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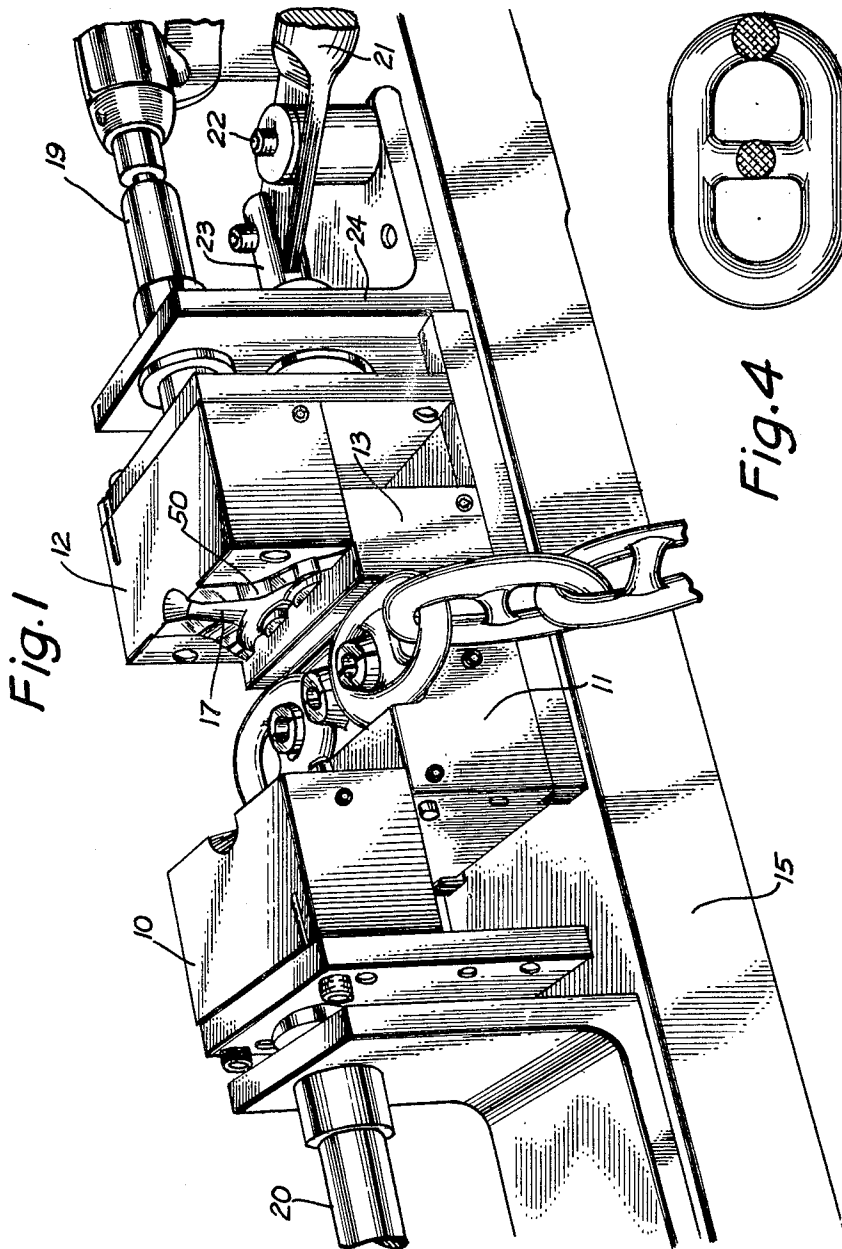
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3,176,357

