

March 30, 1943.

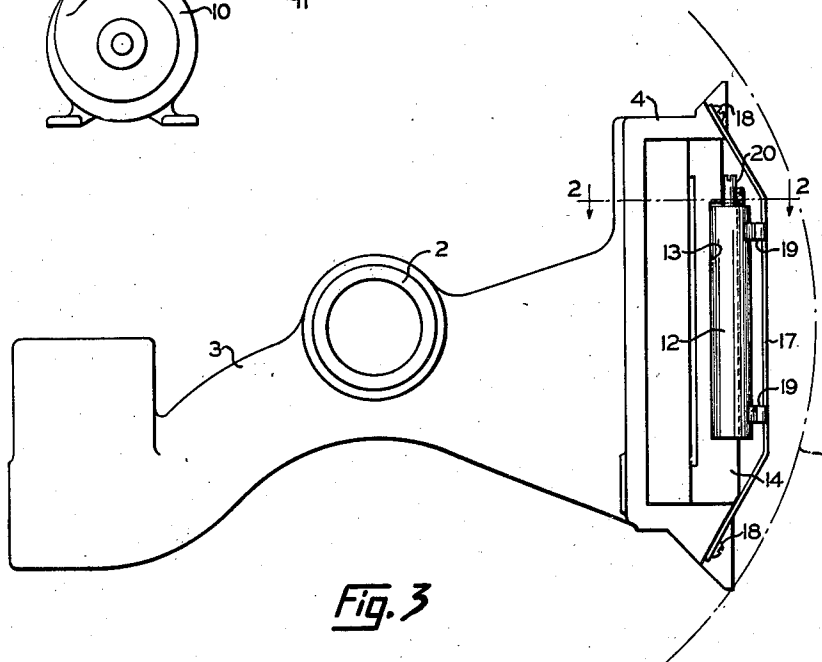
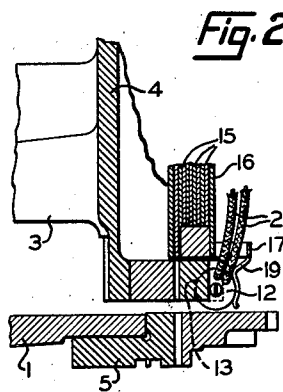
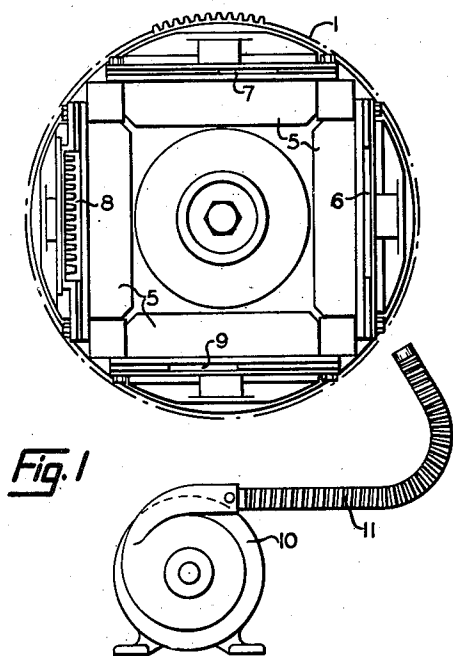
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2,315,234

TYPOGRAPHICAL SLUG CASTING MACHINE

Filed May 14, 1941

2 Sheets-Sheet 1



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TYPOGRAPHICAL SLUG CASTING MACHINE

