Aug. 19, 1969 R. K. LONDAL ET AL 3,461,948

BLOW PLATE ASSEMBLY

Filed April 18, 1967 3 Sheets-Sheet 1

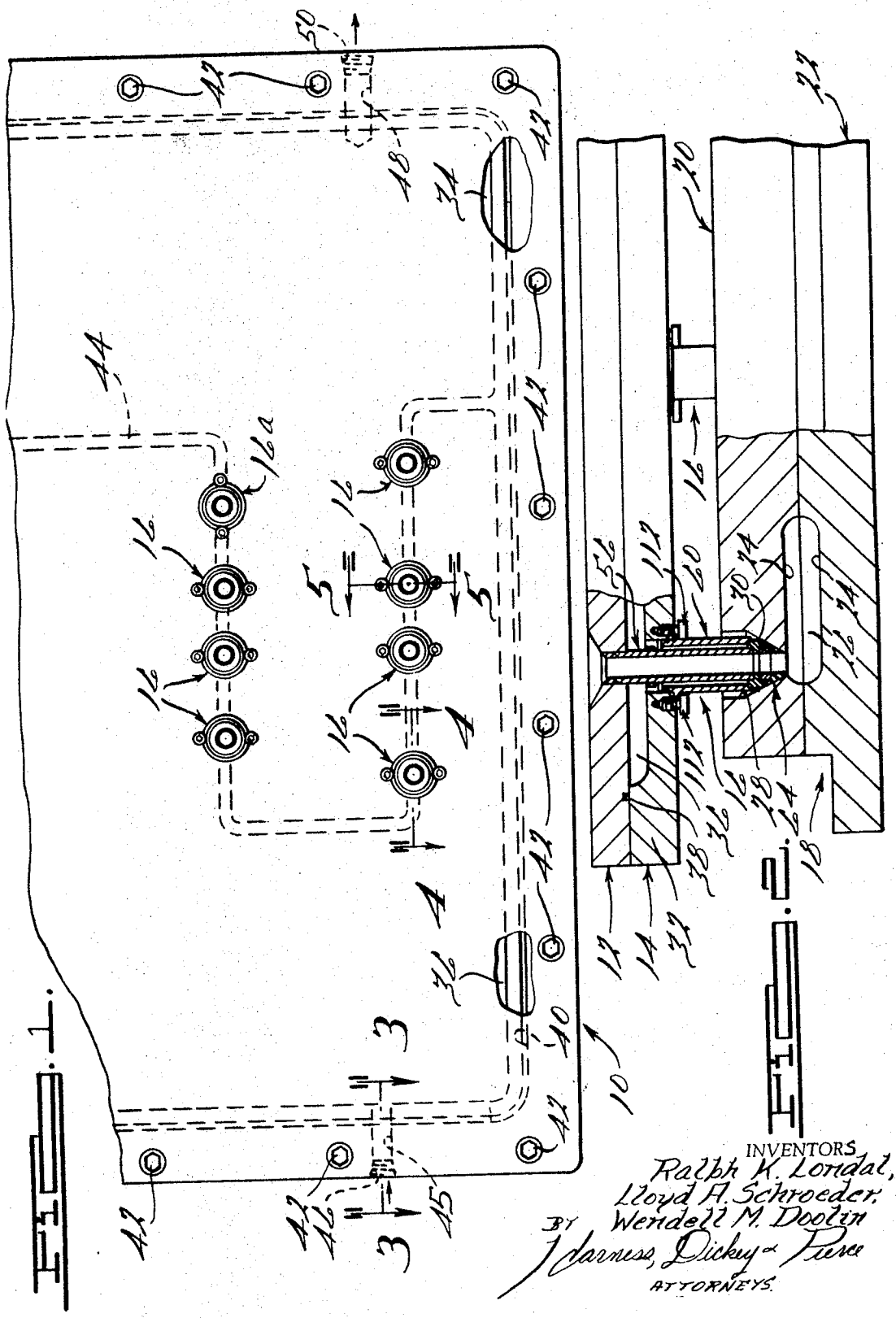


Fig. 1

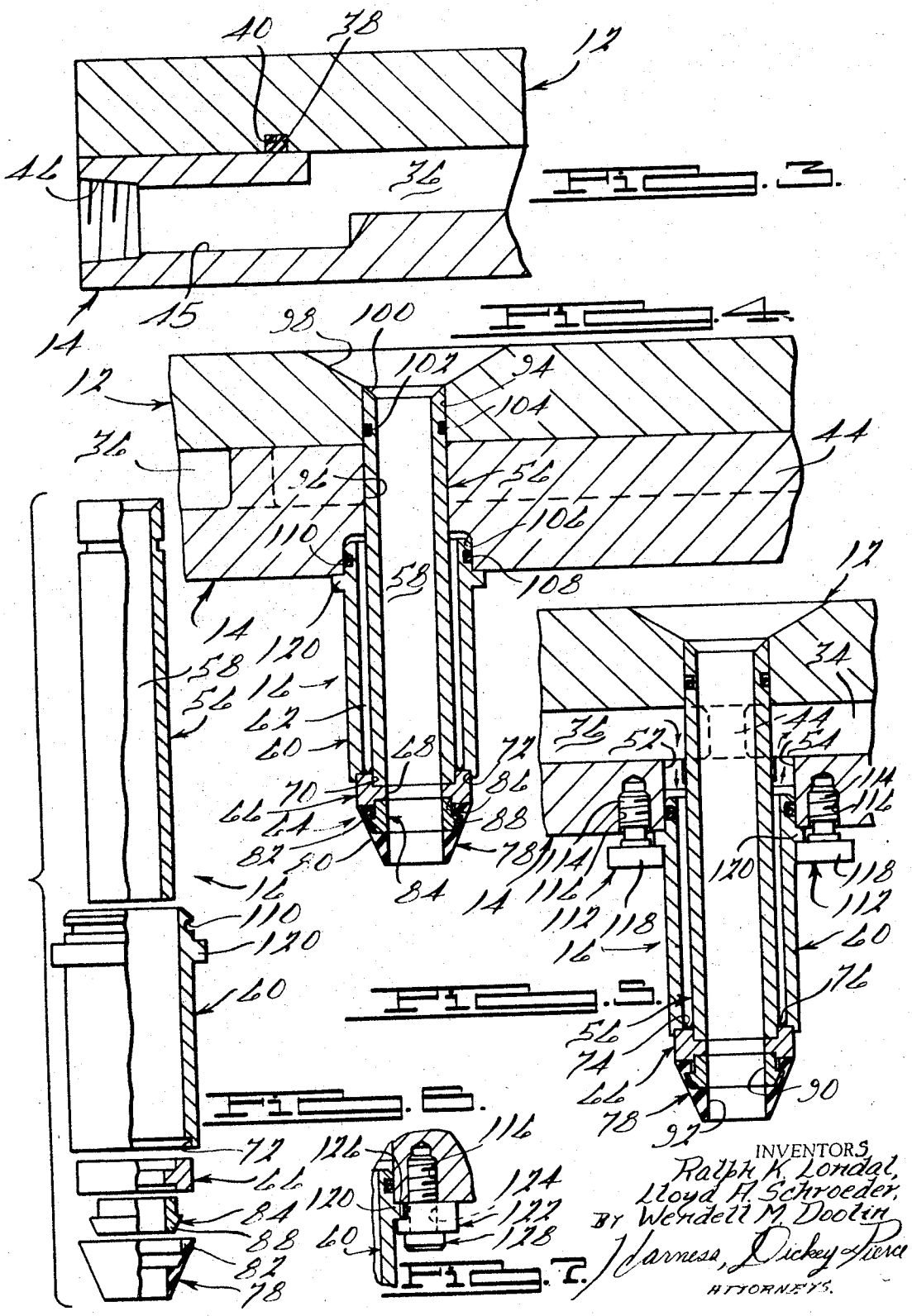
Fig. 2

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BLOW PLATE ASSEMBLY

Filed April 18, 1967 3 Sheets-Sheet 2



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BLOW PLATE ASSEMBLY

Filed April 18, 1967 3 Sheets-Sheet 3

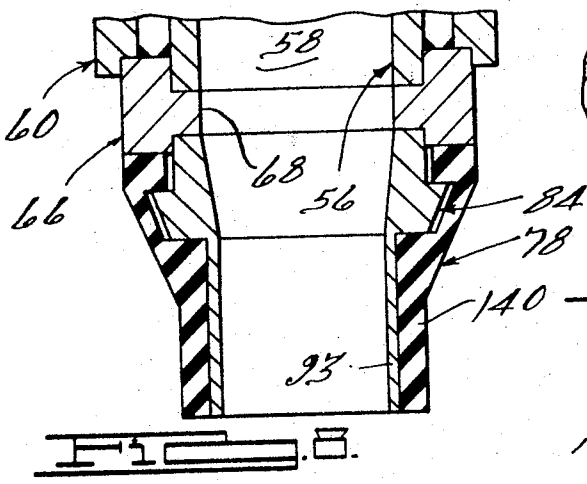


Fig. 8.

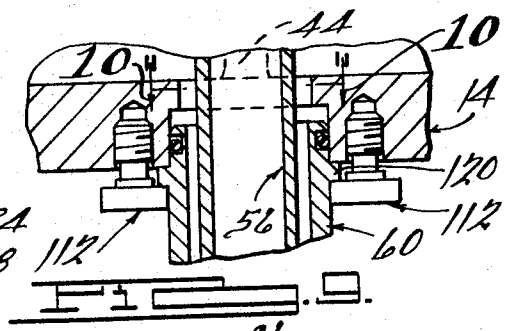


Fig. 9.

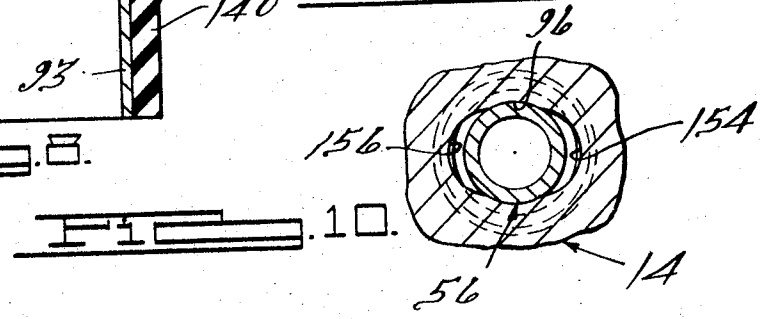


Fig. 10.

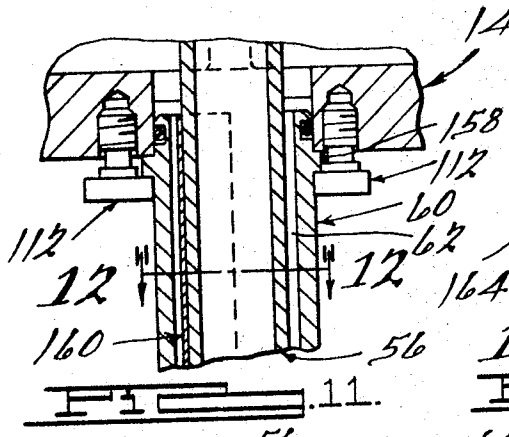


Fig. 11.

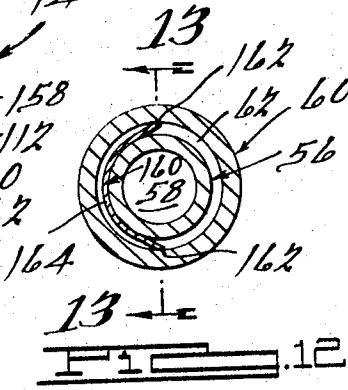


Fig. 12.

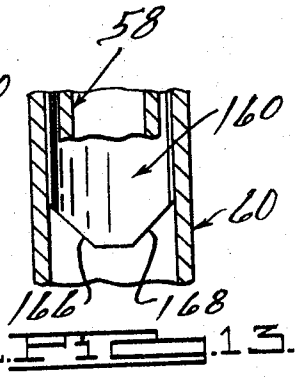


Fig. 13.

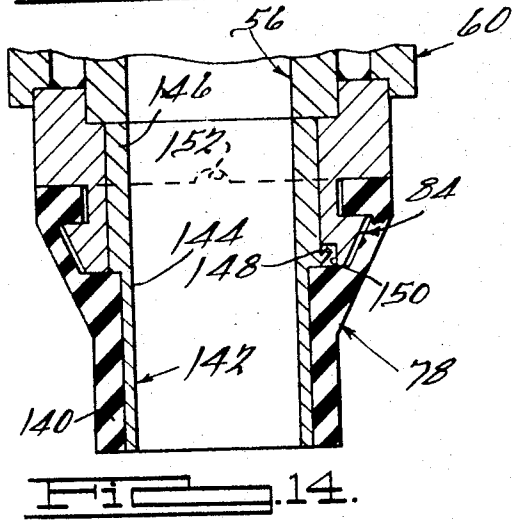


Fig. 14.

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United States Patent Office 3,461,948 Patented Aug. 19, 1969

3,461,948

BLOW PLATE ASSEMBLY

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Continuation-in-part of application Ser. No. 534,807, Mar. 16, 1966. This application Apr. 18, 1967, Ser. No. 634,415

Int. Cl. B22c 7/06, 15/22

U.S. Cl. 164—201 32 Claims

ABSTRACT OF THE DISCLOSURE

A device for use in conjunction with a support member comprising one side of a fluent material reservoir and defining an annular discharge bore adapted to communicate fluent material within the reservoir to an associated mold or the like, the device including a hollow cylindrical member defining a central passage through which the fluent material is communicable, an external jacket member extending coaxially of the first mentioned member and surrounding a portion thereof, the inner periphery of the jacket member and the outer periphery of the first mentioned member defining a fluid circulating chamber therebetween, a tip assembly disposed on the lower end of the device and engageable with the associated mold or the like, fluid passage means formed in the support member and communicable with the upper end of the fluid circulating chamber, and means for detachably securing the device to the support member including an annular flange section formed integrally of said jacket member and clamping means adapted to clampingly secure the flange section to the lower side of the support member.

