May 3, 1955 J. W. WALTHER 2,707,324

CASTING AND PROCESSING OF CAST METAL ARTICLES

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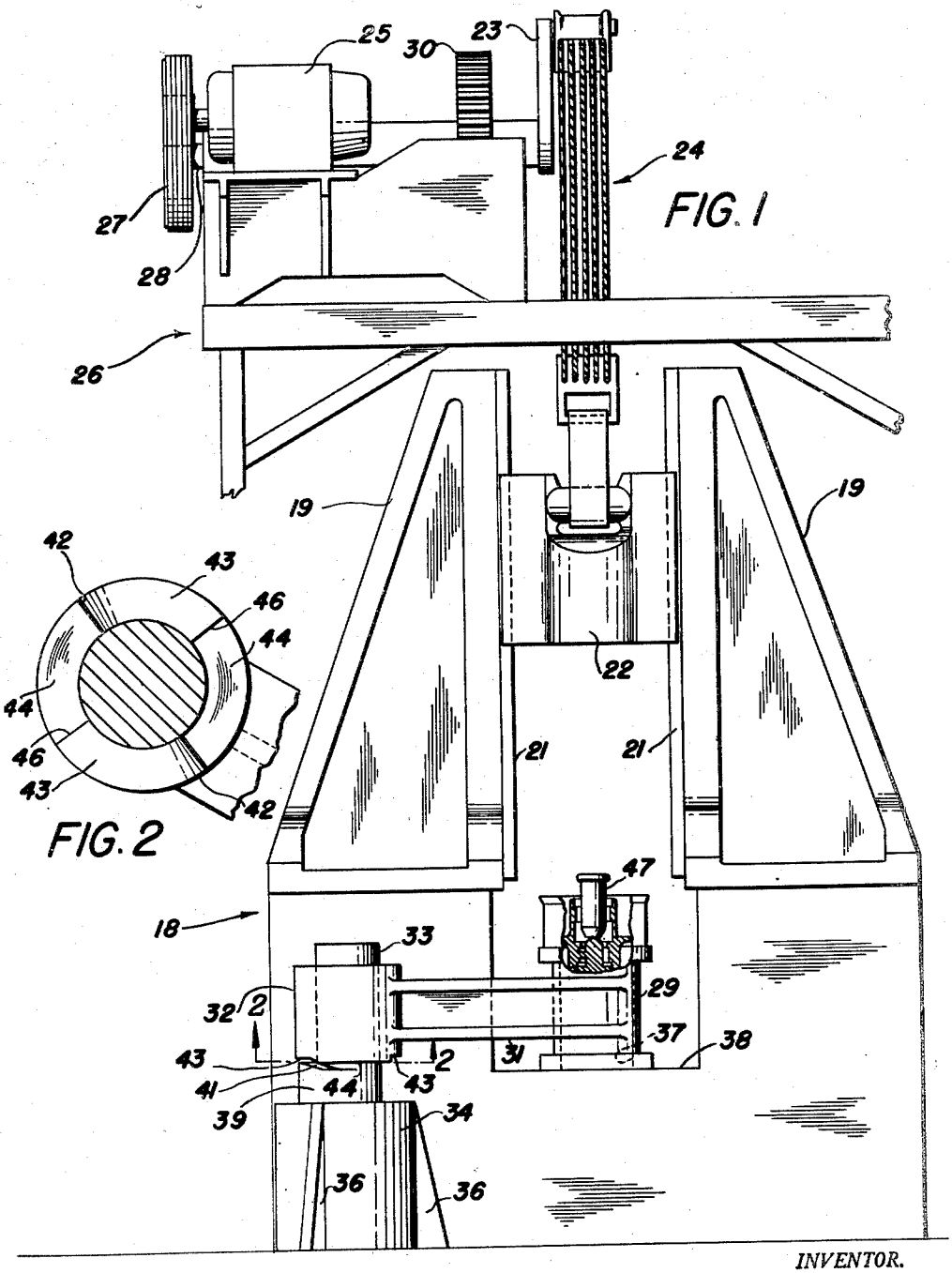


