Sept. 4, 1956 E. F. PETERSON 2,761,186

BLOW TUBE FOR CORE BLOWING MACHINE

Filed April 24, 1952 2 Sheets-Sheet 1

Fig. 1.

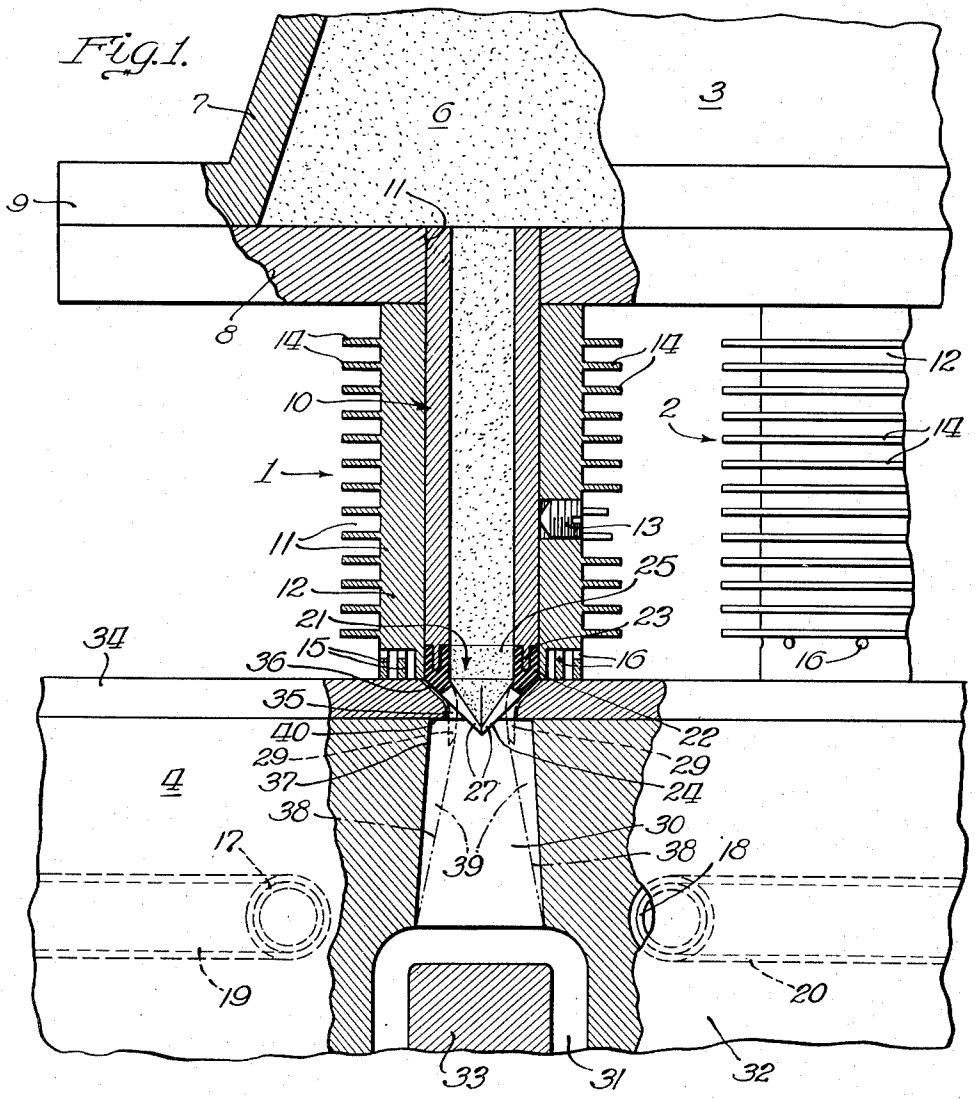

Fig. 2.

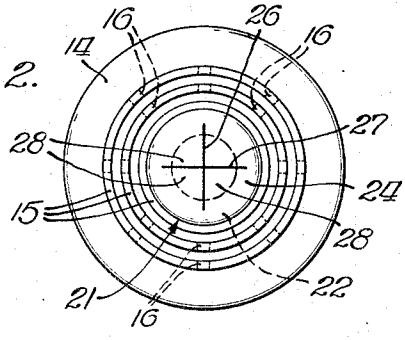

Fig. 3.

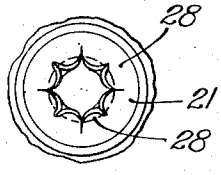

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Fig. 4.