This invention relates generally to foundry equipment and, more particularly, to a new and improved blow plate assembly of the type used for communicating core molding sand into a heated core box. This application is a continuation-in-part of the applicants' copending application, Ser. No. 534,807, filed Mar. 16, 1966 and now abandoned.

It has heretofore been the practice in the fabrication of preformed sand cores to force oil-conditioned core sand or a similar molding material into a core box or mold, whereby the sand assumes a predetermined shape or configuration. The core molds or boxes were subsequently inverted, leaving the cores on suitable driers or dryer members which were placed into baking ovens to permanently set the sand cores.

In order to eliminate the costly driers and the oven cycle, some present day sand core manufacturing involves the use of heated core boxes comprising upper and lower parts of plate-like character shaped at the mating surfaces thereof to provide the desired core forming cavities. As distinguished from earlier practices, these parts or plates are kept in assembled relation with respect to one another throughout both the core forming and setting phases of the core forming operation, the core molding sand in the more recent methods being treated with a thermosetting or curing resin and being blown into heated core boxes to fill the cavities therein by means of an associated blow plate assembly of one sort or another. One particularly objectionable problem which has been created by the aforesaid modern core forming techniques results from the fact that the blow plate assembly and any sand discharge components thereof are in direct heat transfer relationship with respect to the hot core box during the course of the core blowing operation, resulting in these parts being heated and thereby curing or setting the resin which is combined

with the core forming sand, with the further result that the discharge tubes of the blow plate assembly frequently become clogged.

It has been proposed to meet the aforementioned problem by the more or less obvious procedure of cooling the blow plate assembly through the use of circulating cooling water. A suggested procedure was to provide a blow plate having a main cavity containing cooling water, with sleeves open to this cooling water and surrounding the blow conduits.

More recent designs have utilized jacketed blow tubes which extend closer to the core cavities of the core box, and which are themselves cooled by the circulation of water about their jacketed sand discharge passages. For example, one construction that has been heretofore known and used comprises two matingly engageable blow plates, one of which is formed with a plurality of interconnected channels through which the circulating cooling water can be pumped; however, this construction has been unsatisfactory due to the fact that the plates have been glued together with an adhesive which has not provided a completely fluid-tight seal, resulting in considerable leakage of the cooling water that is pumped under pressure through the blow plate assembly. Such constructions have also been unsatisfactory due to the fact that the plates were difficult to disassemble for service or modification, and because the adhesive utilized in connecting the blow plates would frequently get into the channels and subsequently plug up the water circulating passages surrounding the blow tube units.

It is accordingly a general object of the present invention to provide a new and improved blow plate assembly for core making and, more particularly, for use in conjunction with a separable heated core box apparatus.

It is a more particular object of the present invention to provide a new and improved blow plate assembly which includes one or more blow tube units movable into direct communication with the cavities of the associated heated core box, which blow tube units are adapted to exhibit improved and more positive heat transfer circulation of cooling water to prevent setting up of the core molding sand therewithin.

It is a more particular object of the present invention to provide a new and improved blow plate assembly of the above character wherein the blow tube units are detachably secured to the assembly so as to provide for rapid replacement thereof.

It is still another object of the present invention to provide a new and improved blow plate assembly of the above character which is constructed to provide a fluid-tight relationship between the upper and lower blow plate members thereof and between the plates and the blow tube assemblies, thereby obviating the possibility of any leakage of the circulating cooling water from the assembly.

It is a further object of the present invention to provide a new and improved blow plate assembly of the above character wherein the blow tube units are provided with resilient or flexible tip members which may, if desired, be provided with means for transmitting or conducting heat away from the discharge ends thereof.

It is still another object of the present invention to provide a new and improved blow plate assembly of the above character which includes means for radially aligning the individual blow tube units with the blow plate assembly, and with means for radially aligning the tip members on the ends of the blow tube unit.

It is yet another object of the present invention to provide a new and improved blow plate assembly of the above character which includes shielding or baffle means for selectively circulating cooling fluid within the individual blow tube units.

It is a further object of the present invention to provide a new and improved blow plate assembly of the above character which is of a relatively simple design, is easy to assemble and economical to commercially manufacture.

The foregoing and other objects and advantages of the present invention are achieved through the provision of a novel blow plate assembly which is fabricated of a pair of rugged blow plate members which define a pair of fluid-tight manifold chambers therebetween, these chambers being separated by a substantially transversely extending partition member which provides a fluid-tight seal therebetween. The assembly is provided with a plurality of blow tube units which are mounted in alignment with respect to the partition in a manner such that the cooling water disposed within one of the chambers may flow into one side of the blow tube units and after circulating therethrough, may flow out of the opposite side of the units into the other of the said manifold chambers. The plurality of blow tube units are mounted such that they may be easily removed from the assembly for purposes of replacement or repair, each of the blow tube units being a conveniently separable subassembly which is of a very inexpensive nature, and whose standard design permits a plurality of them to be assembled rapidly and easily in similarly standard sized, predeterminably located openings in the blow plate assembly. A particular feature of the blow tube units utilized in the blow plate assembly of the present invention resides in the provision of an integral flange portion disposed around the outer periphery of each of the blow tube jacket members and adapted to bear directly against the lower side of the lower blow plate member, whereby to assure perpendicular tube orientation. The flange portions are sufficiently small to materially reduce heretofore required expensive machining operations (counterboring) necessary for adjusting the effective lengths of the tubes.

Another feature of the present invention resides in the provision of resilient tip members on the lower ends of the blow tube units, which members are detachably and movably mounted to provide for convenient removal in the event they became damaged, and also to provide for slight radial movement to accommodate for misalignment between the blow plate assembly and the associated core box due to uneven temperature distribution.

In certain installations, a rigid internal sleeve may be provided within the interior of the tip members for purposes of conducting heat away from the lower ends of the blow tube units.