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Fig. 4

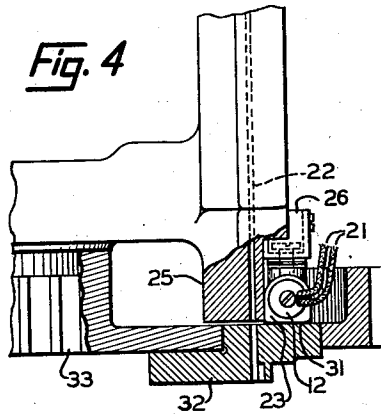


Fig. 6

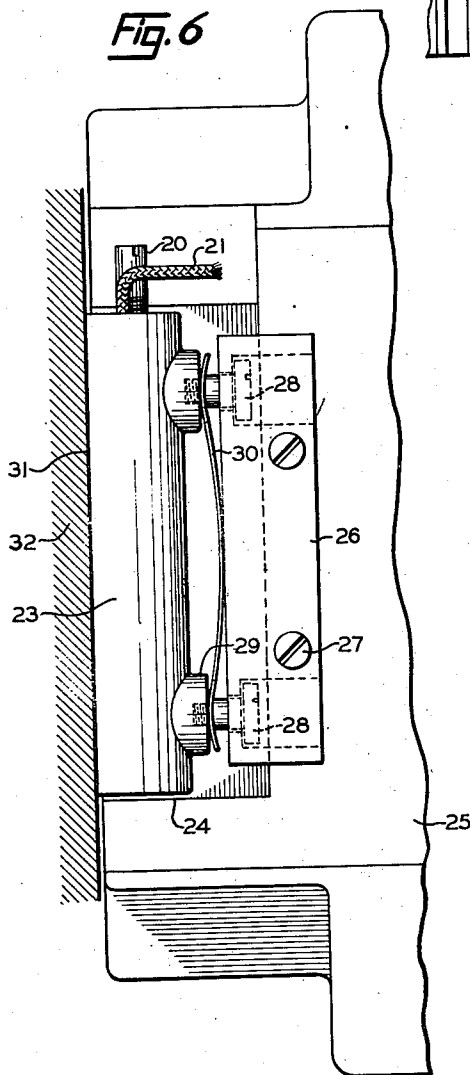
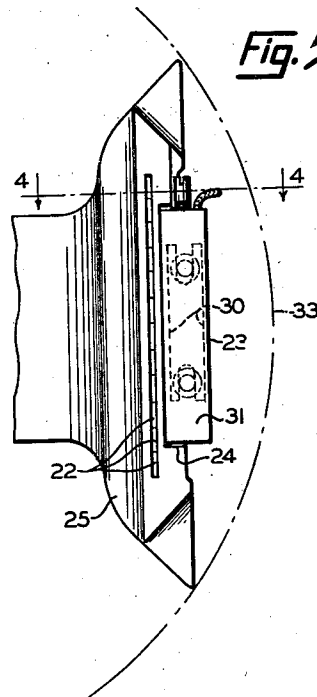


Fig. 5



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TYPOGRAPHICAL SLUG CASTING MACHINE

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13 Claims. (Cl. 199—56)

This invention relates to typographical slug casting machines of the general organization represented in U. S. Letters Patent No. 436,532 granted September 16, 1890, wherein successively composed lines of circulating character bearing matrices are presented to the front face of suitable slotted molds into which molten type metal is injected from the rear to cast type bearing slugs, the mold in use being moved after the casting operation to position for ejecting the slug while the matrices are delivered to devices which serve to distribute them to their places of storage from which they were drawn in the process of composition of the line.

The injection of the molten metal into the mold slot naturally results in absorption of heat by the mold in greater or less amount according to the size of the slug and the rate of casting. Under continuous operation of the machine, especially when casting large slugs, the mold becomes so hot that the slugs do not congeal or solidify at the proper rate, that is, to the extent necessary to prevent the ejector blade from digging into the soft bottom edge, or to produce slugs with solid bottoms that will trim squarely and support the slugs in a vertical edgewise direction under the heavy pressure to which they are subjected in modern printing processes. As an aid toward producing satisfactory slugs it is now the practice to provide mold cooling devices of one kind or another in order to dissipate the excess heat induced in a mold as by continuous casting or as when producing slugs in the larger sizes.

Such cooling arrangements are generally satisfactory in themselves but they require attention and regulation by the operator to suit the changing conditions that arise. In short, such devices are not automatic but rather must be rendered operative or inoperative by the operator according to his estimate of the necessity for such regulation as from observation of the ejected slugs or otherwise.