PERMANENT MOLD FOR CASTING ALUMINUM STUD CHAIN LINKS

Filed April 27, 1962

2 Sheets-Sheet 1



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Fig.3

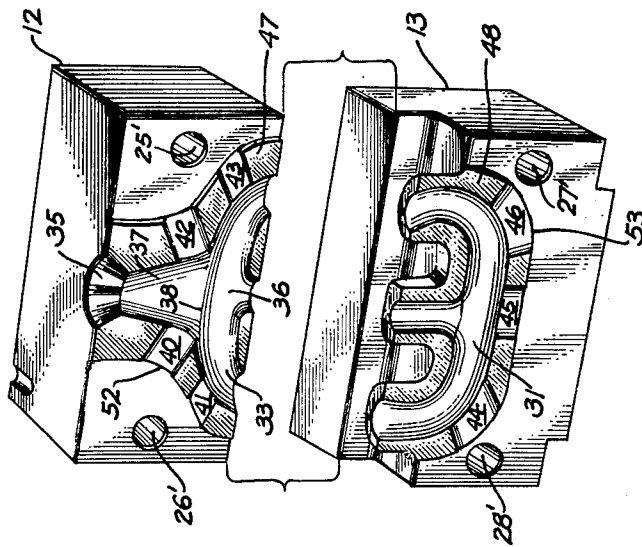
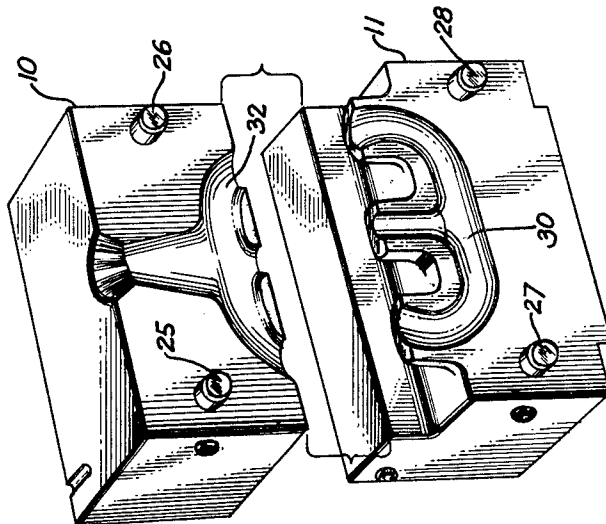


Fig.2



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**PERMANENT MOLD FOR CASTING ALUMINUM
STUD CHAIN LINKS**

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5 Claims. (Cl. 22—137)

This invention relates to the manufacture of chains and chain links. The invention is more particularly concerned with a permanent mold for casting stud link chains.

The invention constitutes an improved permanent mold structure over my prior molds as described and claimed in U.S. Patent 2,786,248. In my prior patent there is illustrated and described a permanent mold for casting chain stud links of aluminum or bronze. The improved permanent mold of this invention distinguishes therefrom in the following important and essential features.

(1) The permanent mold is useful for casting stud links of various metals and alloys regardless of the shrinkage and physical characteristics of the casting metal.

(2) By reason of the off-set structure of the complementary mold block faces defining the chain link cavity, as hereinafter described, which provides for rapid release of gases from the mold cavities during casting, the mold is much more versatile in use. The mold may be used for casting large diameter chain links, e.g. links having a length of two to three feet and cross-section of six to eight inches, and such as anchor chains which are used for heavy duty work. Similarly, the permanent mold is adapted for casting small size stud link chains.

(3) The permanent molds of the invention make possible the casting of beryllium-copper stud links of increased tensile strength. For example, stud link chains made of beryllium copper employing the improved molds of my invention had a tensile strength of 170,000 pounds/sq. inch. This is contrasted with the same size stud link chains manufactured by conventional molds which had a tensile strength of only 70,000 lbs./sq. in. This difference of 100,000 lbs./sq. in. in T.S. represents a T.S. gain of approximately 150% over conventionally cast chains.

(4) The mold construction having the recess provision or offset mold cavity structure which is in communication with multiple vents around the mold cavity permits the casting to be carried out at twice the rate using prior mold structures. Castings are completed in 5 to 6 seconds with beryllium-copper alloys, and 6 to 7 seconds in the use of aluminum alloy metals.

(5) High shrinkage casting metal alloys are readily cast into chain links, and the permanent molds are usable for over a thousand times without repair or replacement. Due to the speed at which the castings can be made, shrinkage, cracking and sticking of the mold parts is eliminated by the improved mold structures.

It is a primary object of the present invention to provide an improved permanent mold for use in the casting of stud chain links.

Another object of the invention is to provide a permanent mold which permits the casting of stud links whereby the same are interconnected to a pair of similar precast stud links whereby a chain of such stud links is expeditiously produced and providing a stud link chain of any desired length.

A further object of the invention is to provide a multiple part mold which is made of permanent material such as metal, for example alloy steel as aforementioned, and which can be both rapidly assembled preparatory to the casting operation and quickly disassembled after congealing of the metal in the mold to free the stud link after it has been cast, the mold being used again and again to cast the stud links.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the drawings in which—

FIGURE 1 is a perspective view in elevation of a permanent mold embodying my invention and showing the mold open and preparatory to casting an interconnecting stud link of a chain, the mold and associated mechanism for opening and closing the mold being shown partly broken away;

FIGURE 2 is an exploded view in perspective of two of the mold sections which are adapted to be fitted together during use of the mold for casting;

FIGURE 3 is a similar view as in FIGURE 2, and illustrating the complementary mold sections and depicting the mold cavity configuration, the mold blocks being fitted together to form the mold cavity for casting a stud link; and

FIGURE 4 is a perspective view illustrating a cast stud link, the link being shown partially in section.