A more complete understanding of the present invention and other objects and features thereof will be obtained from the following detailed description taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a top elevational view, partially broken away, of a blow plate assembly in accordance with an exemplary embodiment of the present invention;

FIGURE 2 is an enlarged side elevational view, partially broken away, of a portion of the blow plate assembly of the present invention shown in operative association with a typical heated core box;

FIGURE 3 is an enlarged fragmentary cross-sectional view of a portion of the blow plate assembly illustrated in FIGURE 1, as taken substantially along the line **3—3** thereof;

FIGURE 4 is an enlarged cross-sectional view of a portion of the blow plate assembly illustrated in FIGURE 1, as taken substantially along the line **4—4** thereof;

FIGURE 5 is an enlarged transverse cross-sectional view of a portion of the blow plate assembly illustrated in FIGURE 1, as taken substantially along the line **5—5** thereof;

FIGURE 6 is an expolded assembly drawing of one of the blow tube units of the blow plate assembly of the present invention;

FIGURE 7 is a fragmentary cross-sectional view of an alternative means for detachably mounting the blow tube units;

FIGURE 8 is an enlarged transverse cross-sectional view of an alternate embodiment of the tip portion of one of the blow tube units incorporated in the blow plate assembly of the present invention;

FIGURE 9 is a transverse cross-sectional view of a portion of one of the blow tube units and an associated blow plate showing an alternate construction for communicating cooling fluid to and from the blow tube unit;

FIGURE 10 is a fragmentary cross-sectional view taken substantially along the line **10—10** of FIGURE 9;

FIGURE 11 is a transverse cross-sectional view of one of the blow tube units incorporated in the assembly of the present invention, the unit being provided with baffle means for selectively circulating cooling fluid within the blow tube unit;

FIGURE 12 is a transverse cross-sectional view taken substantially along the line **12—12** of FIGURE 11;

FIGURE 13 is a fragmentary cross-sectional view of the lower end portion of the baffle illustrated in FIGURES 11 and 12, and

FIGURE 14 is an enlarged transverse cross-sectional view, similar to FIGURE 8, of still another alternate construction of the tip portion of one of the blow tube units incorporated in the present invention.

Referring now to FIGURES 1 and 2 of the drawings, a blow plate assembly **10**, in accordance with an exemplary embodiment of the present invention, is shown as comprising upper and lower plates **12** and **14**, respectively, which are bored or otherwise apertured in vertical registration with one another at a plurality of points determined by and corresponding to the location of a plurality of blow tube units, generally designated **16**, that extend downwardly from the lower side of the assembly **10** and are adapted to be received one within each of a plurality of suitable openings in an associated sand core mold or core box, one of which is representatively illustrated in FIGURE 2 and generally designated by the numeral **18**. The blow plate assembly **10** constitutes the base of lower panel of a sand reservoir or magazine which may be replenished from time to time with a core molding sand or similar material that is adapted to be communicated through the blow tube units **16** to the associated core box **18** which, by way of example, includes separable upper and lower plate-like component members **20** and **22** that are respectively formed on their lower and upper surfaces to provide mating recesses **24** which conjointly constitute a core-forming cavity **26** when the plates **20, 22** are adjacently oriented in the manner illustrated. The core box **18** is adapted to be heated by any suitable manner to a temperature sufficient to cure the thermosetting material which is combined with the core-forming sand communicated into the cavities **26** by means of the assembly **10** of the present invention. The upper surface of the plate member **20** is conventionally provided with a suitable number (depending upon the number and size or design of the cavities **26**), of upwardly opening, filling holes **28**, each shaped to provide a substantially frustoconical bottom seat **30** opening directly into the cavity **26** and flush with the top of the latter, for receiving the lower end of one of the blow tube units **16**, in the manner hereinafter to be described.

In accordance with the principles of the present invention, the outer periphery of the upper surface of the lower plate **14** is formed with an upwardly projecting shoulder portion, generally designated **32**, which is adapted to continuously engage the lower surface of the upper plate **12**, as best seen in FIGURE 2, and define the outer marginal boundary of a pair of manifold chambers, generally designated **34** and **36**, which are provided between the upper surface of the plate **14** and the lower surface of the plate **12**. Suitable gasket means **38** is disposed within a recess **40** which is formed within the lower surface of the plate **12** in direct registry with the upper surface of the shoulder portion **32**, whereby to provide a fluid-tight seal at the juncture of the plates **12** and **14**.

The plates 12 and 14 are adapted to be rigidly secured to one another by means of a plurality of screws, bolts or the like 42 which extend through suitable aligned bores formed in the periphery of the plates 12 and 14. The mutually adjacent boundaries of the chambers 34 and 36 are defined and separated by an upwardly extending partition 44 which is integrally formed on the upper surface of the plate 14 and engages the lower surface of the plate 12 upon assembly of the members 12 and 14, thereby functioning to isolate or provide substantially a fluid-tight wall between the manifold chambers 34 and 36. The particular configuration or orientation of the partition 44 is adapted to be controlled by the number and size or design of the cavities 26, but regardless of the particular conformation of the partition 44, this member is adapted to divide or separate the chambers 36 and 34 into upstream and downstream manifolds, the former of which is adapted to receive fresh cooling fluid, preferably but not necessarily water, from an external source of such fluid as is commonly available in foundaries and the like, and the latter of which is adapted to receive the cooling fluid after the same has functioned to cool the plurality of blow tube units 16 and thereafter communicate this water to a suitable drain or the like.

As best seen in FIGURES 1 and 3, the cooling water is adapted to be communicated to the chamber 36 by means of a substantially horizontally extending bore 45 that is formed in the lower plate 14 of the assembly 10 and which includes an internally threaded end section 46 adapted to receive a suitable fluid fitting on the end of an associated fluid inlet conduit (not shown) or the like. A similar bore 48 having an internally threaded end portion 50 is formed on the opposite (right) end of the plate 14 and functions to communicate cooling water from the chamber 34 to an associated outlet conduit (not shown) having suitable fitting means secured within the bore section 50. The manifold chambers 34 and 36 are placed in communication with the interior of the blow tube units 16 by drilled pairs of individual, downwardly extending intake and discharge ports 52 and 54, which are arranged on the sides of the partition 44 confronting the chambers 36 and 34, respectively, and function to communicate cooling water to and from the blow tube units 16 in the manner hereinafter to be described.

Referring now in detail to the construction of one of the blow tube units 16, as best illustrated in FIGURES 4 through 6, the unit 16 comprises a hollow cylindrical member 56 which is of substantially uniform cross-section and defines a central cylindrical passage 58 through which core molding sand is adapted to be transmitted. The unit 16 also comprises an external tubular jacket member 60, the inner diameter of which is somewhat greater than the outer diameter of the member 56, whereby an annular space or chamber 62 is defined between the members 56 and 60. The members 56 and 60 are coaxially aligned and the lower end of the jacket member 60 terminates at a position slightly above the lower end of the member 56, as illustrated. The members 56, 60 may be formed or turned from tubular stock, as by a screw machine operation, and are preferably constructed of cold rolled steel, or alternatively, of stainless steel when desired.

Mounted on the lower ends of each of the units 16 is a tip assembly, generally designated 64 and comprising a ring-shaped member 66 that defines a central opening 68 which is of the same diameter as the passage 58 and aligned coaxially therewith. An annular recessed portion 70 is formed at the upper end of the member 66 around the inner periphery thereof and is adapted to receive the lower end of the member 56 therewithin. The lower end of the jacket member 60 is formed with a recessed portion 72 around the inner periphery thereof and is adapated to receive the upper outer edge of the member 66, as illustrated in FIGURES 5 and 6. The member 66 is rigidly secured to the lower ends of the members 56 and 60 by means of fluid-tight brazed joints, as seen at 74 and 76 in FIGURE 5.