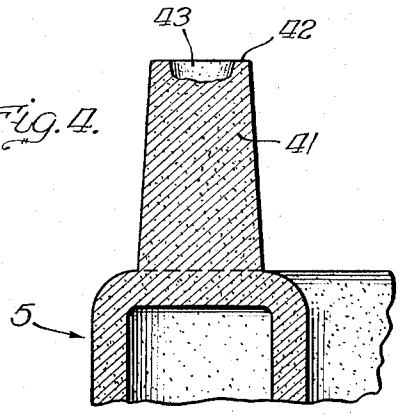


Fig. 7.

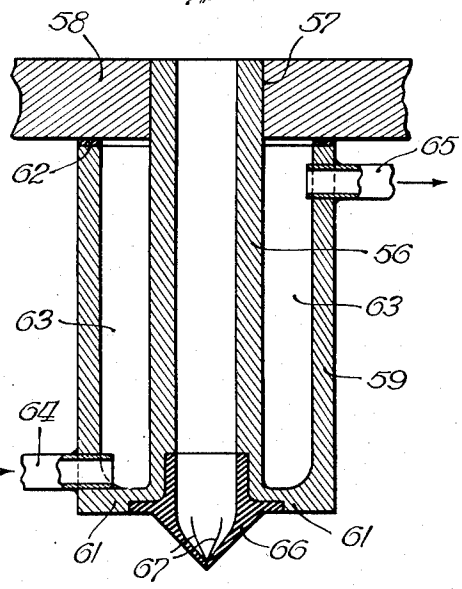


Fig. 5.

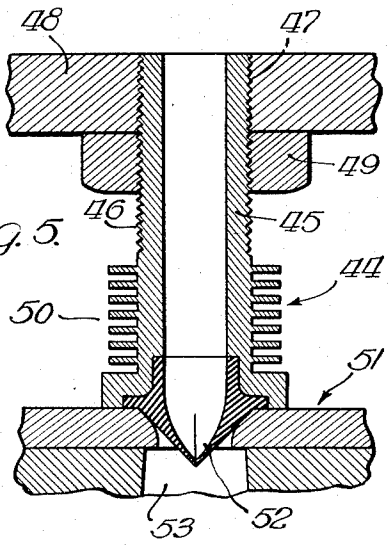


Fig. 8.

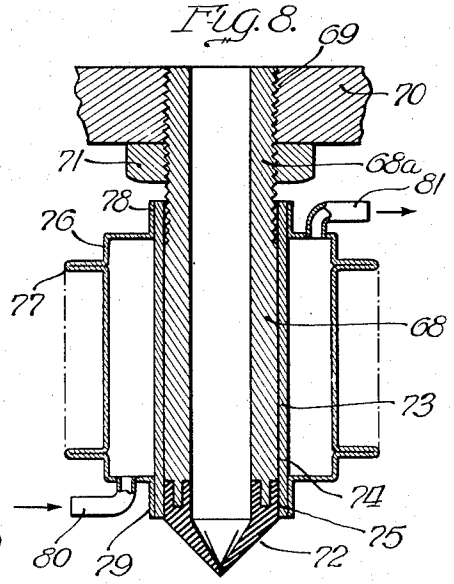
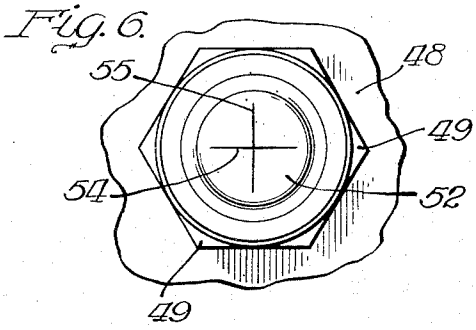


Fig. 6.



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BLOW TUBE FOR CORE BLOWING MACHINE

Edwin F. Peterson, Kewanee, Ill.

Application April 24, 1952, Serial No. 284,014

3 Claims. (Cl. 22—10)

In general, this invention relates to a sand conducting tube for delivering a supply of sand from a sand reservoir into a pattern mold, core box, or to analogous arrangements of that character.

More specifically this invention is directed to a blow tube constructed for dry sand feed or delivery into a pattern mold or core box and in situations where such mold or box is remotely positioned from the blow plate of a sand supply reservoir of the character generally used in core making machines.

One of the main objects of the sand blowing tube of this invention is to provide a dry sand supply duct capable of permitting free and unobstructed flow of sand from a blow plate to a pattern mold and which tube includes valving means to cut off the free flow of the dry granular sand when the sand blowing operation is concluded.

Another object of this invention is to provide a material conducting blow tube to deliver or supply such material to a pattern mold or the like in situations requiring the use of material comprising a mixture of molding sand and thermo-setting material that functions to bind the sand grains together under the application of heat.