The object of the present invention is to provide for automatically regulating or governing the operation of such mold cooling medium as may be provided on the machine and thus automatically control the temperature of the molds. To this end the invention provides in combination, for example, with an air blower a thermosensitive switch arranged to respond to heat changes in an active mold either by direct contact therewith or with associated parts thereof or by induction of heat radiated by such molds or parts and thereby initiate and terminate oper-

ation of the blower automatically as the temperature of the mold varies under the prevailing casting conditions. The arrangement is such that regardless of the size of the slugs being produced or the rate of casting the temperature of a mold may be maintained substantially within a predetermined range of variation according to the setting, in advance, of the thermoswitch, the latter acting automatically to set the cooling medium into operation when the mold temperature reaches a predetermined maximum and automatically to cut off or terminate operation of the cooling medium when the temperature falls to a predetermined minimum.

It will be understood, of course, that the thermoswitch setting may be altered if and when desired to widen or narrow the permissible range of variation in mold temperature. Thus, when applied to a machine devoted exclusively to producing large size slugs the thermoswitch may be set to permit a wider variation in the working temperature of the mold, it being clear that the continuous casting of large slugs induces heat so fast as to require almost continuous operation of the cooling medium. Conversely, on machines devoted exclusively to producing small slugs, heat is induced in less quantity and more slowly so that the switch may be set to allow a relatively narrow range of temperature variation in the mold. In practice, however, a single setting for the switch suitable for maintaining at satisfactory working temperatures molds differing over a wide range of sizes may readily be chosen. Once such setting is made the working temperature of molds in all sizes will be maintained within such limits as to produce satisfactory slugs, thus eliminating the manual attention and consequent loss of time and production resulting from the present guess-work methods of exercising control over mold temperatures. Moreover, due to the fact that the mold cooling device, whatever its type or form may be, will operate only when actually needed, wear on the parts thereof will be minimized and energy for operating them will not be wasted.

The invention will be best understood from the detailed description which follows taken together with the accompanying drawings wherein:

Fig. 1 is a front elevation showing a conventional form of rotary mold disk employed in slug casting machines and showing in diagrammatic manner a motor driven blower for directing a stream of air against a mold when disposed by the disk at slug ejecting position in the machine.

Fig. 2 is a fragmentary horizontal section taken on the line 2—2 in Fig. 3 and shows a switch according to the invention arranged for response to heat in a mold by induction of heat radiated therefrom while the mold is disposed at slug ejecting position.

Fig. 3 is a front elevation on an enlarged scale of the parts shown in Fig. 2, the mold disk being removed to depict details of the mounting of the switch shown in Fig. 2 on the usual mold disk supporting slide.

Fig. 4 is a fragmentary horizontal section taken on the line 4—4 in Fig. 5 and shows a switch according to the invention arranged for response to heat in a mold by direct contact therewith while the mold is disposed at slug ejecting position, this view being generally similar to Fig. 2 but applying to a machine in which the parts differ somewhat therefrom in form.

Fig. 5 is a fragmentary front elevation of the parts shown in Fig. 4 with the mold disk removed to depict details of the mounting of the switch shown in Fig. 4 on the usual mold disk supporting slide, this view being generally similar to Fig. 3 but applying to a machine in which the parts differ somewhat therefrom in form.

Fig. 6 is a fragmentary side elevation on an enlarged scale of the parts shown in Fig. 5.

As well known, the mold disk 1 is mounted for rotation in a vertical plane in a bearing 2 provided in an arm 3 offset from the forward end of the usual mold disk supporting slide 4, the latter being slidable fore and aft in horizontal guides formed in a rigid frame member of the machine. The molds 5 (either four, as shown, or six may be provided) are mounted on the disk 1 in the usual way (as by screws, not shown) and each mold has a casting slot or cavity into which molten metal is injected from the rear in well known manner to cast a slug having formed on the front edge thereof the type characters of the line of matrices presented at the front of the mold.

As usual, any one of the molds on the disk may be selected for use by rotating the disk 1 by a manually operated pinion (not shown) until the desired mold occupies a vertical position at the right of the disk as viewed from the front of the machine. During each cycle of operation of the machine, in a manner well understood, the mold disk is turned by power, first, through a quarter revolution to bring the selected mold to slug casting position (the horizontal position at the top of the disk) and then through a three-quarter revolution to bring such mold around again to its normal vertical position at which time after the cast slug is ejected in a forward direction out of the mold, the machine is automatically stopped.