Referring more particularly to FIGURES 1 to 3 of the drawings, a permanent mold embodying my invention is shown as having four complementary parts or blocks 10, 11, 12, and 13. The mold blocks each are shaped to comprise a portion of a mold cavity which when fitted together defines a stud link mold cavity. The lower mold block 11 is held stationary, the same being fixedly arranged on a supporting base 15, as shown in FIGURE 1. The mold blocks 10, 12 and 13 are adapted to be moved rectilinearly of the base 15 to close the mold parts and form the mold cavity 17. Further, as illustrated in FIGURE 1, the top mold blocks 10 and 12 are adapted to slidably engage the upper surfaces of the bottom mold blocks 11 and 13.

As shown in FIGURE 1, the movable mold blocks 10, 12 and 13 are advanced or retracted by a piston arm member 19 located at one end of the base 15 and a like actuated arm 20 disposed at the opposite end. Where desired, opening and closing of the mold may be accomplished manually by reciprocation of the lever arm 21. The latter arm is connected through a pivot 22 to an abutment 23 which in turn is secured to a movable wall 24. Closing and opening of the mold is preferably carried out utilizing compressed air and the piston and cylinder means. Hydraulically actuated means may be used if desired as will be readily understood by those skilled in the art.

To assure accurate registry of the mold complementary blocks, the same are fitted with dowel pins 25, 26, 27 and 28, as illustrated in FIGURE 2. These dowel pins fit into the complementary mold apertures 25', 26', 27' and 28' respectively whereby accurate registration of the same is assured. Further, the coating mold surfaces are carefully machined to close tolerances whereby the mold cavity is sharply defined. The mold faces which engage together are provided with complementary mold cavities. Such partial cavities are shown at 30 on mold 11, and at 31 on mold 13. Similar complementary cavities are shown on molds 10 and 12, at 32 and 33 respectively.

The mold cavity in the mold blocks also includes a gate 35 which is suitably shaped by the complementary mold blocks 10 and 12. This gate communicates with the main chain stud link mold cavity 36 by means of a tapered flared neck 37. The neck portion 37 is flared outwardly near the junction with the main stud link mold cavity, as at 38, to provide a strengthened cast jointure and prevent cracking of the casting at the neck or flared section.

To permit ready release of air trapped in the mold there is provided a multiplicity of vents such as shown at 40, 41, 42, 43, 44, 45 and 46, the vents being placed at each curved section and at the highest point of radius of curvature in the chain link mold cavity. The vents

allow air and gases in the mold cavity to be quickly forced out of the mold through the multi-vents upon introduction of the molten metal. Any even minor trapping of gases in the mold results in the production of a defective porous casting.

Rapid and unobstructed release of the gases from the mold cavity is achieved by raising or offsetting of the mold face portions as at 47 and 48, adjacent to the vent openings. The vents communicate with the opening or slot as indicated at 50, formed between the mold blocks when the same are fitted together for casting a chain link. Complementary mold parts 10 and 11 fit snugly against the mold faces 47 and 48 and leaving an opening slot as at 52 and 53 between the mold blocks 12 and 13. This recessed opening or slot 50 preferably is on the order of 20 to 30 thousandths of an inch depending upon the size of the mold.

The improved vent construction of mold parts constitutes one of the important features of my permanent mold structure. Casting of stud links of light metals such as aluminum, magnesium, and alloys thereof, as well as beryllium copper, steel, or precious metals heretofore have been very difficult because of the shrinkage and venting problems. In accordance with my invention and utilizing the improved permanent mold of the structure illustrated and described, this problem has been solved. As illustrated in FIGURE 3 the mold cavity is disposed whereby molten metal enters through the gate or opening 35 centrally of the stud link mold cavity, with the mold blocks being separable four ways, e.g. two in the top half and two in the bottom half of the mold cavity. Separation of the mold is provided along a line representing the central longitudinal axes of the stud link.

Uniformly cast high tensile strength chain links are made possible because of the multiple venting of the mold cavity which communicates with a recess opening between the mold blocks as described. It is essential to provide a gate and interconnected neck portion which is flared outwardly at the junction of the neck with the mold link cavity as illustrated in FIGURE 3. Such a wide neck jointure permits molten metal upon shrinking during casting to form a strong section and eliminate cracking of the casting. After removal of the cast chain link the gate and neck portion are machined off to produce a smooth finished stud link casting.

In the making of chains of a desired length it will be understood that single stud links are cast and then two links connected with a cast link, as illustrated in FIGURE 1.

Utilizing the permanent molds of the improved structure illustrated, it is possible to cast stud links and manufacture chains of various metals and alloys having high shrinkage characteristics, and which heretofore could not be satisfactorily cast in permanent molds, particularly as stud links. This difficulty was a result of the shrinkage of the casting which produced cracks and imperfections thus making the casting operation of little value commercially.

