

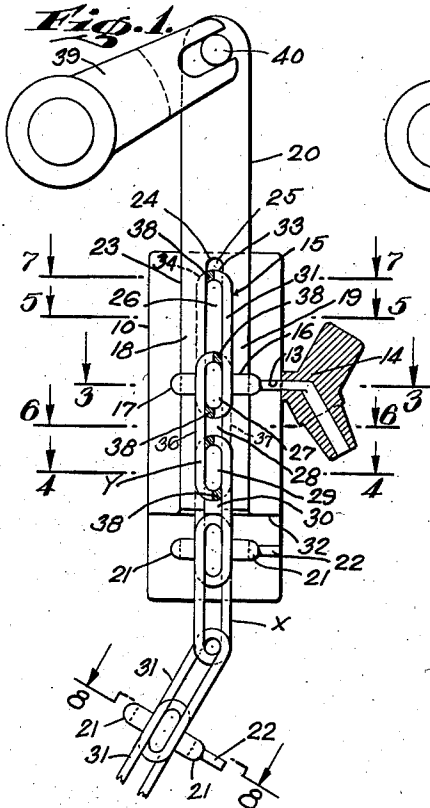
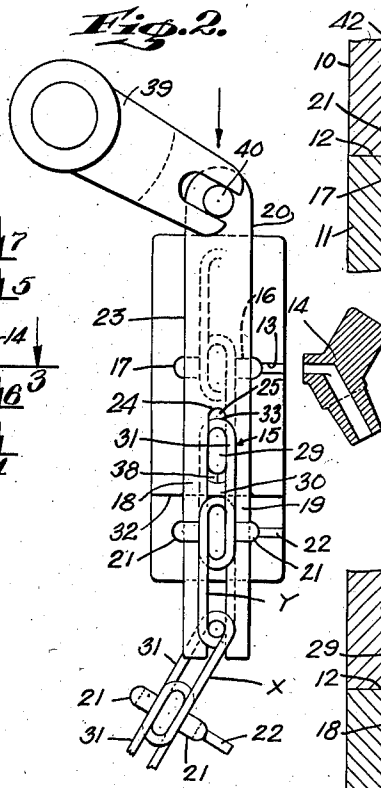
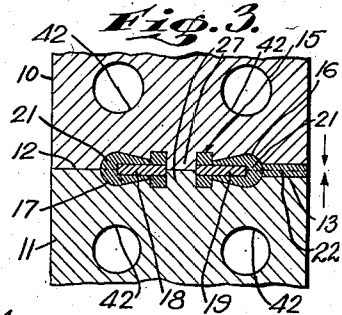
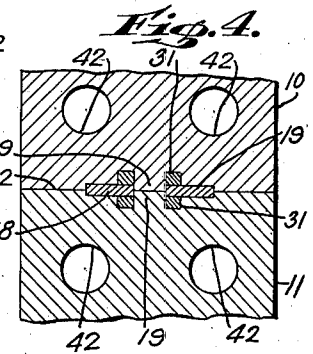
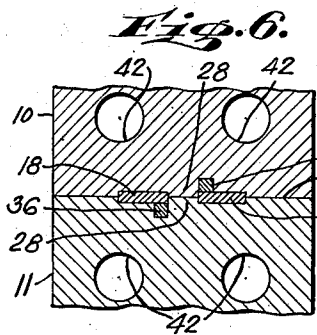
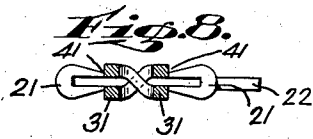
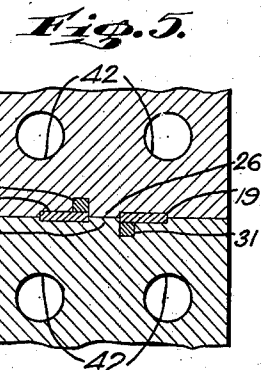
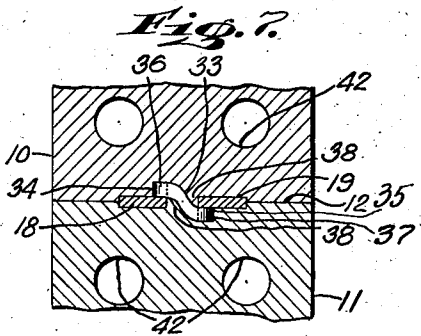
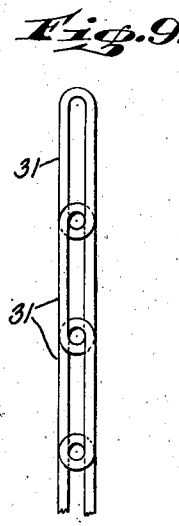
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2,363,801