FIG. 1

FIG. 2

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FIG. 3

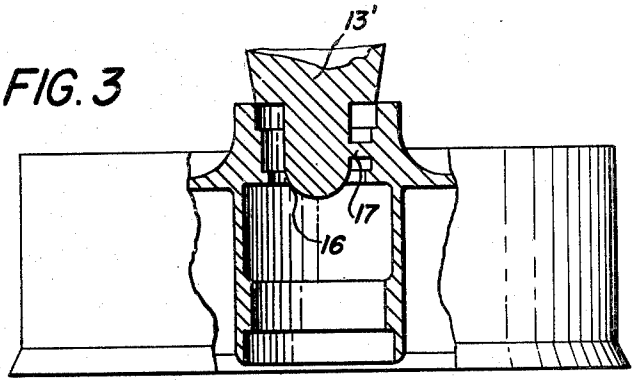


FIG. 4

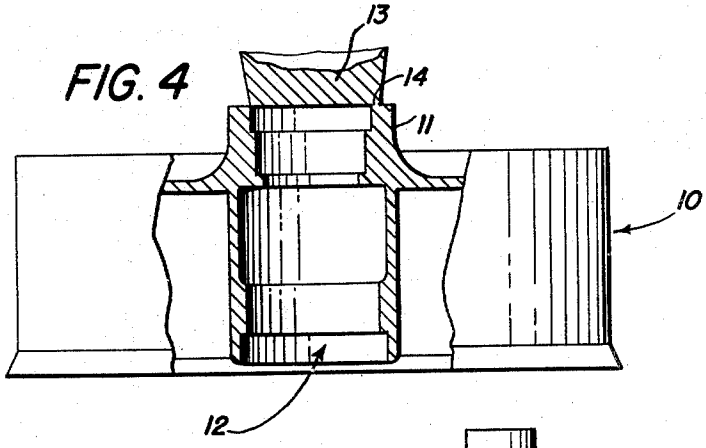
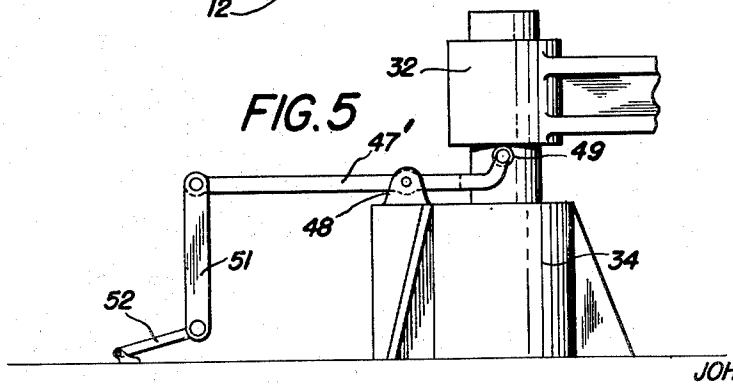


FIG. 5



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CASTING AND PROCESSING OF CAST METAL ARTICLES

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Application July 14, 1951, Serial No. 236,725

1 Claim. (Cl. 29—529)

This invention relates to metal casting in general, and in particular to removal from castings of excess metal adhering to the castings as a result of the pouring operation. Heretofore, these excess chunks of metal have been removed by workmen, using sledge hammers. With brittle metals such as cast iron, the removal is not too difficult, but with metals of the toughness of cast steel the sledge hammer method is laborious and dangerous, and is also time-consuming and therefore unduly costly and detrimental to production volume.

In still greater particular, the invention relates to the casting of metal articles having a through passage, such as a vehicle wheel having an axial passage in the hub. The practice has been to arrange the mold so that the metal is poured in at points on the outer rim of the hub. Thus, in the solidified casting, the excess metal occurred outwardly of the hub rim and had to be removed by the sledge hammer method. It is important to note that with the excess metal thus extending from the hub rim, it had to be removed by laterally applied blows to cause failure in shear, both for the reason that a much larger force is required to effect rupture at the "gates" in tension, and for the reason that rupture in tension usually ruins the casting itself.

I have found that by introducing metal into the mold laterally through gates within the opening in the casting, the glob of excess metal may be removed by shearing forces, in a direction axially of the opening. Another important result is that due to the symmetry of the casting with respect to the axial direction of applied force, the excess metal may be removed by a trip hammer.

It is therefore an object of the invention to provide for readier removal of excess metal in casting. Another object is to provide a casting having excess poured metal so located that it may be removed in shear by forces directed axially of the casting. In still greater particular, it is an object to provide castings having excess pouring metal so located that it can be removed by a trip hammer.

These and other ends are attained by the present invention, as described in the following specification and illustrated in the drawings, in which:

Fig. 1 is a front elevational view of a trip hammer with a casting in place for removal of the excess metal,

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1,

Fig. 3 is an elevational view of an annular casting formed by pouring through "center" gates, the view being broken away in the central portion,

Fig. 4 is a view similar to Fig. 3, showing an annular casting formed by pouring through "top gates," and

Fig. 5 is a detail, in elevation, showing a modified arrangement for the lifting means for the casting in the mounting shown in Fig. 1.

Referring to the drawings by characters of reference, there is shown, in Fig. 4, a cast vehicle wheel 10, the exact form of which is not important for present purposes except for the fact that it is symmetrical about an

axis and has a hub 11 with an axial passage 12. The wheel is cast in the position shown, by pouring through a pouring cup, as well understood in the art, the cup being arranged to provide a plurality of openings through which the metal passes into the mold cavity. After the mold-filling operation, a frusto-conical slug 13 of excess metal remains above the casting, being joined to the latter at points 14 where the metal passed through the filler openings. Since this slug must be removed, the cross-sectional area of the joining regions at points 14 is kept to a minimum, which is consistent with proper pouring. Removal of this type of slug by application of a force axially of the casting has not been practicable because such action is almost certain to unduly mar the rim of the hub. Hence the slug has been removed by blows applied in a direction transverse to the axis of the casting. The only manner of accomplishing this has been by laying the casting on the ground and applying a sledge hammer manually, which, for reasons given above, is unsatisfactory. Furthermore, for separation with a sledge hammer, it is often necessary to weaken the connecting regions by burning with a torch. This is further expensive and time-consuming, and results in a surface which requires subsequent chipping, grinding and annealing.

