f^2 (FIG. 2) while the toggle 17, 18 remains in bearing relation to the abutment 19 under the action of the torque exerted on the toggle by the tooth 8 and of the action of the spring 22.

As the rotary structures 1 and 3 continue to rotate, the metering ladle 4 moves away from the position I and moves towards the position II for entering a mould 2. As the roller 32 rolls along the ramp 10 towards the recess 11, the roller 31 in turn approaches the peripheral recess 9. In the course of this approach, the guide lever 35 rotates about the journal 19 and moves closer and closer to the position II in alignment with the axis Y—Y of a mould 2. When the roller 31 in turn enters the peripheral recess 9 of the tooth 8′ which has reached the position 8″, and the roller 32 is simultaneously in the bottom of the recess 11, the guide lever 25 is parallel to the ramp 10 and therefore parallel to the axis Y—Y of a mould. The pouring spout 4a of the metering ladle 4 which has progressively entered the mould in the course of this rotation about the journal 19, is now in the pouring position inside the mould and the ladle 4 is on the axis Y—Y of the mould 2 (position II). This position is maintained in the pouring zone, that is, along a certain arc of the circular paths b and c of the driving teeth 8. This period corresponds to the molten metal pouring period in the course of which the roller 30 of the crank 28 of each metering ladle 4 engages the arcuate ramp 29 for tilting the ladle which causes the iron to be poured from the ladle into the mould 2 (FIG. 2).

Meanwhile, in view of the fact that in this pouring zone the guide rollers 31 and 32 carried by the ends of the guide lever 25 have left their circular paths d and e about the axis Z—Z and adopted the circular paths b and c about the axis X—X of the rotary structure 1, and that the pivot journals 16 of the arms 17 continue to rotate in their circular path a about the axis of rotation Z—Z of the rotary structure 3 and move away from the axis Y—Y of the mould 2 in which a metering ladle 4 is engaged, the arm 17 is constrained to move away from the guide lever 25, and consequently from the assembly of the composite arm 18 of the toggle, in rotating about the journal 19. The angle between the two arms 17 and 18 of the toggle therefore increases beyond the value x to a value y corresponding to an obtuse angle. The return spring 33 is then put under tension.

Further, owing to the kinematic arrangement of the rotary structures 1 and 3, that is, the circular path a of the journal 16 which causes it to move away from the roller 32 engaged in the recess 11 and therefore from the circular path c about the axis X—X, each arm 17 must rotate about the journal 16 and its depending portion 20 must move away from the stop member 21. The spring 22 is put under tension. The opening of the angle between the arms 17 and 18 beyond the value x is maximum (value y) at the exit of the overlapping zone A of the rotary structures, as seen in FIG. 4.

A metering ladle 4 is withdrawn from a mould 2 in the following manner (FIG. 4):

Owing to the fact that the circular path a of the journal 16 moves away from the roller 32 engaged in the bottom of the recess 11, a traction is exerted by the journal 16 and the guide arm 25 on the roller 32 so as to withdraw it from the recess 11. It therefore starts to move away from the bottom of this recess and to roll along the ramp 10 while simultaneously the roller 31 is disengaged from its recess 9, and the guide lever 25 starts to move away from the position II and assume a position which is slightly oblique with respect to the axis Y—Y of the mould in which the ladle 4 is engaged. The pouring spout of this ladle starts to withdraw from the interior of the mould. As the rotary structure continues to rotate, the rollers 31 and 32 move away from the recesses 9 and 11 and the metering ladle 4 assumes an increasingly oblique position with respect to the axis of the mould while withdrawing from the latter. When the roller 31 is completely disengaged from the tooth 8, the return spring 33 closes the toggle 17, 18 up to the abutment 34 and the return spring 22 urges the depending portion 20 against the stop member 21. At this moment, the arms 17 and 18 of the toggle have resumed the angle x and the metering ladle 4 is completely disengaged from the mould 2. The metering ladle 4 has left the overlapping zone A between the rotary structures and enters the downstream zone C for reconditioning the metering ladle 4. The ladle is once more in the position I which is convenient for the reconditioning work. As the crank **28** of the ladle has left the arcute ramp **29**, it can be rotated manually so as to return the ladle **4** to the filling position.