A still further object of the present invention is to provide a sand blowing tube that incorporates cooling features to conduct and radiate heat away from such tube and to counteract premature setting or obstructional caking of a mixture of sand and thermo-setting molding material.

A further object of the blow member of the present invention is to provide a tube for the conveyance of a mixture of sand and thermo-setting material and for directly delivering such a mixture into a mold or core box employing associated heating means to cure such a sand mixture when disposed within the confines of the mold or box.

Other objects and advantages relating to the present invention shall hereinafter appear in the following detailed description thereof relating to the accompanying drawings forming a part of this specification.

In the drawings:

Fig. 1 is a fragmentary, side elevational view of a molding machine incorporating the structure comprising the blow tube of the present invention with portions thereof broken away and in section to show details of the construction thereof;

Fig. 2 is a bottom end view of the blow tube illustrated in Fig. 1;

Fig. 3 is an end view of a fragmentary portion of the blow tube of Fig. 1 illustrating the appearance thereof under certain conditions of operation;

Fig. 4 is a fragmentary view of a core or rigid object formed in the mold illustrated in Fig. 1 through the instrumentality of the blow tube there shown;

Fig. 5 is a modified arrangement of the blow tube of the present invention incorporating certain other details of construction therein;

Fig. 6 is a bottom end view of the blow tube illustrated in Fig. 5;

Fig. 7 is another modified construction of a blow tube shown in section to illustrate other means for cooling such tubes under operative conditions; and

Fig. 8 is a cross sectional view of a slightly different arrangement of cooling mechanism as applied to a blow tube of the present invention.

Referring to Fig. 1, one or more blow tubes of the present invention are indicated at **1** and **2** for conducting molding material from the reservoir **3** into a heatable mold **4** to produce cores or like objects of predetermined configurations, one of which is fragmentarily shown at **5** in Fig. 4. This tube is primarily adapted for use in connection with the conducting of a granular, free flowing mixture **6** of sand and thermo-setting material into the mold **4**. The reservoir **3** comprises a sand box such as used in molding machinery, the box being indicated at **7**, for containing the material **6**, and this box is closed by means of a blow plate **8** suitably secured to the flange **9** of the box **7**. The tubes **1** and **2** are of the same construction and any number of such units may be used to properly feed the fusible mixture **6** from the reservoir **3** into a mold to produce a pattern.

The blow tube **1** comprises primarily a conduit **10** that is secured into an opening **11'** formed in the blow plate **8**, the tube **10** being surrounded by suitable mechanism **11** to cool the tube and to maintain the mixture **6** contained within the tube at a temperature below the fusible temperature thereof.

The cooling mechanism **11** is preferably made in the form of a sleeve **12** which is snugly retained upon the outer periphery of the tube and locked in position upon the tube by means of one or more set screws **13**, and this sleeve **12** is provided with peripherally disposed fins **14**. In addition to the fins **14**, the end of the sleeve **12** is also provided with a plurality of annular ridges **15** as best illustrated in Figs. 1 and 2, which ridges or annular rings **15** are provided with radial openings **16**. The ridges or rings together with their annular cavities therebetween and the radial openings **16** provide a labyrinth structure to insulate the sleeve from the heatable mold **4** and to thereby counteract heat transfer from the mold to the sleeve **12** and tube **10** respectively.

As previously described, the mold **4** is arranged with any suitable means to provide a heat supply to bring the mold structure up to a temperature which will cause the thermosetting material **6** to fuse within the mold and to thereby produce a core or a desired sand body pattern made from such material, one such formed object being partially illustrated in Fig. 4. Various means may be used to heat the mold **4** to the necessary temperature, and in Fig. 1 suitable heating coils such as **17** and **18** are carried within coil receptacle openings **19** and **20** for electrically heating the mold through the described coils. While the heating process is being performed, the mold necessarily is in the position illustrated in Fig. 1, this position being attained by suitable means for bringing the mold and reservoir together except for the spacing provided by the blow tube **10** and its associated sleeve **12**.

Obviously, after the blowing operation has been completed, the mold **4** is heated and it is important to reduce the heat conduction and radiation to the tube **10** to eliminate and counteract preheating of the material **6** within the tube **10**. This insures a continuation of the molding process in that a subsequent mold will again receive a free flow of the material **6** from the tube **10** and out of the reservoir **3**.