METHOD OF CASTING CHAIN AND THE LIKE

Filed June 27, 1942



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2,363,801

METHOD OF CASTING CHAIN AND THE LIKE

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17 Claims. (Cl. 18—59)

This invention relates to the method of forming one casting within another casting to establish an interlock or coupling between two castings. More particularly the invention relates to the method of forming chains with the adjacent links of the chains formed one within the other in producing chains of predetermined lengths, composed of solid die cast link member or elements. The novel features of the invention will be best understood from the following description when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed, and in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a diagrammatic sectional view taken along the parting line of a die, and illustrating the formation of a few links of a chain.

Fig. 2 is a view similar to Fig. 1 showing the position of the core in feeding a cast unit into a position preparatory to forming the next successive casting.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a section on the line 6—6 of Fig. 1.

Fig. 7 is a section on the line 7—7 of Fig. 1.

Fig. 8 is a section on the line 8—8 of Fig. 1.

Fig. 9 is a detailed view of a few links of a completed chain made according to my invention.

My invention deals generally with the die casting of what might be termed inter-locked or inter-coupled members, regardless of the shape or contours of these members and comparative sizes thereof, and also regardless of the material employed. From the standpoint of material, it will be understood that the castings may be formed from any suitable die casting alloy or plastic injection molding material.

In order to simplify illustration of one adaptation of the invention, I have diagrammatically illustrated in the accompanying drawing the formation of a chain wherein the links are of the same size and contour and of relatively simple design. At this time it is also well to point out that where the castings are formed of plastic material, adjacent links or groups of links, may be formed of different or contrasting colors by simply moving nozzles discharging different colored materials into registering position with the gate passage of the dies.

In the construction shown, 10 and 11 represent the two parts of the die, adjacent surfaces or the parting line of which is indicated at 12, note Fig. 3. On the parting line of the die is formed

a gate or admission passage 13, which opens outwardly through one side of the die so that a nozzle 14 registering with the gate passage will facilitate pressure injection of the heated casting material into the cavity or impression 15, formed on the adjacent surfaces or parting line of the die. The gate 13 communicates with one enlarged chamber and through the impression 15 to a corresponding chamber 17, in which chambers are arranged the forked ends 18 and 19 of a core member 20. It will thus be seen, from a consideration of Figures 3 and 8, that the casting material formed in the chambers 16 and 17 and around the core member 18, 19 will form substantially U-shaped gate portions 21 one of which includes the rod portion 22 formed in the gate opening 13.

The core 20 seats in the elongated recess 23, formed on adjacent surfaces of the dies 10 and 11 and the slot 24 of the core which forms the forked ends 18, 19 receives the members 25, 26, 27, 28, 29, and 30 which may be termed the core portions of the dies which form the openings of the resulting links 31 of the chain. In other words, the surfaces of the members 25 to 30 inclusive are flush with the other abutting surfaces of the dies and the various sections Figures 3 to 7 inclusive will clearly illustrate this fact. Below the surface 30 adjacent surfaces of the dies are recessed as indicated at 32 to provide the clearance for receiving the castings including the member 21 while supported in position to receive the next successive cast link unit.

In the present construction and in order to increase production of the chain, I form in each unit casting two inter-coupled links and this unit is then joined with the next unit of two links, so that in two casting portions four links of the resulting chain are formed.