Thus, the rotary structures **1** and **3** rotate continuously and in synchronism while the metering ladles **4** are automatically caused to enter and then withdraw from the moulds **2**.

In the course of the rotation of the rotary structure **3**, the molten iron supply ladle **5** is shifted in the upstream zone of the rotary structure **3** so as to fill the metering ladles **4** in succession. This movement is moreover very short owing to the small radius of the rotary structure **3**.

The main advantages of the system according to the invention are the following:

Owing to the combination of the driving teeth **8** of the rotary structure **1** and the guide rollers **31** and **32**, and the pivot journals **16** and **19** of the toggles, the rotary structure **3** is rotated in perfect synchronism with the rotary structure **1**. This drive is similar to the meshing of two gear wheels. Thus, advantageously, with a small number (m) of metering ladles **4**, it is possible to supply without stopping a large number (n) of moulds **2** which rotate continuously at rather high speed without becoming short of metering ladles **4** since those which are empty rapidly return to be filled in a short circular path. Thus, there is no loss of time in the pouring of the metal into the moulds **2** and this allows a high production rate.

More particularly, owing to the roughly tangential position of the arm **17** with respect to the circular path *a* of the journals **16** of the rotary structure **3**, the teeth **8** can exert a torque on the rotary structure **3** through the rollers **31** and **32** and the journals **16**.

Owing to the guide lever **25** and to its rollers **31** and **32** in combination with the recesses **9** and **11** and the ramp **10** of each tooth **8**, each metering ladle **4** is perfectly guided for its insertion into a mould **2** and withdrawal from the mould. Owing to the pivot journals **16** and **19**, the metering ladle can effect these insertion and withdrawing movements with respect to the mould owing to the overlapping of the circular paths of the parts of the rotary structures **1** and **3**, with no need for a piston and cylinder device for inserting and withdrawing each metering ladle. In particular, it is these journals which enable each ladle **4** to be maintained on the axis Y—Y of a mould **2** in a certain arc of the circular path of the rotary structure **1**, in the pouring zone, while the journal **16**, in continuing its circular path about the axis Z—Z of the rotary structure **3**, moves away from the corresponding ladle **4**.

Owing to the action of the return springs **22** and **33**, each ladle **4** can resume its position I for entering a mould, whereas if it retains its radial pouring position II it would be impossible to insert it in a mould in the following rotation since it would strike the outer wall of the mould.

Owing to the small size of the rotary structure **3**, and therefore the small circular path of the metering ladles **4** about the axis Z—Z, a very short time elapses during the passage through the zone for cleaning the metering ladles, that is, between the moment when they have just poured the metal and the moment when they once again receive metal from the supply ladle **5**. For this reason, the metering ladles **4** are maintained at practically constant temperature, which is advantageous for

the metallurgical pouring conditions and avoids thermal shocks. Thus, advantageously, the metering ladles have a longer life. Note, also, that the reconditioning of these ladles, consisting of coating them with carbon black, is carried out very easily in the downstream zone on the periphery of the rotary structure **3**.

Having now described my invention what I claim and desire to secure by Letters Patent is:

1. A system for the mass-production pouring of metal into foundry moulds comprising, in combination: a plurality of moulds each having an entrance, a large mould-carrying rotary structure having an axis of rotation and on which the moulds are circumferentially spaced and arranged to extend along radial axes, a small rotary structure having an axis of rotation, metering ladles having pouring spouts and carried by the small rotary structure, the number of metering ladles being less than the number of moulds, the ladles having a circumferential spacing corresponding to the circumferential spacing of the moulds, interengaging means associated with the rotary structures for rotating the small rotary structure in synchronism with the large rotary structure, and a molten metal supply ladle independent of the two rotary structures and associated with the metering ladles in the known manner for supplying metal to the metering ladles.