Mounted on the lower end of the assembly 64 is an apertured tip member 78 which is preferably constructed of a heat resistant, somewhat flexible hard rubber material or alternatively, of a suitable synthetic plastic resin such as "Viton." The outer periphery of the the tip 78 defines a frusto-conical surface 80 which is substantially complementary in shape with respect to the bottom seats 30 formed in the filling holes 28 of the core box 18. The tip member 78 is formed with a radially inwardly extending flange or shoulder portion 82 at the upper end thereof which is adapted to "snap on" or be similarly detachably secured to a downwardly extending, centrally apertured tip mounting member 84 which is secured to the lower side of the ring member 66, the upper end of the mounting member 84 being secured as by silver soldering or the like within an annular recess 86 formed around the inner periphery of the member 66 at the lower end thereof. The lower end of the mounting member 84 is formed with a radially outwardly extending shoulder portion 88 which is adapted to releasably engage the shoulder portion 82 of the tip member 78. The members 84 and 78 are formed with central apertures 90 and 92, respectively, which are of the same diameter as the passage 58 and are coaxially aligned therewith, whereby to provide a smooth bore extending through the blow tube unit 16. Preferably some radial clearance is provided between the outer diameter of the member 84 and the inner diameter of the member 78 to enable the member 78 to move slightly on the lower end of the assembly 16, whereby to accommodate for slight misalignment between the core box 18 and the blow plate assembly 10 due to uneven heat distribution.

For certain types of installations, it may be desirable to provide some means for conducting heat away from the tip member 78 and for reinforcing the member 78 against excessive transverse deformation. As best seen in FIGURE 8, an exemplary embodiment of such means may be provided by constructing the mounting member 84 with a downwardly extending sleeve or liner section 93 having an inner diameter of substantially the same dimension as the inner diameter of the mounting member 84. As shown in FIGURE 8, the tip member 78 may be formed with an annular downwardly extending section 140 which is coextensive of the lower end of the section 93 of the mounting member 84, whereby the tip member 78 will extend downwardly through the bottom seat 30 of the plate 20 into the interior of the cavity 26 for certain types of core forming operations. The primary feature of such a construction resides in the fact that the section 93 of the mounting member 84 is adapted to transmit or conduct heat away from the lower end of the tip member 78 and hence maintain the member 78 at a lower temperature, whereby to prevent premature curing or setting up of the core molding sand which is transmitted through the blow tube units 16.

As best seen in FIGURE 14, instead of having the section 93 integrally formed on the mounting member 84, a separable sleeve member 142 may be disposed within the interior of the tip member 78 and have its upper end detachably secured within the interior of the mounting member 84 and ring member 66. More particularly, the member 142 defines a central passage 144 which is of the same diameter as the passage 58 defined by the cylindrical member 56. The inner diameters of the ring member 66 and mounting member 84 are preferably somewhat larger in size than in the embodiment shown in FIGURE 8, whereby to receive an enlarged thickness section 146 formed on the upper end of the member 142. The primary advantage of having the member 142 be separable from the mounting member 84 resides in the fact that the member 142 may be easily removed for purposes of replacement in the event it becomes damaged or worn. As illustrated in FIGURE 14, the upper section 146 of the member 142 may be formed with an outwardly extending tang portion 148 adapted to be received within a suitable radially outwardly extending recess 150 formed in the inner diam-

eter of the mounting member **84** for purposes of radially aligning the member **142** as it is mounted on the member **84**. Similarly, the mounting member **84** may be formed with an upwardly extending recessed portion indicated at **152** in FIGURE 14 which is adapted to receive a suitable complementary-shaped boss portion on the tip member **78** for purposes of radially aligning the member **78** with the members **66**, **84** and **142** upon assembly thereon.

As best illustrated in FIGURES 4 and 5, the plate members **12** and **14** are formed with a plurality of aligned pairs of bores **94** and **96**, respectively, each of these pairs of bores being adapted to receive the upper end of one of the blow tube units **16**. The diameter of the bores **94**, **96** are preferably such that the upper ends of the members **56** of the blow tube units **16** may be received therewithin with a slip or only slight interference fit. The upper ends of the bores **94** are formed with a countersunk or chamfered portion **98**, the surface of which is generally frusto-conical in shape, whereby to provide an enlarged entrance for the core molding sand communicated into the upper ends of the passage **58**.A fluid-tight seal is provided between the outer periphery of the upper end of the member **56** and the bore **94** by means of suitable O-ring sealing means or the like **102** which is disposed within an annular recess **104** formed around the outer periphery of the member **56**. The lower end of the bore **96** is formed with a counterbore, as seen at **106** in FIGURE 4, that is adapted to receive the upper end of the jacket member **60**. A fluid-tight seal is provided between the outer periphery of the member **60** and the inner periphery of the counterbore **106** by means of suitable O-ring sealing means **108** which is disposed within an annular recess **110** formed around the outer periphery of the upper end of the member **60**. Preferably the diameters of the bores **96** are slightly larger than the bores **94** to accommodate the O-rings **102** upon assembly of the blow tube units **16**.

As best seen in FIGURES 9 and 10, instead of providing the intake and discharge ports **52** and **54** within the lower plate **14** as shown in FIGURE 5, the plate **14** may be formed with a pair of generally eliptical recesses **154** and **156** which are located on the diametrically opposite sides of the bore **96** along a line perpendicular to the partition **44** (see FIGURE 10). By way of example, the recesses **154**, **156** may be formed through the use of a drilling or milling tool which is slightly smaller in diameter than the bore **96**, the tool being moved along the aforesaid line perpendicular to the partition **44** a distance sufficient to make the maximum width of the recesses **154**, **156** approximately equal to the diameter of the intake and discharge ports **52**, **54**. In a preferred construction, the diameter of the bore **96** can be approximately 1 inch, with the drilling or milling tool being approximately ⅞ of an inch in diameter, resulting in the maximum width of the recesses **154**, **156** being approximately .090 inch. The primary feature of such a construction resides in the fact that improved circulation of cooling fluid is provided between the chambers **34**, **36** and the interior of the blow tube units **16**, thereby providing for improved heat transfer from the units **16**. A further advantage of the above described construction resides in the fact that the upper ends of the blow tube units **16** may be inserted into the bores **94**, **96** without any excessive stress being exerted against the O-ring sealing means **102**, whereby to prevent tearing or similar damage to the sealing means **102** when the units **16** are mounted.

