

Dec. 10, 1957

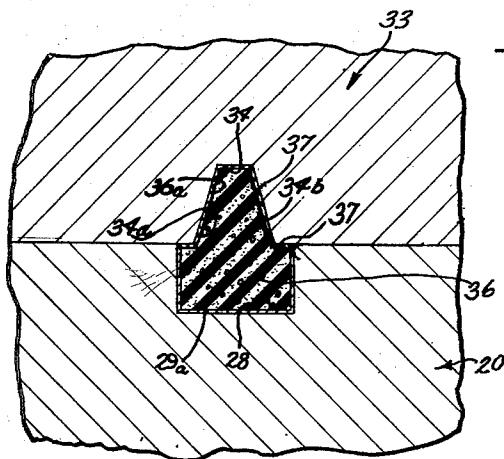
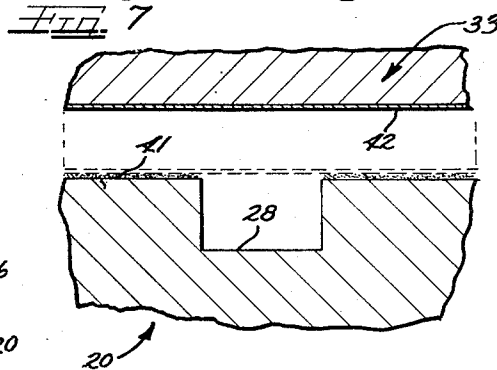
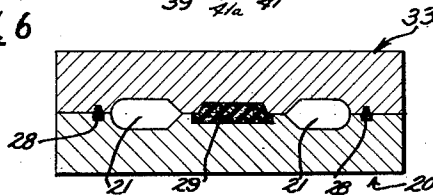
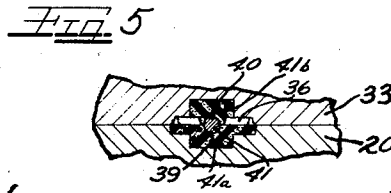
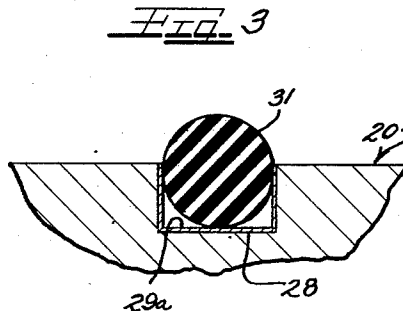
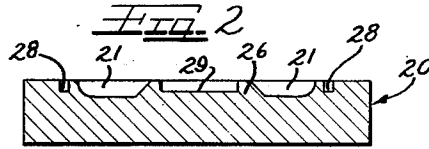
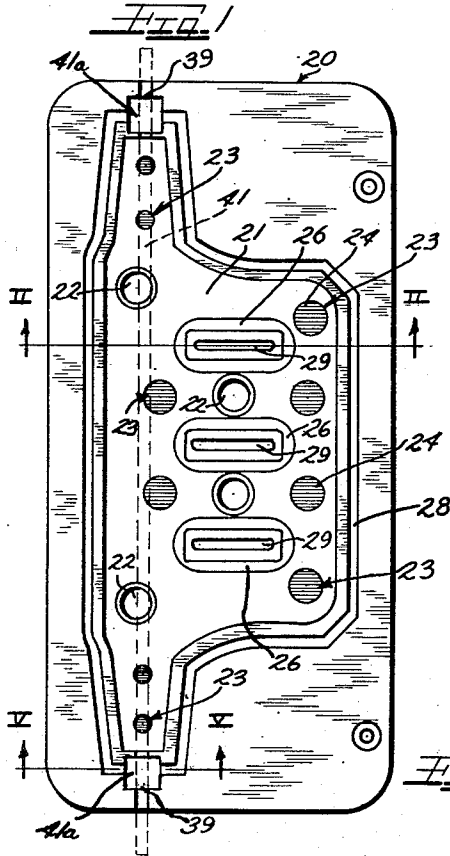
R. L. OLSON