By way of illustration, the molds 5 have casting slots 6, 7, 8 and 9 respectively which differ in size whereby to produce slugs correspondingly differing in size. The mold having the slot 8 is of the recessed or head-letter style for casting large bodied slugs bearing type for printing headlines and display advertising matter and it will be obvious that continued casting in a mold of this size will result in the induction of a very considerable amount of heat in a relatively short time. On the other hand, the molds having the slots 6, 7 and 9 are used for producing relatively thin bodied slugs bearing relatively small characters as for text or body matter in newspapers, books and the like and upon continuous use of these molds very little heat will be induced therein

due to the relatively small amount of type metal injected at each cast.

The mold cooling air blower 10 (here shown diagrammatically in form and location) may be secured at any convenient location on the machine frame and is provided preferably with a flexible tube 11 the free end of which is suitably held as by a bracket (not shown) in such position as to direct a stream of air across or against the active or selected mold while the latter stands at slug ejecting position. The blower may be of any commercial form ordinarily obtainable on the market, it being preferable for convenience and economy to employ a type comprising an electric motor and impeller unit to which a flexible outlet tube of suitable length may be attached.

When a mold with a large casting slot is selected for use, such as the mold with the recessed slot 8, it is desirable that a cooling medium such as the air blower 10 be set into operation and kept running a large part of the time in order to dissipate the excessive heat absorbed by the mold parts from the large volume of injected type metal at each cast. But when a mold having a relatively small casting slot such as the slot 7 is selected for use, the mold cooling medium is seldom needed for more than a short period at infrequent intervals. Heretofore, in order to obtain satisfactory slugs in different sizes, it has been incumbent upon the operator to render the mold cooling medium operative and inoperative manually according to his own judgment and by observation from time to time of the condition of the ejected slugs.

According to the present invention the mold cooling medium such as the motor driven blower 10 is rendered operative and inoperative automatically as the temperature of the active mold varies beyond certain predetermined limits. In the embodiment of the invention illustrated particularly in Figs. 2 and 3 this is accomplished by a heat sensitive switch represented by the tube 12. This switch is of the thermo-couple type adapted to open and close contacts connected in an electric circuit through expansion and contraction of unlike metals within the tube. The particular form of switch illustrated is commercially known as the "Fenwal" thermoswitch but other similar types of switches may of course be employed.

The switch 12, as shown in Figs. 2 and 3, is mounted in an elongated vertical recess 13 at the front end of the disk supporting slide 4, the recess preferably having a curved bottom wall corresponding to the curvature of the switch tube. Actually, the recess 13 in the present instance is formed in the outer edge of the so-called ejector blade guide 14 secured to the front end of slide 4 and which is common to the type of line casting machine employing a plurality of solid ejector blades 15 carried vertically edgewise and in compact facewise relation in a box 16, each blade being of a different width vertically and the blades being selectable for individual use according to the length of the casting slot in a selected mold by adjusting the box 16 laterally on supports (not shown) on the slide 4. For full details of the foregoing type of ejector mechanism which is well known on commercial machines, reference may be had to Letters Patent No. 1,123,814.

For retaining the switch 12 in the recess 13 there is provided a metal strap or bracket 17 secured to the slide 4 as by screws 18. Bracket 17 is provided with spring fingers 19 which, as

best shown in Fig. 2, are shaped to suit the curvature of the switch 12 and thus press and clamp it firmly in place. The recess 13 is of such depth as to allow the tube of the switch 12 when seated therein to just clear the back surface of the molds as the disk 1 rotates. Such proximity of the switch to an active or selected mold while disposed at slug ejecting position, as shown in Fig. 2, enables the heat sensitive elements of the switch to respond to temperature changes in the mold through induction of heat radiated from the latter. An adjustable set screw 20 exposed at one end of the switch permits of varying the space or distance between the contacts within the switch whereby to predetermine the range of temperature variation permissible between the closed and open positions of the switch contacts. As indicated, conductors or lead wires 21 are provided, one from each contact within the switch, and these wires are connected in series with the current supply line and the electric motor of the air blower 1, all in such conventional and well known manner that it is deemed unnecessary here either to illustrate or explain in detail.