As best seen in FIGURE 5, the blow tube units **16** are adapted to be fixedly secured to the lower side of the plate **14** by means of a plurality of suitable mounting screws, bolts or the like, generally designated **112**. In the exemplary embodiment of the present invention illustrated herein, only two of the mounting bolts **112** are utilized for securing each of the units **16** to the plate **14**; however, if the size of the units **16** or the operational environment of the assembly **10** warrant, three, four or more of the bolts **112** may be used. Each of the bolts **112** is formed with a threaded portion **114** which is adapted to be threadedly mounted within a suitable internally threaded aperture **116** formed in the lower side of the plate **14**, and be provided with suitable nylon locking means such as is distributed under the trade name "Nylok," each of the bolts **112** further comprising an enlarged diameter head section **118** which is adapted to engage a radially outwardly extending flange portion **120** formed around the outer periphery of the jacket member **60**. As illustrated in FIGURE 1, the threaded apertures **116** may be arranged on the opposite sides of the partition **44**; however, they are preferably located along or are aligned with the partition **44**, as seen in connection with the blow tube unit **16***a*, whereby to minimize the possibility of drilling completely through the plate member **14** as the apertures **116** are formed therein. The flange portions **120** are adapted to bear directly against the lower side of the member **14** and thereby assure perpendicular orientation of the units **16**. Also, the portions **120** are axially spaced from the upper ends of the jacket members **60** such that when the portions **120** are seated against the lower side of the plate **14**, the upper ends of the jackets **60** will be spaced slightly from the upper ends of the counterbores **106**, as illustrated in FIGURES 4 and 5. It may be noted that by virtue of the small size of the flange portions **120**, very little machining will be necessary if it is desired to form a counterbore in the plate member **14** in order to recess the flange portions **120** and thereby reduce the lengths of the units **16**. It is contemplated that for nominal heights, no such counterboring will be required.

Referring briefly to FIGURE 7, a slightly modified means of securing the blow tube units **16** to the lower side of the plate member **14** is shown as comprising a clamping member, generally designated **122**, which is formed with a central vertically extending bore or aperture **124** and a recessed portion **126** along one side of the upper edge thereof. Two or more of such clamping members **122** are adapted to be used in security each of the units **16** to the plate **14**, the apertures **124** being adapted to receive suitable screws, bolts or the like **128** that are threadably mounted within the aforedescribed apertures **116** or the like. It will be seen that a section of the flange portion **120** is adapted to be received within the recessed portion **126** of the clamping member **122** and be clampingly secured against the lower surface of the plate member **14**, whereby the associated blow tube unit **16** will be positively, yet removably, attached to the member **14**.

The aligned pairs of bores **94** and **96**, within which the upper ends of the blow tube units **16** are received, are formed in alignment with the hereinbefore described partition **44**, whereby the upper ends of the blow tube members **56** extend upwardly through the partition **44**, as best illustrated in FIGURE 5. The pairs of intake and discharge ports **52** and **54**, respectively, are juxtapositioned adjacent the opposite sides of the partition **44** and are adapted to communicate the chambers **36** and **34** with the upper ends of the counterbore **106** and hence with the chamber **62** defined between the members **56** and **60** of the blow tube units **16**.

In operation, as core-forming sand is communicated through the passage **58** and bores **68**, **90** and **92** of each of the blow tube units **16** to the cavities **26** in the core box **18**, cooling water is adapted to be pumped into the manifold chamber **36** and be communicated through the intake port **52** to the chambers **62** surrounding the lower ends of the blow tube members **56**, thereby maintaining the blow tube units **16** at a relatively low temperature to prevent curing or setting up of the resin which is combined with the core-forming sand. The cooling water thus communicated into the chambers **62** is forced under pressure therefrom through the discharge ports **54** and into the mani-

fold chamber **34**, from where it is communicated through the bore **48** to some external depository. It will be seen that the cooling water that is communicated into the chamber **34** has become heated slightly upon flowing through the blow tube units **16** and is positively separated from the fresh cooling water in the chamber **36** so that there is no mixing of the heated or "used" water with the fresh cooling water to reduce the cooling effectiveness thereof.

It may be noted that if it is desired to maintain a pressure differential across the partition **44** of any desired magnitude, the size of the intake and discharge ports **52** and **54** may be varied slightly or, alternatively, a plurality of such ports may be located on one side or the other of the partition **44** for communicating a greater or lesser amount of cooling water to each of the blow tube units **16**. For example, relatively small diameter intake ports **52** may be used to increase the turbulence of the cooling fluid flowing into the chambers **62**, thereby improving the heat transfer characteristics of the units **16**. It will also be apparent that each of the blow tube units **16** comprises a separable subassembly whose standard design permits a number of them to be assembled rapidly and easily in similar standard size, predeterminedly located openings in the plates **12** and **14**, and that each of the units **16** may be conveniently removed merely by removing the mounting bolts **112** and applying a nominal axially downwardly directed force by hand to the units **16**.

As best seen in FIGURE 11, it may be desired to form a radially inwardly extending, semi-circular recess **158** in the outer periphery of the flange portion **120** of the jacket members **60**, which recess **158** is adapted to register or align with one of the mounting bolts **112** preparatory to operatively securing the blow tube units **16** to the lower plate **14**, whereby to selectively radially position the blow tube units **16** as they are assembled.

In order to provide for improved heat transfer from the blow tube units **16**, it may be desired to insert some type of baffle means within the chambers **62** thereof to assure that the cooling fluid being communicated into the chambers **62** circulates entirely around the full length of the tube members **56** before this cooling water is transmitted out of the chamber **62**. An exemplary embodiment of such a baffle means is illustrated in FIGURES 11 through 13. More particularly, an elongated semi-circular baffle member **160**, which is preferably constructed of tempered spring steel, is disposed within the chamber **62** interadjacent the outer periphery of the member **56** and of the inner periphery of the jacket member **60**. By virtue of the resilient characteristic of the baffle member **160**, as the member **160** is inserted into the chamber **62**, the longitudinally extending side portion thereof sealingly engage the inner periphery of the jacket member **60**, as seen at **162** in FIGURE 12, while the medial portion of the baffle member **160** sealingly engages the outer periphery of the cylinder member **56**, as seen at **164** in FIGURE 12. Thus, the annular chamber **62** is divided into two diametrically opposed sections by the baffle member **160**.

The length of the baffle member **160** may be varied in accordance with the length of the associated blow tube units **16**. the upper end of the member **160** terminating at a position adjacent the upper end of the jacket member **60**, as seen in FIGURE 11. The baffle member **160** is adapted to be oriented within the chamber **62**, in a manner that the longitudinal sides thereof lie along a plane extending through the partition **44**. Accordingly, a cooling fluid which enters the chambers **62** through the intake port **52** (for recess **156**), will travel downwardly within the chamber **62** along one side of the baffle member **160** until the fluid reaches the lower end of the member **160**, at which time the fluid will flow below the lower end of the baffle member **160** and thereafter upwardly through the opposite side of the chamber **62** and outwardly through the discharge port **54** (or recess **154**). Thus, it will be seen that the baffle member **160** assures that the cooling fluid travels downwardly within the chambers **62** a distance at least as great as the length of the member **160**, so that the greater the length of the member **160**, the greater the cooling efficiency of the blow tube units **16**. In a preferred construction, the lower end of the member **160** has the opposite sides thereof slightly tapered, as seen at **166** and **168** in FIGURE 13, whereby to provide for improved circulation of cooling fluid from one side of the baffle member **160** to the other side thereof.