Noting for example Fig. 7 of the drawing, it will appear that the ends of the links are formed by cavity portions 33 which unite a cavity 34 formed in the die part 10 with a cavity 35 formed in the die part 11, the cavity 33 crossing through the recess 24 in the forked member 18, 19 of the core 20. This same crossing takes place at each of the rounded ends of the link. In other words, again considering Fig. 7 of the drawing, it will appear that one long side 36 of the link is formed at one side of the core 18, whereas the other long side 37 is formed on the opposite side of the core 19 whereas this condition is reversed on the next adjacent link. Note in this connection Fig. 6 of the drawing in which figure the comparable sides 36 and 37 of the next link are arranged on

directly opposed surfaces of the forks 18, 19 of the core 20. This structural arrangement will be clear from a consideration of these figures as well as Figures 1 and 5. On the other hand in considering Fig. 4 which shows a section taken through the overlapped inter-coupled portions of two link units; here the side portions of the inter-coupled ends is illustrated. In other words it shows the upper end of one link unit and the lower end of the adjacent link unit illustrating the core forks 18 and 19 separating these inter-coupled ends one from the other.

Where the cross portions 33, forming the rounded ends of the links, are formed in the dies, the surfaces of the dies will have projecting elements 38 which project from the normal surfaces of the dies as is clearly illustrated in Figure 7 and also by the small sectional portions in Figure 1. In this figure the sectional portions are on the die part 11 but corresponding sectional portions are on the die part 10 but are covered by the links which are shown in elevation in Figure 1.

In producing chain according to the teachings diagrammatically illustrated in the accompanying drawing, the dies 10 and 11 are moved into firm engagement with each other around the core 20 when in the position shown in Fig. 1. Casting material is then pressure injected into the cavities of the dies after which the dies are separated and the core 20 is moved downwardly through any suitable means such for example, as a forked arm 39, engaging a pin 40 on the core. In its downward movement, the core 20 is projected to the position indicated in Fig. 2 whereupon the dies 10 and 11 are partially closed, the core stripped from the cast unit, then returned to the position shown in Fig. 1, after which the dies are again firmly moved into engagement with each other and the next casting operation is performed. In the above operation, the first casting is suspended from the members 29 of the separated dies, and is also retained in the aligned position illustrated at X in Figure 1, preparatory to the formation of the next casting Y. After the casting Y is formed, then this casting is moved into the position of the X casting, Figure 1, and this cycle of operation is continued.

As the links or chains feed out of the casting machine they may be directly or indirectly passed through a trimming machine which would trim off the U-shaped gate portions 21 along the lines 41, note Figure 8 of the drawing, which trimming operation would free the two links of each cast unit, thus producing a resulting chain, note Figure 9, in which all of the links are inter-locked and free for independent movement one upon the other as in conventional chain structures. Wherever desirable or considered necessary, the offset end portions of the links may be shaped by suitable dies or tools to flatten these ends. In accomplishing this result on plastic materials, it will be desirable to perform this operation while the casting is still warm or to re-heat the casting preparatory to this forming operation.

In producing most forms castings according to the invention, water cooled dies are employed, and in the several views 42 represents part of circulating chambers employed for this purpose as previously stated. The particular shape or contour of each casting may be varied to suit the particular product to be produced and where the product is in the form of a chain, the shape and size of the adjacent links of the chain may be varied, the only limitation being the necessity

of forming the links so as to provide free removal of the castings from the dies and further in establishing the interlinkage between adjacent castings or cast units.

In referring to the member 20 as a core member it is to be borne in mind that this expression is descriptive of a member movable with respect to the two die parts proper. In actual fact, however, in the present instance the member 20 forms side surfaces of the resulting castings, and from this standpoint can properly be termed as a supplemental die part movable angularly with respect to relative movement of the dies 10 and 11. This member 20 also functions as a stripper removing the castings from the dies 10 and 11.

The illustrations in the accompanying drawing are chosen to disclose a simple adaptation of the invention. It will be apparent, however, that many more intricate forms of coupled or inter-linked castings may be formed. In all instances the coupled or inter-linked portions of the castings will be over-lapped and one die part, for example the supplemental die part, will form a partition subdividing these over-lapped portions. As will appear from the present disclosure, where two castings are simultaneously formed, over-lapped portions of these castings are temporarily united through the medium of the gate portions. The severing of these gate portions frees the castings from each other while retaining their coupled or linked relationship. It will also be apparent that in some instances the two coupled or linked castings may be of entirely different shape and contour. Still further in some instances the two coupled castings or members may be retained in united relationship, for example, where it may be desirable to maintain two adjacent links rigidly coupled to form what might be termed a dual link unit. In some instances the gate portion may be made ornamental for this purpose.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of forming a series of interconnected die cast links, which comprises supporting two die parts in firm engagement upon a core member arranged on the parting line of the die parts, positioning the core member in the die parts in such manner as to form, in conjunction with cavities of said die parts a pair of interlocked links by the pressure injection of heated casting material into said cavities with the core member disposed between overlapped portions of said links, then separating the die parts and feeding the formed castings relatively thereto by said core member, then stripping the core member from said castings with the die parts in partially closed position and returning the core to casting position, and then forming another pair of links with one of the second named pair of links inter-locked with one of the first pair of links.

