June 17, 1952 J. C. McCAULEY 2,600,559

MOLD FOR CASTING PRINTERS' RULES, LEADS, AND THE LIKE

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Fig. 1

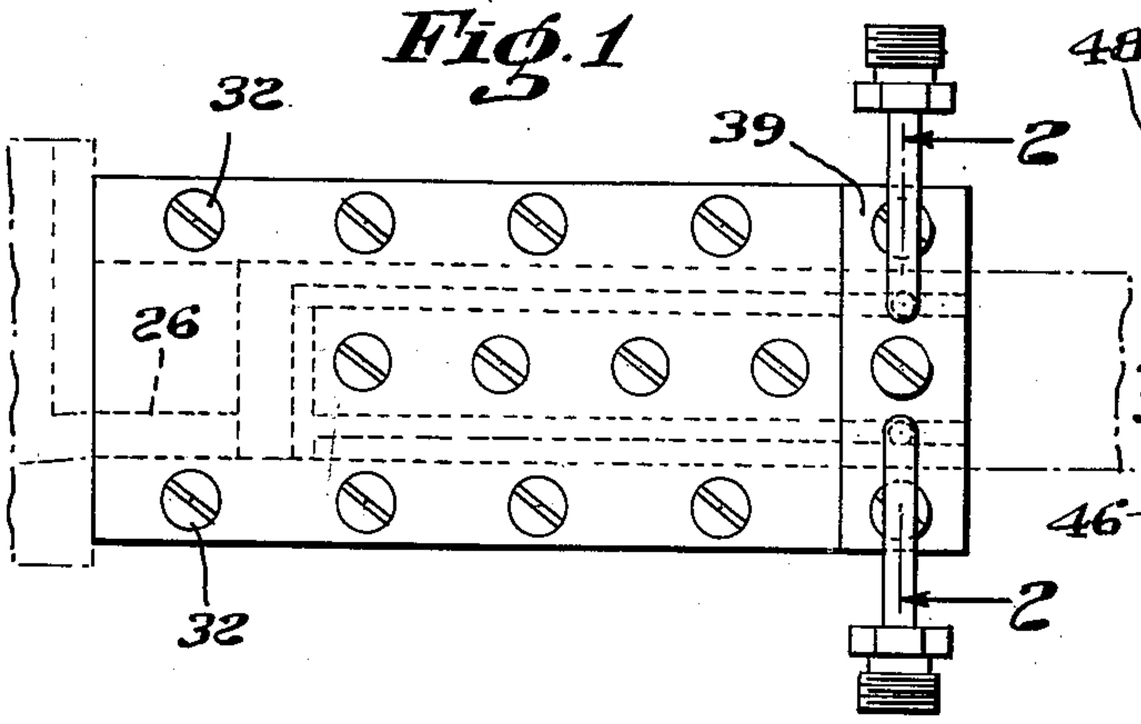


Fig. 2

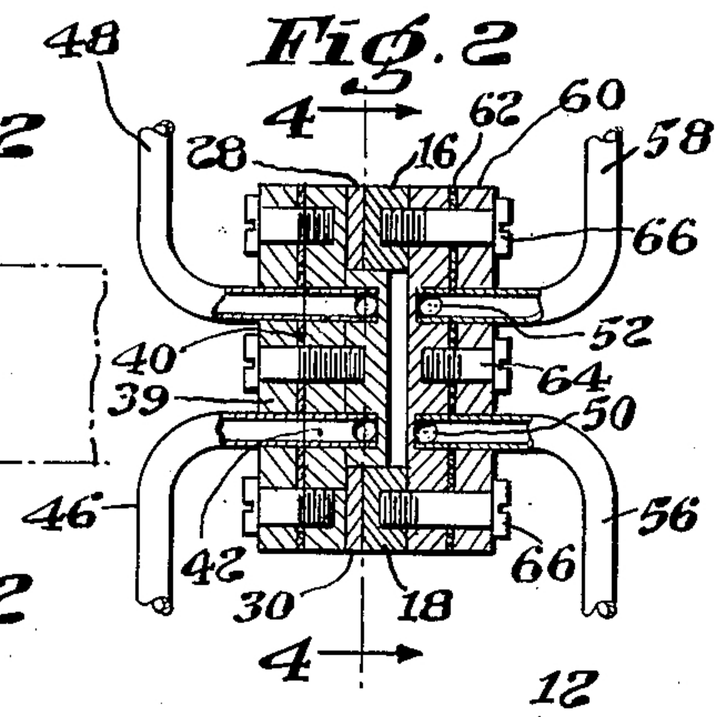


Fig. 3

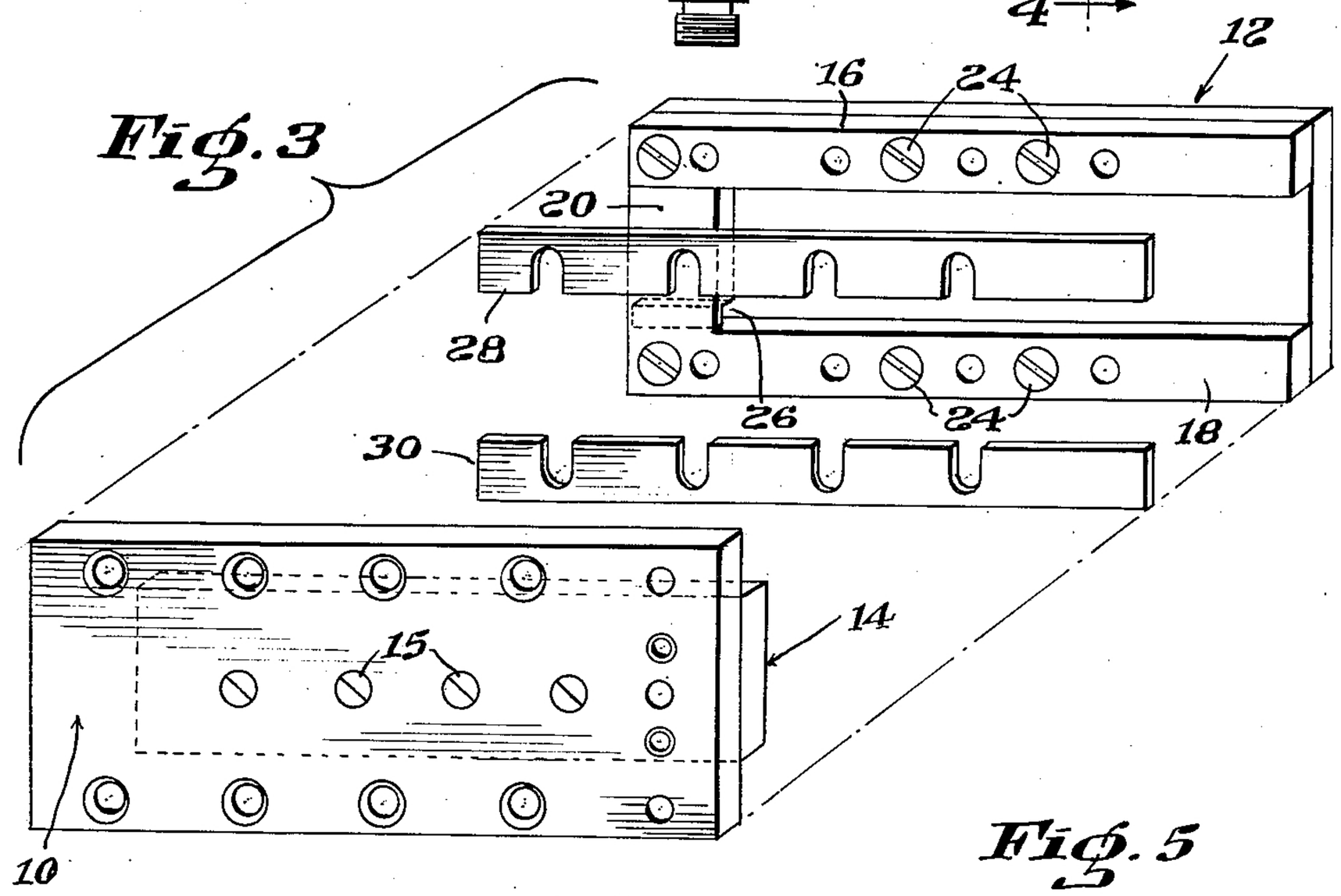


Fig. 4

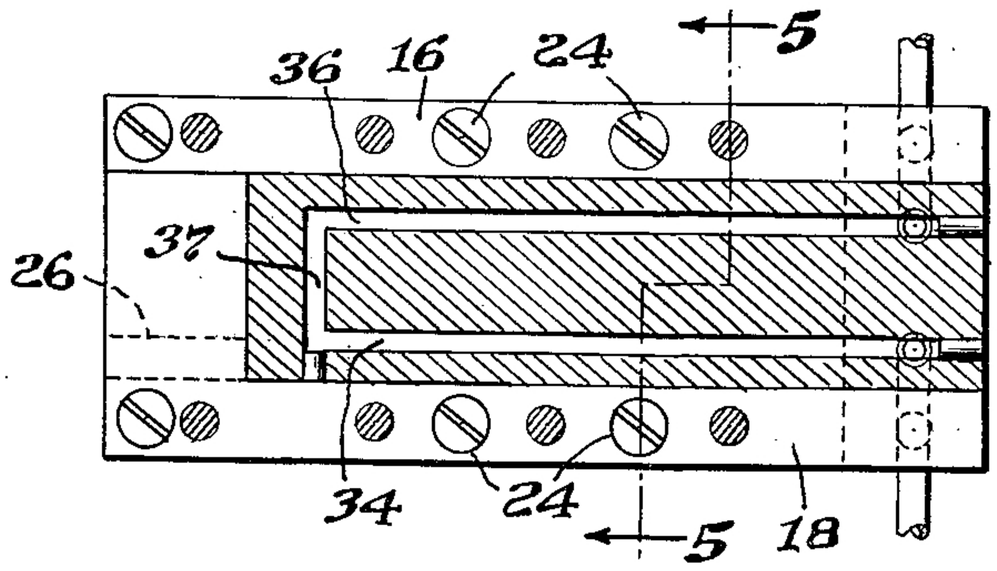
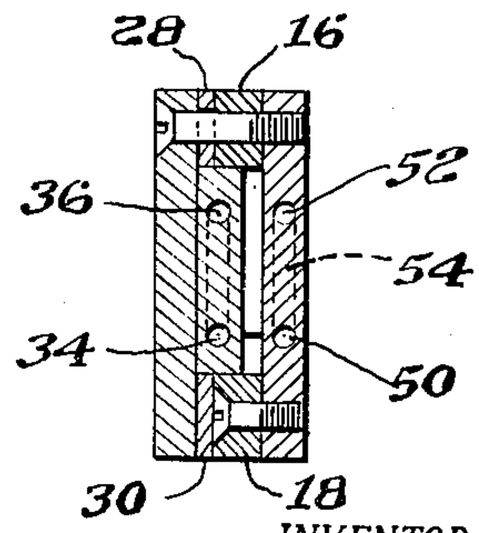


Fig. 5



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MOLD FOR CASTING PRINTERS' RULES, LEADS, AND THE LIKE

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2 Claims. (Cl. 22—146)

1

The present invention relates to improvements in the production of metal strips in the form known in the printing art as rules, leads and the like, such strips being formed directly from a body of molten metal by the casting of a continuous strip through a mold. The casting preferably is supplemented by a feeding device which forces metal into the mold and a device which applies a pull to the finished strip as it emerges from the mold.