It will now be evident that each time the active or selected mold is brought into slug ejecting position where it stands at rest during the operation of the ejector mechanism, heat radiated from the mold will be picked up by the heat sensitive elements of the switch. If the mold temperature exceeds the maximum limit for which the switch is set response of such elements to the excessive heat will force the switch contacts into circuit closing position and thus automatically initiate operation of the cooling medium or device such as the air blower 10. Once set into operation the cooling device will continue to run until the mold in use or a newly selected mold fails to radiate enough heat to keep the heat sensitive elements of the switch in the expanded condition necessary to hold the contacts closed, thus automatically terminating operation of the cooling device.

In another embodiment of the invention now to be described the switch 12 is arranged for contact constantly (either of itself or preferably through a heat conducting housing) with the back of molds whereby to control the operation of the mold cooling medium through direct conductance of heat rather than by induction of radiated heat as in the embodiment already described. For illustrative purposes only, the thermoswitch 12 in this instance is shown as applied to a commercial type of line casting machine wherein the relations between the molds, mold disk and disk supporting slide are the same as that between like parts shown in Figs. 1, 2 and 3, but such parts differ therefrom slightly in form and the ejector mechanism comprises a series of separate finger-like blades 22 arranged in edge to edge relation in a common vertical plane, more or less of such blades being selected for use according to the length of the casting slot in a selected mold.

As seen in Fig. 4, the switch 12 is carried in a metal casing 23 which fits into a recess 24 formed at the front end of the mold disk supporting slide 25. Casing 23 is supported on slide 25 by means of an angle bracket 26 secured to the slide as by screws 27, and bored (indicated by dotted lines in Fig. 6) to accommodate shoulder screws 28 which project forwardly from the front of the bracket and thread into bosses 29 formed on the casing. A bow-spring 30 notched to fit freely over the screws 28, see Fig. 5, presses against

the front face of bracket 26 and against bosses 29 on casing 23 whereby to yieldingly urge the latter forwardly at all times.

Thus, as clearly indicated in Figs. 4 and 6, the flat front face 31 of the casing 23 is normally disposed in a vertical plane slightly forward of the front end of slide 25. Such disposition of the casing under the influence of spring 30 results in holding the face 31 of the casing in intimate contact with the back face of any mold such as the mold 32 which in Figs. 4 and 6 is shown at slug ejecting position. It will be understood that the disk 33, as with the disk 1, is adapted to accommodate a plurality of molds 32 any one of which may be selected for use. And it will be evident from Figs. 4 and 6 that the screws 28 which support the casing 23 on bracket 26 have just enough play laterally and axially in the bores which accommodate them in the bracket to allow spring 30 to act freely but at the same time prevent excessive forward advance of the casing by the spring in the event that the mold disk is slid out or removed as it is in practice when inspection or cleaning or other attention becomes necessary.

The arrangement of the thermoswitch as just described serves automatically to control operation of a mold cooling medium such as the air blower 10 through absorption of heat by the casing 23 in which the switch 12 is carried, heat in the active mold being transmitted by direct contact with such mold of the casing face 31. Response of the heat-sensitive elements of the switch within the casing to heat changes in the mold then results in initiating operation of the blower if the heat transferred from a mold exceeds the maximum limit for which the switch is adjusted by the screw 29, or causes termination of operation of the blower when the heat transferred is insufficient to keep the switch contacts in circuit closing position.

It may be pointed out here, especially in connection with the direct contact arrangement of the thermoswitch (either of itself or in a housing such as the casing herein shown) that the actual contact obviously may be made with part of a mold and an adjacent part of the disk or only with the mold disk proper instead of the molds themselves, it being apparent that contact with the disk over a portion thereof adjacent a mold would indeed be effective in controlling mold temperatures due to the natural conduction of heat from the mold mounted directly thereon. For contact only with the disk the thermoswitch would, of course, be so disposed as to lie wholly out of the path of contact with the rotating molds. In the present instance its disposition is such that it will contact with any given mold for an extended period, that is, while such mold is at rest in ejecting position and during its rotation into and out of such position, and during rotation of the disk the switch will contact portions thereof between adjacent molds.