2,815,549

SEALING OF CAVITATED ASSEMBLIES

Filed Aug. 19, 1955

2 Sheets-Sheet 1



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SEALING OF CAVITATED ASSEMBLIES

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2 Sheets-Sheet 2

Fig. 8

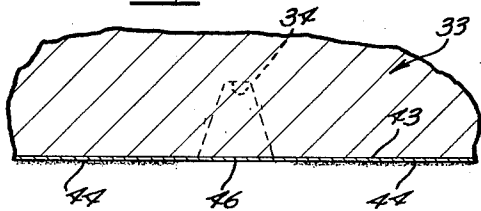


Fig. 9

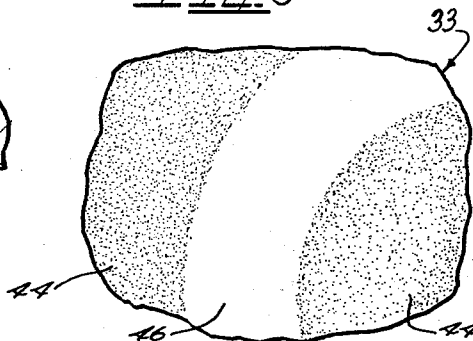


Fig. 10

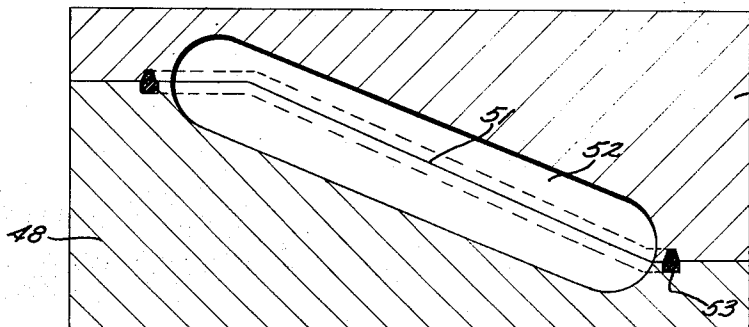


Fig. 13

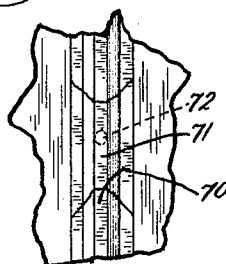


Fig. 11

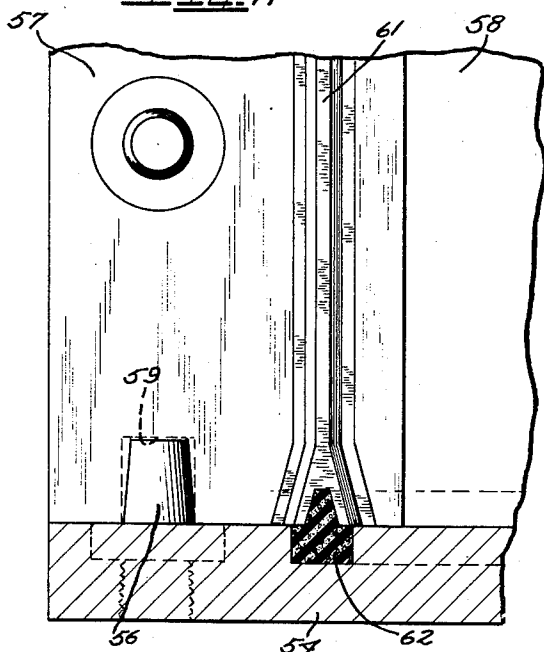
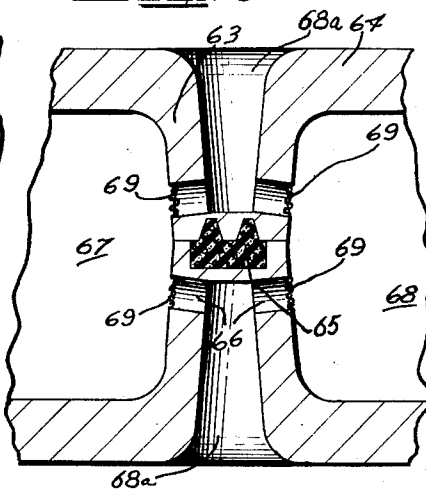