Molten metal is forced into the base end of a channel in the mold, within which the metal is cooled and set, and is moved gradually out through the outer open end of the channel as an integral part of the finished strip. In order to ensure rapid cooling and setting of the metal, and thereby to increase the permissible rate of feed, the mold is cooled, usually by means of a water jacket extending around the mold.

The molds employed in the manufacture of printers' leads and rules, in accordance with the continuous or intermittent casting process above referred to, are required to be strongly and accurately constructed to withstand the extreme fluctuations of heat and cooling, and at the same time to produce a metal strip which will meet rigid specifications of measurement and uniformity.

The present invention is an improvement upon a mold of the general type which comprises a pair of plates separated by two liners or spacers which form the sides of the mold, these parts being rigidly secured together by machine screws. Because the assembly and accurate adjustment of these molds requires factory supervision and facilities, it has been found desirable to provide separate molds for each different shape and thickness of lead or rule.

Objects of the present invention are to provide a novel and improved mold for use in the manufacture of printers' leads, rules, and the like strip material, which is more strongly and efficiently constructed than the molds previously available in the art, which is further constructed and arranged to permit of a more rapid rate of cooling and of setting the molten metal, and a substantially faster rate of extrusion of the finished strip from the mold, and which is well adapted to be taken apart and reassembled in the field and adjusted for the production of rules and leads of different dimension, without loss of accuracy or effectiveness in use.