Since the material comprising the mixture **6** is in the form of a generally dry granular free flowing aggregate, the blow tube **10** is provided with a valving unit **21** of

the character best illustrated in Figs. 1 and 2. The valving unit comprises an annular wall 22 that is suitably bonded to a reduced ring portion 23 of the tube 10 whereby this annular wall 22 forms a continuation of the tube 10, and the balance of the valving unit 21 is made into a conical body such as 24 which extends across the discharge opening 25 of the blow tube 10. The conical body 24 is provided with one or more cross slits 26 and 27 as best shown in Fig. 2, and the entire valve unit 21 is constructed from a resilient material such as rubber which is normally maintained in the particular shape or form shown in Figs. 1 and 2, with the slits 26 and 27 in tightly closed relation. Slits 26 and 27 together produce a plurality of deformable valving portions 28 which will open up under pressure applied from within the tube 10 generally into the broken line positions indicated at 29 in Fig. 1 wherein these portions 28 will occupy a relationship similar to the calyx structure of an apple as best illustrated in Fig. 3. With this particular arrangement, the granular material or mixture 6 will be normally retained by means of the valving structure 21 prior to the application of pressure within the sand box 7. When the mold 4 is brought into contact with the blow tubes or vice versa as shown in Fig. 1, pressure is introduced into the core box 7 to blow the granular material out of the tube 10 into the sprue opening 30 in the mold 4 which connects with the mold cavities 31 formed between coacting mold parts 32 and 33.

The mold part 32 of the mold 4 is provided with a separable plate 34 which has an opening 35 therein to accommodate the projecting end of the valving structure 21. This opening 35 includes an outwardly flared portion 36 that is preferably made larger than the adjacent body portion of the valve body 24 to prevent direct heat transfer from the mold to the valving unit. Furthermore, the diameter or area of the opening or aperture 35 is such as to generally permit the deformable portions 28 of the valving unit to open up substantially to the amount of the interior area of the tube 10 to obtain as great a discharge of the molding material 6 as possible from within the tube 10. Furthermore, the aperture 35 is of a diameter considerably less than the diameter 37 of the adjacent sprue opening 30. With this particular arrangement of the aligned apertures or openings 30 and 35, the molding material 6 will first follow the path indicated by the dot and dash lines 38 until the mold cavity 31 is filled, after which the triangular portions 39 of the sprue will also be filled up to and against the under surface 40 of the plate 34 and the head end of the valving unit 21.

This relationship of the diameter of the opening 35 to the diameter 37 of the opening 30 prevents the granular material from sweeping or wiping off the lubricating material that is normally applied to the interior of a mold for the purpose of obtaining a clean separation of the core from the mold. By preventing the sand blasting removal of the slicon or other release agent from the wall of the sprue opening as described, a clean separation of the finished pattern is possible. By providing a valving unit such as illustrated in Fig. 1 which extends downwardly into an aperture such as 35, it is possible to form a sprue leg such as shown in Fig. 4 at 41 upon a core 5 and wherein the upper terminal end 42 of the sprue leg may be made with a definite maximum surface relation with respect to the rest of the mold. In other words, all of the sprue legs such as 41 can be made to terminate with surfaces such as 42 all disposed in coplanar relationship. With this arrangement it is possible to mount matching patterns or sand body shapes between suitable clamps or clutch plates in subsequently pouring a mold formed by these patterns by the method shown and described in my copending application Serial No. 284,015 filed of even date herewith.

The valving means 21 is, therefore, preferably extended through the clearance opening 35 for operating partially within the opening 30 that forms the sprue leg 41. After the sand is blown, the valving means 21 will close upon release of the pressure within the mold 4 after the interruption of the pressure within the sand box 7 whereupon the valving structure will close, leaving the sprue leg surface 42 as shown in Fig. 4 with a cavity or recess such as 43 as made by the ends of the portions 28 of the valving unit 21.

Obviously, the blow tube structures such as 1 and 2 may be made of various lengths and the sleeves such as 12 may be correspondingly constructed. Although the sleeves shown in Fig. 1 provide spacing means between the blow plate 8 and the top of the mold 4, this particular length of sleeve may also be varied for other conditions of operation.

The construction of blow tube generally indicated at 44 in Fig. 5 is formed as a unitary structure having a shank 45 that is externally threaded at 46 for threaded connection within a threaded opening 47 in a blow plate 48. A lock nut 49 secures the tube in position with respect to the plate 48.

The tube 44 in this construction is provided with annular fins 50 which encircle the portion of the tube disposed adjacent the mold 51 and this tube also incorporates a resilient valving structure such as 52 to retain granular molding material within the tube for predetermined release under pressure into the mold cavity 53.

As shown in Fig 6, the Fig. 5 tube structure valving means 52 is also provided with cross slits 54 and 55 to function in the same capacity as in the previously described form of valving structure 21.