Fig. 12



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1

2,815,549

SEALING OF CAVITATED ASSEMBLIES

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Application August 19, 1955, Serial No. 529,385

10 Claims. (Cl. 22—10)

The present invention relates to improvements in the sealing of cavitated assemblies and is particularly concerned with a method and means for sealing opposed mating surfaces of core boxes, pressure molds, blow plates and mating flasks or molds, and other enclosures where an effective seal against internal or external pressure is needed.

In a typical sand core blowing assembly, for example, two or more confronting mold members are clamped or pressed together, and a stream of air and sand particles, including a suitable binder, is blown into the cavity defined by the cooperating sections under substantial air pressure. The abrasive character of the sand makes it imperative to provide a completely air tight seam at the junction between the cooperating mold sections. Otherwise, the condition known as blow-by exists in which the high velocity, high pressure air stream is forced through minute discontinuities between the mold sections. Within a surprisingly short time, the continued blow-by severely erodes the mating surfaces of the core box necessitating removal of the core box from the production line and refacing the box in the eroded areas, or otherwise patching up the damage done by the erosion. The cost of maintenance on core boxes thereby becomes quite high and their useful life uneconomically low.

The damage done by erosion is frequently accompanied by mechanical damage due to impact as the sections of the core box are assembled in the core forming operation. In order to minimize the possibility of blow-by, the sections are usually held together under very substantial pressures and they are brought into engagement with a considerable force or impact. This further provides a source of damage to the core box, thereby shortening the effective life even further.

These defects in the core boxes are frequently accompanied by imperfect cores. It had heretofore been the general experience that blown sand cores had "fins" produced by leakage at the parting line between the sections. "Piping," "ratholes" and soft spots have also resulted from leakage at the parting line. Such defects have necessitated costly patching, "mudding" and repairs of the cores.

There have been some attempts previously to provide resilient compression sealing gaskets between the surfaces of core boxes and the like, where a gasket supported by or in one surface presses against an opposing flat face. To my knowledge, however, none has proved to be completely satisfactory for one reason or another. Since the seals were frequently made of a non-compressible material such as ordinary rubber or plastic, they required expansion room behind or in the gasket chambers in order that the cooperating faces of the core box could come into proper abutting engagement. In addition, the resilient gaskets of the type described frequently were non-uniform in their sealing pressure or discontinuous, and permitted blow-by despite the presence of the seal. Furthermore, the material presented the problem of properly applying the seal since the ends of the gasket could not

2

be joined together for the most part without producing a weakness in the seal. Furthermore, such resilient seals were virtually impossible to use on contoured core boxes or molds and were thus limited to use on flat faced separable cavitated members.

With the foregoing history in mind, an object of the present invention is to provide an improved method for sealing a plurality of mating cavitated members which are subject to blow-by or similar conditions during use.

Another object of the present invention is to provide an improved method for sealing a plurality of mating molding members, such as the elements of a core box assembly or a blow plate and a core box against the effects of blow-by.

A further object of the invention is to provide an improved method for sealing core boxes, or other cavitated assemblies, which does not require a substantial positive pressure to hold the members in tight abutment to maintain fully sealed relationship, with the result that the members of the assembly can be joined together and simply held against separation minus the appreciable impact and pressure usually deemed necessary with previous core box and like structures subject to internal pressures.

A still further object of the invention is to provide improved compositions for use as sealing elements in preventing blow-by from cavitated members, such as core boxes and the like.