With these and other objects in view as hereinafter may appear, the several features of the invention consist of the devices, combinations,

2

and arrangement of parts hereinafter described and claimed which, together with the advantages to be obtained thereby, will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a side view of a mold illustrating in a preferred form the several features of the invention;

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

Fig. 3 is an exploded view of the mold comprising the mating mold members, and a pair of shims;

Fig. 4 is a sectional view taken on a line 4—4 of Fig. 2 to illustrate particularly the arrangement of the cooling conduits in the male mold member; and

Fig. 5 is a sectional view of the mold taken on a line 5—5 of Fig. 4.

The mold illustrated in the drawing as embodying in a preferred form the several features of the invention comprises a pair of plates 10 and 12 which are constructed and arranged to provide the mating elements of an adjustable mold. The plate 10 has mounted on the inner face thereof a block 14 which forms the male element of the mold. The block 14 is secured to the plate 10 by means of a series of four machine screws 15. The plate 12 has mounted along the edges of the inner face thereof two bars 16 and 18 which provide the side wall members of the casting channel of the mold. The bar 18 is L-shaped, being provided at one end with a transverse extension 20 which may be formed integrally with the bar 18, or as a separate piece and which extends across the face of the mold member 12 into engagement with the bar 16, and forms an end wall, or closure, for the base end of the casting channel. The bars 16 and 18 respectively are rigidly secured to the plate 12 by means of a series of machine screws 24, the heads of which are recessed into the surface of the bars 16 and 18 respectively. A conduit 26 cut through the transverse extension 20 of the bar 18 of the mold provides an entrance or gateway through which molten metal is forced into the casting channel of the mold. It will be understood that while the mold in the preferred form is constructed to include an end wall having a conduit cut therethrough, the invention in the broader aspects is not limited to the specific construction shown. The end wall 20 may, for example, be omitted and the supply nozzle connected di-

rectly across an open base end of the casting channel.

For adjustment of the thickness or point rating of the strip material cast in the mold, two shims or spacers **28** and **30** are provided between opposed faces of the side wall bars **16** and **18** respectively, and the recessed edges formed by the inner face of the plate **10** at each side of the block **14**. The parts of the mold, including the plates **12** and **14**, and spacers **28** and **30**, are held rigidly together by means of a series of machine screws **32** arranged with the head portions thereof recessed into plate **10** and with their opposite ends threaded into plate **12**. Adjustment of the thickness or point rating of the finished strip is determined by the choice of spacer members **28** and **30** which in turn determine the position of the inner face of the block **14** with relation to the opposed inner face of the plate **12**.

To avoid sticking of the cast metal to the mold and to assist generally the process of extruding the cast strip from the mold, the cross-sectional area of the metal receiving and casting channel is increased in each dimension by approximately two thousandths of an inch (.002) along the length of the channel, from the base, or receiving end, to the outer end from which the finished strip is projected. This increase in the vertical cross-sectional dimension is obtained by diverging the opposed walls of bars **16** and **18**. Variation of the shorter transverse cross-sectional dimension is obtained by the shaping of the inner face of the block **14** so that it diverges with respect to the opposed face of the plate **12**. The top and bottom edge of the block **14** are similarly formed in a diverging relation to one another in order to ensure a snug fit between the edges of the block **14** and adjacent walls of the bars **16** and **18**. It will be understood that the desired divergence of the faces of block **14** and plate **12** may be obtained in any alternative manner as for example by the use of tapered spacer members.

To insure that the corners of the cast metal strip may be accurately formed, and in order to prevent leakage of the molten metal, a very close fit with a minimum tolerance is required between the sides of the male mold member **14**, and side bars **16** and **18** forming the side walls of the mold. The slight taper of the member **14** above noted, is of considerable value in assembling the parts of the mold since the narrowed portion of the block **14** can be fitted between the relatively more separated outer ends of the side walls of the channel provided by the bars **16** and **18** and thereafter moved lengthwise into position.

In carrying out the present invention, a water cooling system is provided which takes the form of passages in the block **14** and in the plate **12**, which supply water or other coolant directly to the face portions of the mold in contact with the molten metal. The plate **14** is formed with two longitudinally extending drilled conduits **34, 36**, and a vertically connecting drilled conduit **37** which may be formed preferably with a number 38 drill. The ends of the conduits are then sealed off or plugged.

Supply and exist connections for the coolant are provided at the open end of the mold. These connections take the form of a transverse bar **39** and gasket **40**, secured to the exterior surface of the mold plate **10** at its outer end.