It will be seen from the foregoing description of the present invention that the assembly **10** enables an effective circulation of cooling water into and out of each of the blow tube units **16** closely adjacent their engagement with the associated core-forming box **18**, with the desirable result that the core-forming sand which is transmitted through the blow tube units **16** is prevented from becoming heated as it enters into the high temperature environment of the core box **18**, and with the further result that the possibility of the core-forming sand being cured or setting up as it is transmitted through the blow tube units **16** is eliminated. One very desirable feature of the present invention which is intended to be emphasized herein resides in the provision of the aforedescribed flange portions **120** that assure perpendicular tube orientation without requiring expensive machining of the blow plate member **12** or **14**. Another feature of the present invention resides in the construction of the tip assembly **64** which enables the tip members **78** to move laterally (radially) to accommodate slight misalignment between the blow plate assembly **10** and the associated core box **18** due to uneven heat distribution.

While it will be apparent that the exemplary embodiment illustrated herein is well calculated to fulfill the objects above stated, it will be appreciated that blow plate assembly **10** of the present invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In combination in a device for use in conjunction with a support member comprising one side of a fluent material reservoir and defining an annular discharge bore adapted to communicate fluent material within the reservoir to an associated mold or the like,

a hollow cylindrical member of substantially uniform cross section and defining a central passage through which the fluent material is communicable,

an external jacket member extending coaxially of said first mentioned member and surrounding a portion thereof,

the inner periphery of said jacket member and the outer periphery of said first mentioned member defining a fluid circulating chamber therebetween,

a tip assembly disposed on the lower end of said device and engageable with the associated mold or the like and closing the lower end of said chamber,

the upper end of said first mentioned member being substantially the same size as said annular bore in said support member and adapted to be received therewithin in a manner such that the outer periphery of said upper end is contiguously engaged with the inner periphery of said bore,

the upper end of said jacket member being adapted to be received within a counterbore formed in said support member circumjacent and coaxially of said first mentioned bore,

the upper end of said jacket member being of substantially the same size as said counterbore so as to contiguously engage the periphery thereof,

fluid passage means formed in said support member and directly communicable with the upper end of said fluid circulating member,

means for detachably securing the device to said support member including an annular flange section formed integrally of said jacket member and projecting radially outwardly therefrom,

said flange section being precisely perpendicularly

oriented with respect to the axis of said cylindrical and jacket member, and

clamping means adapted to clampingly secure said flange section to the lower side of said support member and thereby assure that the device is oriented at right angles thereto.

2. The invention as set forth in claim 1 wherein said means for clampingly engaging said flange portion to said support member comprises means threadably mounted within said support member.

3. The invention as set forth in claim 1 wherein said tip assembly comprises a resilient detachably mounted member of substantially complementing configuration with respect to a portion of the associated mold or the like.

4. The invention as set forth in claim 1 which includes sealing means interposed between one end of said first mentioned member and the periphery of said opening.

5. The invention as set forth in claim 1 which includes sealing means interposed between the one end of said jacket member and the periphery of said counterbore.

6. In an assembly for communicating a thermosetting fluent material to an associated mold or the like,

means forming one confining side portion of a fluent material reservoir defining a pair of spaced apart, generally parallel surfaces,

partition means extending between said surfaces and dividing the space therebetween into first and second fluid manifold chambers,

means for communicating cooling fluid to said first chamber and from said second chamber,

said chambers together being substantially coextensive of the entire confining side portion of the reservoir, whereby cooling fluid being communicated through said chambers acts to cool the fluent material in said reservoir adjacent said one side thereof,

conduit means extending through said first mentioned means at a position aligned with said partition means for communicating the fluent material from one side of the said first mentioned means to the opposite side thereof,

fluid passage means for communicating fluid in said first chamber to a position in heat transfer relationship with respect to a portion of said conduit means extending below said first mentioned means and thereafter communicating the fluid from said position into said second chamber.

7. The invention as set forth in claim 6 which includes passage defining means for communicating the fluent material from one side of said first mentioned means to the opposite side thereof, and wherein said last mentioned means includes means for communicating the fluid in said first chamber to a position substantially surrounding said passage defining means.

8. The invention as set forth in claim 6 wherein the first mentioned means comprises a pair of spaced apart plate-like elements between which said first and second manifold chambers are located, and which includes partition defining means extending between said elements and separating said chambers.

9. The invention as set forth in claim 6 wherein said means extending through said first mentioned means comprises a passage defining member, means surrounding a portion of said member and defining a fluid circulatory chamber therewith, and means for communicating fluid from said first chamber to said circulator chamber and from said circulatory chamber to said second chamber.

10. The invention as set forth in claim 9 wherein said passage defining means is aligned with and extends substantially through said partition.

11. The invention as set forth in claim 6 wherein the first mentioned means comprises a pair of spaced apart plate-like elements between which said first and second manifold chambers are located, which includes partition defining means extending between said elements, which includes conduit means extending through said elements at positions aligned with said partition defining means, which includes jacket means surrounding a portion of said conduit means and defining a fluid circulatory chamber therewith, and which includes means for communicating fluid from said first chamber to said circulatory chamber and from said circulatory chamber to said second chamber.

12. The invention as set forth in claim 6 which includes a pair of spaced parallel plate-like elements, means extending between said elements and defining the outer marginal boundaries of first and second fluid manifold chambers, partition means extending between and separating the adjacent portion of said chambers, a pair of bores formed in said elements and aligned with said partition means, which includes a hollow cylindrical member defining a central passage and having at least a portion thereof received within said bores, an external jacket member extending coaxially of said last mentioned member and defining a circulatory chamber therewith, a counterbore formed in one of said elements adjacent one of said bores and adapted to receive one end of said jacket member therewithin whereby to communicate said circulatory chamber with said counterbore, intake and discharge ports respectively communicating said first and second chambers with said counterbore, and means detachably securing said jacket member to one of said elements.

13. The invention as set forth in claim 12 which includes a tip assembly disposed on adjacent ends of said cylindrical and jacket members and defining one end of said circulatory chamber, said assembly comprising a resilient detachably mounted member of substantially complementary configuration with respect to a portion of the associated mold or the like.

14. The invention as set forth in claim 12 wherein said jacket member is formed with an integral radially outwardly extending flange portion, and which includes means for clampingly and contiguously engaging said flange portion with the adjacent surface of one of said elements.

15. The invention as set forth in claim 14 wherein said means for engaging said flange portion with one of said elements comprises means threadably mounted within said one element.

16. The invention as set forth in claim 12 which includes fluid-tight sealing means interposed between one end of said cylindrical member and the periphery of the adjacent of said bores.

17. The invention as set forth in claim 12 which includes fluid-tight sealing means interposed between said one end of said jacket member and the periphery of said counterbore.