Still another object of the invention is to provide an improved cavitated assembly such as a core box structure or similar molding device with sealing means which will last indefinitely and in which the sealing efficiency is increased rather than decreased during pressure differentials between the internal cavity and the external aspects of the assembly.

Yet another object is to provide a novel separable seal for the joining faces of separable cavitated assemblies.

In the process of the present invention, a plurality of mating cavitated members, of which a core box is a typical example, is sealed against blow-by or leakage and similar conditions by forming continuous confronting grooves in the opposing faces or surfaces of the members adjacent and surrounding cavity, and disposing in one groove a suitable non-metallic plastic or elastomeric material capable of being molded or formed into a continuous, homogenous seal in situ in its own chamber. Preferably, such a material or composition is used as will provide a compressible, cellular elastomer. Then the members of the assembly are brought together to place the confronting grooves in alignment and thereby form a continuous sealing space or chamber about the cavity. Finally the sealing material is cured in the sealing space chamber. Where the material is sufficiently fluent it may, of course, be introduced into the seal chamber by pressure or suction injection through suitable sprue holes communicating with the seal chamber.

The vastly improved results achieved by the process of the present invention are due in a large part to the characteristics of the sealing material employed. The material employed in the process of the present invention has many unique advantages, among them being high resistance to denting or damaging deformation. In a preferred form the seal material possesses resiliency coupled with compressibility. In other words, while I may use a sealing material that is not substantially compressible or resilient, I generally prefer a material which is resilient and compressible after setting or curing, such as those capable of producing a cellular, spongy body for the seal in the cooperating grooves which define the sealing space chamber about the cavity. While cellular rubber as such may be used, many different types of synthetic resinous materials that are capable of being molded and set to a compressible, cellular elastomer may

likewise find use in the process of the present invention.

While a material may be used which requires an excess quantity to be placed in the groove chambers and then be put under compressive pressure therein while setting or curing, such as vulcanization or baking, I have had advantageous results with material of the kind that, as it is being formed in situ about the molding cavity, swells up and expands in exact conformity with the grooves in which it is disposed. There is no problem presented of shaping the seal, because it is formed directly in its seal space chamber, thus assuring, that the seal is in proper alignment between the cooperating faces of the cavitated members.

Numerous other objects and features and advantages of the invention will become apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings illustrating both the process for the manufacture of a seal and the resulting articles, and in which:

Figure 1 is a plan view of a cavitated core box section or member which has been grooved to receive the improved sealing members;

Figure 2 is a cross-sectional view taken substantially along the line II—II of Figure 1;

Figure 3 is an enlarged, fragmentary cross-sectional view illustrating the manner in which the elastomeric composition is received within the groove prior to curing;

Figure 4 is an enlarged cross-sectional view illustrating the seal and groove arrangement after the seal has been completely formed;

Figure 5 is a fragmentary cross-sectional view as though taken substantially along the line 5—5 of Figure 1 but showing how a seal is effected in assembly about a vent hole forming rod;

Figure 6 is a view similar to Figure 2, but illustrates the two component sections of the core box and the manner in which they cooperate after the formation of the seal;

Figure 7 illustrates somewhat schematically a process which may be employed for forming two confronting grooves for receiving the sealing member;

Figure 8 is a fragmentary view of a portion of a core box element further illustrating said process;

Figure 9 is the greatly enlarged, fragmentary view illustrating the face of the element shown in Figure 8, before the groove has been cut;

Figure 10 is a cross-sectional view, with parts in elevation, of a contour type core box employing the improvements of the present invention;

Figure 11 is a fragmentary view, with parts in elevation, of a three piece core box structure employing the improvements of the present invention;

Figure 12 is a cross-sectional fragmentary view, with parts in elevation illustrating the manner in which the invention can be applied to molding members having multiple cavities, and

Figure 13 is a fragmentary elevational view of a modification showing the use of a combination of metallic and non-metallic material in the seal.