Transverse drills extending inwardly through the transverse bar **39** and mold plate **10**, and into the block **14** are arranged to intersect with the

longitudinal conduits **34, 36**. To avoid any possibility of leakage, a coolant supply tube **46**, and a coolant return tube **48** are fitted into said transverse drills and intersect with the longitudinal passages **34, 36**. In order to insure an open connection between the supply tube **46** and passage **34**, and similarly between return tube **48** and passage **36**, passages **34, 36** are preferably drilled after the tubes **46, 48** are in place thus causing the drill to cut away obstructing portions of the tubes.

Coolant is supplied in a similar manner to cool the inner surface of mold plate **12** through longitudinal passages **50, 52**, a vertical passage **54** (see Fig. 5), a coolant supply tube **56** and a coolant return tube **58**. A vertically disposed supporting plate **60** and a gasket **62** are secured to the outer surface of the mold plate **12** at its outer end by means of machine screws **64** and **66**. The coolant supply and the coolant return tubes **56, 58** are inserted into transverse drills passing through the supporting plate **60** and mold plate **12** to intersect the longitudinal passages **50, 52**. It will be understood that applicant is not limited to the specific construction of the coolant supply conduits shown, and that, if so desired, the transverse bars and gaskets could be omitted in favor of a direct connection of the supply conduits to the male and female mold members respectively.

The improved mold assembly above described has a number of very important advantages over extrusion molds provided by the prior art. The construction and arrangement of the mold members is such that the coolant is more efficiently shielded from the casting channel of the mold, and those surfaces of the mold members engaging the shims or spacers **28, 30** which are employed to control the thickness or point rating of the cast strip, are free from contact with either the molten metal or with the coolant along the length of the casting channel. As will be readily evident from an inspection of the drawing, the molten metal is entirely contained by the mating elements of the mold within a casting channel which comprises the plate **12**, the side wall members **16, 18**, and end wall **20**, and the block **14** which is closely fitted thereto.

The arrangement above described of the coolant supply and return tubes which serve as linings for the supply and return conduits, and which bridge certain contacting surfaces of the parts from which the mold members are constructed, has been found to entirely eliminate leakage of coolant, which might otherwise result from any separation of these contacting surfaces caused by heat induced expansion or contraction of mold members when in use.

A highly rigid and efficient construction of the mold assembly is provided by the arrangement of the adjustable mold members and associated spacer members in which the shims or spacers **28, 30**, are well removed from the casting channel and need not be fitted together with the care required for previous constructions to maintain smooth surfaces and tight joints in the casting channel, and in which the mold plates with the side walls and spacer members there between are rigidly secured together by screws passing through the side walls and spacer members of the mold.

The arrangement of the male and female mold members in which the side walls **16, 18** of the female member and the sides of the block **14** engaging therewith diverge slightly toward the open end of the casting channel is of substantial

importance in the illustrated construction in that it permits the mold to be taken apart and readily assembled into a tight fitting unit by even an unskilled workman who in assembling the mold will insert the block 14 between the side walls 16, 18 toward the open end of the casting channel and thereafter slide it lengthwise into position toward the base end of the mold.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A mold for use in the casting of continuous printers' leads, rules and the like strip material which comprises a female mold member providing a flat casting channel having an open discharge end, and a base inlet end for molten metal with side walls of a height greater than the greatest thickness of lead to be cast in the mold, a male mold member comprising a block arranged to extend between and closely fitted to said side walls and having recessed outwardly extending edge portions overlying said side walls, spacers of predetermined thickness interposed between said side walls and said recessed overlying edge portions of the male mold member, and fastenings passing through the edge portions of said mold members including said spacers and walls for fastening together the male and female mold members.

2. A mold for use in the casting of continuous printers' leads, rules and the like strip material which comprises a female mold member providing a flat casting channel having an open discharge end and a base inlet end for molten metal with the opposite walls thereof diverging slightly from the base inlet end to the open discharge end including divergent side walls of a height greater than the greatest thickness of lead to be cast in the mold, a male mold member comprising a block having the sides thereof diverging along their length and arranged to extend between and closely fitted to said side walls, and further comprising recessed outwardly extending edge portions overlying the side walls of the female mold member, spacers of predetermined thickness interposed between said side walls and the recessed edges of the male mold member, and screw fasteners passing through said mold members including the side walls and spacers for fastening together said mold members.

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