2. A system as claimed in claim **1**, wherein the large rotary structure comprises circumferentially spaced driving teeth arranged in a ring formation and the small rotary structure carries supports carrying the metering ladles and rollers which are adapted to engage the driving teeth.

3. A system as claimed in claim **2**, wherein each tooth is disposed radially of the axis of rotation of the large rotary structure in alignment with each mould and parallel to the radial axis of the mould and comprises a peripheral recess, a second recess having a similar rounded shape as the first recess for guiding each metering ladle with respect to each mould, and a straight radial ramp interconnecting the two recesses, the second recess being adapted to limit the insertion of the metering ladle in a mould and the whole of each tooth being adapted to maintain the metering ladle parallel to the radial axis of the mould.

4. A system as claimed in claim **2**, wherein the small rotary structure has a body and the support of each metering ladle comprises a toggle having a first arm having an end carrying the corresponding metering ladle and a second arm, a first journal parallel to the axis of rotation of the small rotary structure pivoting the second arm to the rotary structure, a second journal parallel to the first journal pivotally interconnecting the first arm and second arm, the two arms of the toggle making an angle which varies from a first value, corresponding to a first position of the metering ladle which is oblique relative to said radial axis of the mould and in which the metering ladle is presented in front of the entrance of each mould, to a larger second value corresponding to a second position of the metering ladle in which the pouring spout of the metering ladle is inserted in the entrance of the mould in a direction parallel to the radial axis of the mould.

5. A system for the mass-production pouring of metal into foundry moulds comprising, in combination: a plurality of moulds each having an entrance, a large

mould-carrying rotary structure having an axis of rotation and on which the moulds are circumferentially spaced and arranged to extend along radial axes, a small rotary structure having an axis of rotation, metering ladles having pouring spouts and carried by the small rotary structure, the number of metering ladles being less than the number of moulds, the ladles having a circumferential spacing corresponding to the circumferential spacing of the moulds, interengaging means associated with the rotary structures for rotating the small rotary structure in synchronism with the large rotary structure, and a molten metal supply ladle independent of the two rotary structures and associated with the metering ladles in the known manner for supplying metal to the metering ladles, the large rotary structure comprising circumferentially spaced drying teeth arranged in a ring formation and the small rotary structure comprising supports respectively carrying the metering ladles and rollers which are adapted to engage the driving teeth, each tooth being disposed radially of the axis of rotation of the large rotary structure and in alignment with each mould and parallel to the radial axis of the mould and comprising a peripheral recess, a second recess having a similar rounded shape as the first recess for guiding each metering ladle with respect to each mould, and a straight radial ramp interconnecting the two recesses, the second recess being adapted to limit the insertion of the metering ladle in a mould and the whole of each tooth being adapted to maintain the metering ladle parallel to the radial axis of the mould, the support of each metering ladle comprising a toggle having a first arm having an end carrying the corresponding metering ladle and a second arm, a first journal parallel to the axis of rotation of the small rotary structure pivoting the second arm to the rotary structure, a second journal parallel to the first journal pivotally interconnecting the first arm and second arm, the two arms of the toggle making an angle which varies from a first value, corresponding to a first position of the metering ladle which is oblique relative to said radial axis of the mould and in which the metering ladle is presented in front of the entrance of each mould, to a larger second value corresponding to a second position of the metering ladle in which the pouring spout of the metering ladle is inserted in the entrance of the mould in a direction parallel to the radial axis of the mould, the first arm of each toggle being composite and comprising a guide lever which has two opposed ends each of which ends carries a roller co-operating with the recesses and the ramp of the corresponding driving tooth, so as to first bring and then maintain the metering ladle parallel to the radial axis of the mould.

6. A system as claimed in claim **4**, comprising on each toggle support a first return spring connected between the first arm of the toggle and the body of the small rotary structure, and a second return spring connected between the first arm and second arm of the toggle so as to bias said metering ladle from said second position to said first position by rotation about the first and second journals and the return of the first arm and second arm of the toggle against respective abutments.

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