By flowing the cast metal into the mold cavity from a point within the axial opening through a passage transverse to the axis of the casting, a casting results which is well adapted for removal of the slug by a mechanical drop hammer. Such a casting is shown in Fig. 3. In this case, the core which forms the axial passage has a depression which provides in effect a downward extension of the pouring cup resulting in a lower extension 16 of the slug 13', the core having lateral openings through which the metal flows to the mold cavity, resulting in bridges 17 which unite the slug to the casting. It will be readily seen that this type of slug may be removed from the casting by shearing rupture caused by a force directed along the axis of the casting. Thus, the casting lends itself to mechanical methods of removal of the slug by impact, due to the symmetry of the connecting portions with respect to the casting.

In Fig. 1 is shown a crank-lift, drop hammer layout for removing the slugs. A base shown generally at 18 has a forked, upper portion with upright arms 19 having guide rails 21 received in complementary grooves in the sides of a hammer 22, for vertical, sliding motion of the latter. The hammer is lifted by a crank arm 23 which is connected to the hammer by a cable assembly, indicated generally by the numeral 24. The crank is revolved by a motor 25, the entire lifting mechanism being supported on a platform 26 separate from the hammer mounting 18. A belt 27 leads from the motor pulley to the pulley of a shaft 28 having a pinion (not shown) communicating rotation to a gear 30 arranged to revolve crank 23. Through an over-running mechanism (not shown), which may be operator-controlled, the crank may be released at the top of its stroke for free fall. All of the foregoing hammer mechanism is conventional and forms no part of the present invention.

For moving the castings into position beneath the hammer, an anvil 29, carried on the end of a swinging arm 31, is employed, the arm having a central bearing arm 32 rotatably mounted on a pin 33 carried by a base block 34 with bracing webs 36. The swinging anvil 29 is spool-shaped, with an axial bore 37, and is adapted for placement on the flat region 38 of the hammer mount, between the upright arms 19, so as to lie in the path of fall of the hammer.

Since the swinging anvil 29 must rest on the floor 38 of the hammer mount, and since it must clear this level in swinging into position, it is necessary to raise the hammer when passing into working position, and to lower

it onto the said floor when spotted. In the Fig. 1 arrangement this is accomplished by cams **39** having sloping portions **41** cooperating with sloping portions **42** on the underside of bushing sleeve **32**, extending from high levels **43** to low levels **44**. The stepped portions **46** between these levels may be employed as stops to spot the anvil **29** under the hammer.

The cams are so arranged that when the anvil **29** is located outwardly of hammer mount **18**, it is above the level of floor **38**, and in swinging to position remains at this level until the edge of floor **38** has been passed. Thereafter, the anvil descends and becomes fully supported on floor **38** prior to reaching its final position under the hammer.

The casting **10** is mounted on spool **29**, with hub portion **11** and slug **13'** extending into the bore **37** of the spool, and the casting is swung into position. Before or after positioning the anvil, a pin **47** is dropped into the central opening **12** of the casting and rests on the extension **16** of the slug **13'**. The dropping hammer contacts pin **47** imparting an axially directed impact to slug **13'**, which is resisted by the shearing strength in the uniting bridges **17**. If the slug is not separated at the first fall of the hammer, the impact is dissipated through the outer rim of the casting and the hammer does not reach the top of the casting. Even if a portion of the energy of the hammer is imparted to the casting in the drop causing final separation, the impact is well distributed due to the extent and symmetry of the casting. This is possible only with the "center-gate" type of casting and makes possible the use of an extremely heavy drop hammer. The resulting breaks are clean and require little, if any, chipping.

After separation of the slug, the anvil **29** is swung outward, and the slug falls through the passage **37** into a waiting tote pan.

In addition to the foregoing advantages, the use of a "center gate" results in castings of superior and more uniform quality.

In Fig. 5 is shown an alternative means for raising the swinging anvil consisting of a lever **47'** pivoted between ears **48** on base **34**, and having on one end a roller **49** engaging the underside of bushing **32**. From the outer end of the lever a pivoted link **51** connects with a foot treadle **52**. When it is desired to lift anvil **29** above the level of floor **38**, in swinging in or out, it is merely necessary to depress treadle **52**.

The invention may partake of forms other than those illustrated and described, and is therefore not to be considered as limited, except insofar as shall appear from the spirit and scope of the appended claim.

What is claimed is:

In the making of castings having an axial through passage, the method which comprises pouring the molten metal for forming said casting into a mold zone defining said passage and thence flowing the metal into the mold cavity through an opening transverse to and between the ends of said passage, so as to cause any excess poured metal integral with said casting, after solidification, to be joined to said casting at points within said passage, and removing said excess metal by impact applied axially of said passage.

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