The accompanying drawings and description herein refer to two embodiments of the invention merely by way of example, and obviously many changes and variations may be made therein and in the mode of application without departing from its spirit. It should be understood, therefore, that the invention is not limited to any specific form or embodiment except insofar as such limitations are set forth in the claims.

Having thus described my invention, what I claim is:

1. In a slug casting machine having a rotary mold disk carrying a slotted mold and having

means for rotating said disk to present the mold periodically at slug casting and slug ejecting positions, the combination of a supporting slide for the mold disk, a slug ejector mounted on said slide at the rear of the mold, a heat-sensitive member mounted on the slide at the rear of the mold and relatively disposed opposite and in such proximity to the rear face thereof when the mold is presented at slug ejecting position as to detect and respond to abnormal temperatures of said mold by induction of heat radiated therefrom, and a mold cooling device including operating means therefor and adapted for conditioning for operation under control of said heat-sensitive member to cool the mold.

2. A combination as in claim 1, characterized in that the heat-sensitive member is mounted at the forward end of the mold disk supporting slide by retaining means constructed to hold it out of intimate contact with the rear face of the mold and stationary relative to said mold, the mold disk and the supporting slide for the latter.

3. A combination as in claim 1, characterized in that the heat-sensitive member is fixedly mounted relative to the mold, the mold disk and the supporting slide for the latter, and wherein said device is responsive to induction of heat radiated from portions of the mold as the latter approaches and leaves the slug ejecting position as well as while it is in such position.

4. A combination as in claim 1, characterized by a recess formed in the forward end of the mold disk supporting slide and spring fingers for holding the heat-sensitive member removably seated in said recess.

5. A combination as in claim 1, characterized by a recess formed in the forward end of the mold disk supporting slide, a casing carrying the heat-sensitive member, a bracket secured to the slide, and a yielding connection between said bracket and said casing for sustaining the latter for limited fore and aft movement in the recess formed in the slide.

6. A combination as in claim 1, characterized by a casing carrying the heat-sensitive member and having a flat face disposed in a plane parallel to the back surface of the mold, said casing being under constant yielding pressure whereby to hold the flat face thereof in intimate contact with the mold.

7. A combination as in claim 1, characterized by the fact that the heat-sensitive member is carried in a casing mounted on the slide by means of a yielding connection adapted to press the casing forwardly a limited distance beyond the front end of the slide and assure contact of said casing with the back of the mold.

8. A combination as in claim 1, characterized

in that upon detection of mold temperatures beyond predetermined maximum and minimum limits, the heat-sensitive member is adapted to initiate or terminate operation of the cooling device as required.

9. In a slug casting machine having a slotted mold and means for moving and for presenting said mold periodically at operating positions for casting and ejecting the slug, the combination of a mold cooling device including operating means therefor and adapted to direct air against the mold to dissipate heat generated therein from the slug casting operation, a heat-sensitive member adapted periodically to cooperate with a limited surface portion of the mold removed from the casting slot thereof and to detect and respond to the temperature of said mold during the period of such cooperation, and connections between said member and said cooling device for controlling the operation of the latter upon detection of mold temperatures beyond predetermined maximum and minimum limits.

10. A combination as in claim 9 wherein the machine is provided with a plurality of molds arranged on a rotatable carrier and means is provided for rotating the carrier to present a selected one of said molds periodically at operating positions for casting and ejecting the slug, characterized by the fact that during rotation of the carrier the heat-sensitive member is adapted to cooperate with corresponding surface portions of each of the molds and with the carrier, and to cooperate with at least a portion of the selected mold when the latter is at rest in slug ejecting position.

11. A combination as in claim 9, wherein the heat-sensitive member is disposed on the machine for intimate contact with a portion of the back surface of the mold removed from the casting slot thereof when said mold is presented at slug ejecting position, whereby to respond to the temperature of the mold by direct conductance of heat.

12. A combination as in claim 9, wherein the heat-sensitive member is disposed on the machine for yieldingly contacting back surface portions of the mold as the latter approaches and leaves the slug ejecting position and while it is in said position.

13. A combination as in claim 9, wherein the mold cooling device comprises a motor driven air blower and the heat-sensitive member comprises a thermo-couple arrangement which is adjustable whereby to enable said member to control the operation of said blower within different limits of variations in the temperature of the mold.

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