2. The method of forming a series of interconnected die cast links, which comprises supporting two die parts in firm engagement upon a core member arranged on the parting line of the die parts, positioning the core member in the die parts in such manner as to form, in conjunction with cavities of said die parts a pair of interlocked links by the pressure injection of heated casting material into said cavities with the core member disposed between overlapped portions of said links, then separating the die parts and feeding the formed castings relatively thereto by said core member, then stripping the core member from said castings with the die parts in partially

closed position and returning the core to casting position, then forming another pair of links with one of the second named pair of links inter-locked with one of the first pair of links, uniting each pair of links in a gate portion, and removing the gate portion to form independent relatively movable links of each pair.

3. The method of forming inter-engaged and relatively movable castings, which comprises simultaneously forming two castings in a mold with parts of each casting inter-linked and separated by a core, employing a common gate communicating with the inter-linked portions of said castings, removing the castings and core from the mold, and then separating the core from the castings and removing the gate portions from the castings to form resulting independent, inter-engaged and relatively movable castings.

4. The method of forming inter-coupled die castings, which comprises simultaneously die casting two members having over-lapped and inter-coupled portions, by pressure injection of a casting material into a die and around a core disposed between the over-lapped portions of said members, uniting the over-lapped portions in a common gate, removing the cast members and core from the die and separating the core from the castings, and then severing the gate to form independent relatively movable and inter-coupled die cast members.

5. The method of forming inter-coupled die castings, which comprises simultaneously die casting two members having over-lapped and inter-coupled portions, by pressure injection of a casting material into a die and around a core disposed between the over-lapped portions of said members uniting the over-lapped portions in a common gate, moving the cast members by said core into a position to receive the next successive casting, stripping the first casting from the core, then forming another casting comprising two inter-coupled members, and forming one of the members of the last casting in inter-coupled relation with one member of the first casting.

6. The method of forming inter-coupled die castings, which comprises simultaneously die casting two members having over-lapped and inter-coupled portions, by pressure injection of a casting material into a die and around a core disposed between the over-lapped portions of said members, uniting the over-lapped portions in a common gate, moving the cast members by said core into a position to receive the next successive casting, stripping the first casting from the core, then forming another casting comprising two inter-coupled members, forming one of the members of the last casting in inter-coupled relation with one member of the first casting, and then severing the gate portions from the castings to render said inter-coupled members movable relatively to each other.

7. The method of simultaneously inter-engaging die castings, which comprises the steps of moving two die parts having adjacent impression surfaces on the parting line thereof toward each other and relatively to a supplemental die part arranged on the parting line of the die and movable angularly with respect to the path of movement of said die parts, utilizing the supplemental die part as a die element forming predetermined surfaces of the resulting castings and as a partition subdividing over-lapped sections of the two castings to be formed, forming a gate in the die parts adjacent the over-lapped sections, pressure injecting heated casting material into the cavities

of the die through said gate in forming the castings joined by the gate portion, and then severing the gate portion when removed from the die parts to form independent and inter-coupled castings.

8. The method of simultaneously inter-engaging die castings, which comprises the steps of moving two die parts having adjacent impression surfaces on the parting line thereof toward and from each other and relatively to a supplemental die part arranged on the parting line of the die and movable angularly with respect to the path of movement of said die parts, utilizing the supplemental die part as a die element forming predetermined surfaces of the resulting castings and as a partition subdividing over-lapped sections of the two castings to be formed, forming a gate in the die parts adjacent the over-lapped sections, pressure injecting heated casting material into the cavities of the die through said gate in forming two castings joined by the gate portion, then separating the die parts, using the supplemental die as means for feeding the first casting into different position between the die parts, separating the casting from said supplemental die, then returning said supplemental die to normal casting position, and again closing the die parts and forming another casting with part of the last named casting inter-locked with a portion of the first named casting.