The permanent mold of the present invention is provided with interfitting mold blocks which are machined to accurate tolerances and when fitted together form the stud link mold cavity for receiving the molten metal. After pouring the metal, the mold parts are quickly disassembled after 5 to 8 seconds, and immediately upon congealing of the molten metal to produce a sound casting. Stud links can be cast again and again using the 4-way split mold. In casting high shrinkage metals and alloys such as aforementioned without encountering cracking and porosity difficulties by the use of my invention. The invention provides not only a permanent mold for casting stud link chains but due to the construction and design of the mold the same may be used over and over again to produce sound crack-free casting.

By the foregoing description it will be understood that I have provided a novel permanent mold having im-

proved structure features for casting stud chain links from various metals and especially high shrinkage metals and alloys. Having thus described my invention what is claimed is:

5 1. A permanent mold for casting stud link chain links of high tensile strength alloy metal, said mold comprising two pairs of separable mold blocks having complementary mold cavities, said mold blocks being slidably fitted together whereby their opposing mold cavity faces meet and extend vertically defining a mold cavity for casting stud links, a gate having an integral wide neck portion communicating with said mold cavity through which molten metal is introduced thereinto, said mold block faces defining said mold cavity being raised above and offset from the surface of the mold block face to provide a recessed opening slot between said mold blocks to effect rapid release of gas from the mold cavity during casting, and means comprising vents spacedly disposed about and communicating with different areas of said mold cavity and connected with said recessed opening slot.

2. A permanent mold for casting stud link chain links of high tensile strength alloy metal, said mold comprising two pairs of separable mold blocks having complementary mold cavities, said mold blocks being slidably fitted together whereby their opposing mold cavity faces meet and extend vertically defining a mold cavity for casting stud links, a gate having an integral wide neck portion communicating with said mold cavity through which molten metal is introduced thereinto, said mold block faces defining said mold cavity being raised above and offset from the surface of the mold block face to provide a recessed opening slot between said mold blocks to effect rapid release of gas from the mold cavity during casting, means comprising vents spacedly disposed about and communicating with different areas of said mold cavity and connected with said recessed opening slot, and means comprising a horizontally reciprocable arm member connected to a mold block for moving the mold block horizontally from an advanced position to a retracted position for quickly assembling and disassembling said mold.

3. A permanent mold for casting stud link chain links of high tensile strength alloy metal, said mold comprising two pairs of separable mold blocks having complementary mold cavities, said mold blocks being slidably fitted together whereby their opposing mold cavity faces meet and extend vertically defining a mold cavity for casting stud links, said mold block faces defining said mold cavity being raised above and offset from the surface of the mold block face to provide a recessed opening slot between said mold blocks, vents in said mold cavities connected to said recessed opening slot to provide for rapid release of gas from the mold cavity during casting, and means comprising a gate shaped by said complementary mold blocks which communicates with said mold cavity through which molten metal is passed into the mold cavity, said gate having a tapered flared outward neck portion at the junction of the same with said mold cavity, said flared neck portion forming a wide neck jointure providing a reinforced section which resists cracking upon shrinking of the casting.

4. A permanent mold for casting stud link chain links of high tensile strength alloy metal, said mold comprising two pairs of separable mold blocks having complementary mold cavities, said mold blocks being slidably fitted together whereby their opposing mold cavity faces meet and extend vertically defining a mold cavity for casting stud links, said mold block faces defining said mold cavity being raised above and offset from the surface of the mold block face to provide a recessed opening slot between said mold blocks, means comprising vents spacedly disposed about and communicating with said mold cavity and which are connected to said recessed slot for providing quick release of gases from the mold cavity during casting, and means comprising a gate shaped by said

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complementary mold blocks which communicates with said mold cavity through which molten metal is passed into the mold cavity, said gate having a tapered flared outward neck at the junction of the same with said mold cavity providing a reinforced section which resists cracking upon shrinking of the casting.

5. A permanent mold for casting stud link chain links of high tensile strength beryllium copper alloy metal, said mold comprising two pairs of separable mold blocks having complementary mold cavities, said mold blocks being slidably fitted together whereby their opposing mold cavity faces meet and extend vertically defining a mold cavity for casting stud links, said mold block faces defining said mold cavity being raised above and offset from the surface of the mold block face to provide a recessed opening slot between said mold blocks, means comprising vents spacedly disposed about and communicating with said mold cavity and which are connected to said recessed opening slot to provide for rapid release of gas from the mold cavity during casting, means comprising a piston actuated arm member connected to a mold block to move the same rectilinearly back and forth from an

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advanced to a retracted position for quickly assembling and disassembling said mold, and means comprising a gate shaped by said complementary mold blocks which communicates with said mold cavity through which molten metal is passed into the mold cavity, said gate having a tapered flared outward neck at the junction of the same with said mold cavity.

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