In Fig. 7, the blow tube comprises a conduit portion 56 secured within the opening 57 in the blow plate 58 and the conduit 56 is surrounded by means of an annular sleeve 59 connected at 61 to the conduit 56. The upper portion of the sleeve 59 is sealed against the blow plate 58 by means of a gasket 62 to provide an annular chamber 63 surrounding the conduit 56. Cooling fluid pipes 64 and 65 are connected with the tube structure to introduce a cooling fluid into the cavity 63 for cooling the tube proper and the conduit 56 thereof.

This tube structure also embodies a valving member 66 having slits 67 and functioning in the same manner as in the other described forms.

Fig. 8 illustrates another form of blow tube 68 which includes a threaded shank 68*a* that threads into an opening 69 in the blow plate 70 with the tube locked in this position by means of the nut 71. The opposite end of the blow tube 68 incorporates a valve 72 bonded to the tube and automatically opened as in the previous forms by means of the introduction of pressure into the tube 68.

The cooling mechanism of this described form includes a sleeve 73 that snugly fits upon the outer periphery 74 of the blow tube 68. The sleeve 73 is preferably held in place upon the tube 68 by making the outer peripheral wall 75 of the valving member 72 slightly oversize to frictionally grip the interior surface of the sleeve 73.

Sleeve 73 also carries an annular cooling structure comprising a sheet metal container 76 surrounded with a plurality of fins 77, this chamber being suitably soldered or welded at 78 and 79 to the ends of the sleeve 73. Fluid inlet and outlet pipes 80 and 81 are connected with the container 76 to further provide a cooling medium surrounding the tube 68 for dissipating heat that is conducted or radiated to the tube structure from the heatable mold with which this tube is operably used.

The foregoing description relates to several constructions of the blow tube of the present invention. However, certain other changes are contemplated in the exact combination of elements and in the elements per se without departure from the fundamental concept of the invention. Such further modifications and changes shall, however, be governed by the breadth and scope of the

appended claims as directed to the blow tube of this invention.

What I claim is:

1. In a core blowing and forming machine, the combination of a reservoir adapted to hold a dry granular free flowing mixture of sand and thermosetting material, a mold to form a rigid pattern from said mixture, means for heating said mold, and a blow tube interposed between said reservoir and said mold to direct a flow of said granular mixture from the reservoir into the mold, said blow tube comprising a mixture feed tube, a pressure responsive resilient heat insulating normally closed valving unit at the discharge end of said tube comprising a contiguous extension of said blow tube and being arranged for partial entry into a sprue opening in said mold, said valving unit providing a major portion of the area of contact with the heated mold, and cooling means connected with said tube to dissipate heat conducted and radiated to the tube and to said valving unit from said mold under operative conditions.

2. In a core blowing and forming machine, the combination of a reservoir for a mixture of sand and thermosetting material, a mold to form a pattern from said mixture, means for heating said mold, and a blow tube interposed between said reservoir and said mold to connect the interior of one with the interior of the other and to direct a flow of said mixture from the reservoir into the mold, said blow tube having a pressure responsive heat insulating valving member at the discharge end thereof comprising deformable sections normally closed but opening under pressure from within said tube, said valve unit providing a major portion of the area of contact with the heated mold, and said mold having aligned apertures for mixture feed into the mold cavity, one of said apertures comprising means to accommodate said blow tube valving member, and the other aperture being disposed between said one aperture and the mold cavity, said latter aperture being of greater cross sectional area than the discharge area of said tube at the valving member.

3. In a core blowing and forming machine, the combination of a reservoir adapted to hold a mixture of sand and thermosetting material for pressure discharge through an orifice in said reservoir, a mold beneath said reservoir to form a pattern from said mixture, means for heating said mold, and a blow tube carried in said reservoir orifice in a suspended relationship with respect to the reservoir to direct a flow of said mixture from the reservoir into the mold, said blow tube comprising a mixture conduit and having an outwardly opening pressure responsive resilient heat insulating normally closed valve unit depending from the end of said blow tube, said valve unit providing a major portion of the area of contact with the heated mold, and mechanism to cool said conduit comprising oppositely shouldered means carried by said tube to engage said reservoir and said mold respectively and to position said valve unit in a predetermined relationship with respect to said mold and to a mixture receiving opening therein, said mechanism including fluid circulatory passageways arranged for heat dissipation to cool said blow tube and valve unit to counteract setting or partial setting of said material in said blow tube and at said valve unit thus insuring continued free flow of the material and free functioning of said resilient pressure responsive valve unit.

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