9. The method of forming two cast members having ends coupled for movement relatively to each other and employing die parts movable toward and away from each other, comprising the steps of casting part of one casting in over-lapped relationship to the adjacent casting, partitioning the over-lapped portions of said castings one from the other by an element on the parting line of the die parts, then separating the die parts from the castings and said partitioning element, and then removing the castings from the partitioning element.

10. The method of forming two die cast members having coupled ends, which comprises simultaneously forming in suitable dies over-lapped portions of two members in crossed relationship to each other and separated by a partitioning element movable relative to said dies, opening said dies, moving said members and partition element, partially closing said dies, and then removing the partition element from said members.

11. The method of simultaneously forming two over-lapped and inter-coupled cast members, which comprises the arrangement of a supplemental die part on the parting line of relatively movable dies to partially form the impressions or cavities of the dies forming said members and also providing a partition separating over-lapped portions of said cavities, injecting heated casting material into the dies at the over-lapped portions of said cavities in simultaneously forming two cast members, then removing the members and partition from said dies, separating said members and partition and returning the partition to its original position between said dies for the next casting operation.

12. The method of forming inter-coupled die castings, adapted for relative movement in relation to each other, employing complementary and separable die parts, which comprises casting over-lapped portions of said castings on opposite sides of and in contact with a partition positioned in and separable from said die parts and castings and forming with said die parts impressions adapted to form said inter-coupled castings, separating said dies, moving said castings on said

partition member, partly closing said dies, stripping said partition member from said castings and returning said member to its original position between said dies for the next casting operation.

13. The method of forming inter-coupled die castings, adapted for relative movement in relation to each other, employing complementary and separable die parts, which comprises casting overlapped portions of said castings on opposite sides of and in contact with a partition positioned in and separable from said die parts and castings and forming with said die parts impressions adapted to form said inter-coupled castings, uniting said inter-coupled parts by means of a common gate, moving the gate and castings united thereby, together with the partition, relatively to said die parts, and separating the casting from the partition and gate.

14. The method of forming inter-coupled die castings adapted for relative movement in relation to each other, employing complementary and separable die parts which comprises casting overlapped portions of said castings on opposite sides of and in contact with a partition positioned in and separable from said die parts and castings and forming with said die parts impressions adapted to form said inter-coupled castings, separating said castings and partitions from said die parts, and then separating said inter-coupled castings from said partition.

15. The method of producing a chain comprising a series of die cast links intercoupled for free relative movement and employing complementary and separable die parts, which comprises successively casting corresponding members of a pair of links in the same impressions of said die parts and on opposite sides of a partition positioned between and separable from said die parts and links and forming with the die parts impressions adapted to form said inter-coupled links, moving each casting, as formed, from said impressions into a predetermined position between said die parts before casting the succeeding pair of links, casting a portion of each of said succeeding pairs

in interlocked and overlapped relation with said formed casting, separating said castings and partition from said die parts, and separating the castings from the partition.

16. The method of producing a chain comprising a series of die cast links intercoupled for free relative movement and employing complementary and separable die parts, which comprises successively casting corresponding members of a pair of links in the same impressions of said die parts and on opposite sides of a partition positioned between and separable from said die parts and links and forming with the die parts impressions adapted to form said inter-coupled links, moving each casting, as formed, from said impressions into a predetermined position between said die parts before casting the succeeding pair of links, casting a portion of each of said succeeding pairs in interlocked and overlapped relation with said formed casting, separating said castings and partition from said die parts, separating the castings from the partition, and casting predetermined links of the resulting chain in one color material and other links of the chain in material of another color.

17. The method of producing a chain comprising a series of die cast links intercoupled for free relative movement and employing complementary and separable die parts, which comprises successively casting corresponding members of a pair of links in the same impressions of said die parts and on opposite sides of a partition positioned between and separable from said die parts and links and forming with the die parts impressions adapted to form said inter-coupled links, moving each casting, as formed, from said impressions into a predetermined position between said die parts before casting the succeeding pair of links, casting a portion of each of said succeeding pairs in interlocked and overlapped relation with said formed casting, separating said castings and partition from said die parts, separating the castings from the partition, and shaping each link of the resulting chain to a predetermined form.

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