18. In a device for use in conjunction with a support member and adapted to communicate a fluent material to an associated mold or the like,

a first hollow cylindrical member defining a passage through which said fluent material is communicated,

a second hollow cylindrical member surrounding at least a portion of said first member and defining a fluid circulating chamber therewith,

a fluid inlet and outlet section on said support member, and

baffle means including an arcuate plate disposed in said chamber and dividing the interior thereof into first and second portions communicable with said fluid inlet and outlet sections,

said plate being fabricated of a resilient material and adapted to be inserted longitudinally into said chamber and sealingly engage the outer periphery of said first cylindrical member and the inner periphery of said second cylindrical member.

19. The invention as set forth in claim 18 which includes a tip assembly disposed on one end of said first and second members and engageable with the associated mold or the like, said assembly comprising an elongated cylindrical portion insertable within said mold.

20. The invention as set forth in claim 19 wherein said tip assembly defines the lower end of said fluid circulating chamber and one end of said baffle means terminates adjacent said tip assembly.

21. The invention as set forth in claim 18 wherein said baffle means comprises an elongated arcuate member at least partially engaged with the outer periphery of said first member and the inner periphery of said second member.

22. The invention as set forth in claim 1 wherein said tip assembly includes means for conducting heat away from the lower end thereof.

23. The invention as set forth in claim 22 wherein said heat conducting means comprises sleeve means disposed internally of said tip assembly.

24. The invention as set forth in claim 18 wherein the upper end of one of said first mentioned members is mounted within an annular opening in said support member, and which includes generally elliptical shaped recessed portions in said support member for communicating cooling fluid to and from said chamber.

25. The invention as set forth in claim 18 wherein said second member is formed with radially outwardly extending flange portion, which includes clamping means for fixedly securing said flange portion to said support member, and which further includes means on said flange portion for radially aligning said second member with said support member.

26. The invention as set forth in claim 25 wherein said clamping means comprises fastener means threadably secured to said support member, and wherein said means for radially aligning said second member with said support member comprises recess means formed in said flange portion and engageable with said fastener means.

27. The invention as set forth in claim 1 which includes means for radially aligning said tip assembly with respect to said cylindrical member.

28. The invention as set forth in claim 27 wherein said means for radially aligning said tip assembly comprises tang means and tang receiving means on said tip assembly and said cylindrical member.

29. The invention as set forth in claim 23 wherein said sleeve means is detachably secured to said tip assembly.

30. In combination in a device for use in conjunction with a metallic support member comprising one side of a fluent material reservoir and defining an annular discharge bore adapted to communicate fluent material within the reservoir to an associated mold or the like,

a first metallic hollow cylindrical member defining a central passage through which the fluent material is communicable,

a second metallic hollow cylindrical member extending coaxially of said first mentioned member and surrounding a portion thereof,

the inner periphery of said second cylindrical member and the outer periphery of said first cylindrical member defining a fluid circulating chamber therebetween,

means on the support member defining a counterbore circumjacent and coaxially of said first mentioned bore and an annular mounting surface extending around said first mentioned bore lying in a radial plane perpendicular thereto,

the upper end of said jacket member being adapted to be received within said counterbore,

means for detachably securing the device to said support member including means on one of the members defining a mounting face projecting radially outwardly from said first mentioned bore,

said mounting face being precisely perpendicularly oriented with respect to the axis of said first and second members and adapted for abutting metal-to-metal contact with said annular mounting surface on said support member, and

clamping means adapted to threadably engage said support member and force said mounting face into contiguous engagement with saaid mounting surface and thereby assure that the device is oriented at right angles to said support member.

31. In combination in a device for use in conjunction with a support member comprising one side of a fluent material reservoir and defining an annular discharge bore adapted to communicate fluent material within the reservoir to an associated mold or the like,

a first hollow cylindrical member defining a central passage through which the fluent material is communicable,

a second hollow cylindrical member extending coaxially of said first mentioned member and surrounding a portion thereof,

the inner periphery of said second cylindrical member and the outer periphery of said first cylindrical member defining a fluid circulating chamber therebetween,

the upper end of said second cylindrical member being adapted to be received within a counterbore formed in said support member circumjacent and coaxially of said first mentioned bore,

said counterbore defining an annular mounting surface extending around said first mentioned bore and lying in a radial plane perpendicular thereto,

means on the upper end of said second cylindrical member defining a radially inwardly extending annular recess,

sealing means including a radially compressible resilient sealing member disposed within said recess and adapted to sealingly engage an axially extending annular surface spaced radially from said first cylindrical member to provide a fluid tight seal between the lower exterior side of said support member and the interior of said counterbore,

means for detachably securing the device to said support member including means on one of the members defining a mounting face projecting radially outwardly from said first mentioned bore and a radially outwardly extending clamping surface,

said mounting face and said clamping surface being precisely perpendicularly oriented with respect to the axis of said first and second members, with said mounting face being adapted for abutting metal-to-metal contact with said annular mounting surface on said support member, and

clamping means threadably connected to said support member and adapted to clampingly engage said surface and thereby assure that the device is oriented at right angles relative to said support member.

32. In combination in a device for use in conjunction with a support member comprising one side of a fluent material reservoir and defining an annular discharge bore adapted to communicate a thermosetting fluent material within the reservoir to an associated heated mold or the like,

a first hollow cylindrical member defining a central passage through which the fluent material is communicable,

a second hollow cylindrical member extending coaxially of said first mentioned member and surrounding a portion thereof,

the inner periphery of said second cylindrical member and the outer periphery of said first cylindrical member defining a fluid circulating chamber therebetween,

the upper end of said second cylindrical member being adapted to be received within a counterbore formed in said support member circumjacent and coaxially of said first mentioned bore,

said counterbore defining an annular mounting surface extending around said first mentioned bore and lying in a radial plane perpendicular thereto,

fluid passage means in said support member adapted

to communicate cooling fluid to and from said chamber,

means for detachably securing the device to said support member including an annular radially outwardly projecting flange defining a radially extending mounting face,

said mounting face being precisely perpendicularly oriented with respect to the axis of said first and second members and adapted for abutting metal-to-metal contact with said annular mounting surface on said support member,

clamping means adapted to clampingly engage said flange and thereby assure that the device is oriented at right angles to said support member,

a resilient top member disposed on the lower end of the device and cooperable with the inlet of the associated mold,

said tip member defining a passage arranged substantially coaxially of said first mentioned passage and communicable therewith for transferring the fluent material to said mold, and

a generally tubular shaped member extending within said last mentioned passage, the lower end of said

tubular member terminating adjacent the lower end of said tip member and the upper end of said tubular member abutting against a generally radially disposed shoulder defined by said first cylindrical member at a position adjacent the lower end of said chamber, whereby said tubular member will conduct heat away from said tip member to prevent premature curing of the thermosetting fluent material due to the heat of said associated mold as said material is conveyed through the device toward said mold.

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U.S. Cl. X.R.

164—228