In Figure 1 reference numeral 20 indicates generally one section of a two section core box, the section 20 being provided with a directly molded, engraved, machined or otherwise recessed central cavity 21 therein. A plurality of ports 22 is provided to communicate the cavity 21 with the core blowing machine which supplies a suspension of sand, and binder in air under pressure to the cavity 21.

A plurality of vents 23 of various size are disposed in various locations within the cavity 21. Each of the vents 23 is open to the atmosphere and includes a perforate screen 24 which serves the function of filtering or retaining the sand particles within the cavity, while permitting the flow of air through the vents. The vents thereby serve the function of helping to distribute the sand and binder mixture relatively uniformly throughout the molding cavity as, otherwise, there might be dead spots which would not receive a fill of the molding sand.

The central portion of the cavity 21 may also be provided with raised boss portions 26 which are arranged to engage corresponding portions of the mating mold member in abutting relation, thereby providing centrally disposed seals known as "kiss-offs" between the two mating members.

In accordance with the present invention, a core box of the type shown in Figure 1 is suitably provided with a channel or groove 28 extending in closely spaced relation to the outer edge of the cavity 21, and conforming in outline to the outer wall of the cavity. As a practical matter, the groove 28 may be spaced about $\frac{1}{8}$ or $\frac{1}{4}$ of an inch away from the edge of the cavity. As seen in Figure 1, the groove 28 is continuous and extends about the whole molding cavity so that when the sealing means is provided within the groove, the entire cavity is sealed against blow-by.

In addition to the groove 28 extending about the entire cavity, the raised boss portions 26 may also be provided with grooves 29 to receive the sealing members.

Since in the use of a core box it is necessary to separate the members or components of the box for removal of the blown cores, it is highly desirable to have the seal positively anchored within the groove in one of the mating core box members and completely and readily separable from the matching groove of the other of the mating members.

For assuring that the seal will be permanently anchored within the groove in one of the members such as the member 20, a suitable adhesive material or bonding agent is applied within the groove 28 as a layer 29a (Figures 3 and 4), making sure that the layer of bonding agent thoroughly covers both the side and base or bottom walls of the preferably rectangularly cross-sectioned groove. The bonding agent should be such that it has an affinity for the metal of the core box member and also is compatible with the material of the sealing member. To a large extent core boxes are made of cast aluminum although they may be made of brass, steel or cast iron. In such core boxes, a bonding agent consisting of a special compound of rubber and resin derivatives in a volatile solvent may be applied as by brushing the solution into the groove 28 and allowing the same to set by evaporation of the solvent. In a commercially available form a suitable bonding agent of this type is Thixon 0-652, but there are other commercially available bonding agents that may also be used.

For some materials such as magnesium, it may be necessary to treat the surface within the groove to prepare it for proper bonding thereto of the bonding agent. For magnesium it has been found that treatment with a dichromate etching solution is desirable to perfect the bond. It will be appreciated, of course, that suitable adhesives or bonding agents are presently available commercially for practically every different type of synthetic or natural elastomer.

A thorough bond of the seal within the carrying groove of the assembly is highly important in order to avoid not only displacement of the seal from the groove, but also to prevent working into the groove along side the seal of sand or other foreign material that might interfere with proper operation of the seal in service.

The sealing material originally may take the form of a pliant rod-like cylindrical or other cross-section extrusion or ribbon or strip 31 which is inserted by hand into the groove 28 (Fig. 3), as a continuous strip or in various lengths disposed end to end, as may be convenient, and comprises preferably a vulcanizable composition for producing an expanded cellular structure in situ in the process. The diameter or cross sectional volume of the strip relative to the cross-sectional area of the ultimate seal may be gauged to attain the preferred density in the final seal, which may thus be large or small cell structure for various degrees of pliability to suit various conditions. The composition may, for example, include a suitable natural or synthetic rubber, a plasticizer, a vulcanizing

agent, and a gas liberating agent capable upon the application of heat of liberating substantial quantities of gas and thereby swelling or expanding the elastomeric composition.

As previously mentioned, many different types of natural or synthetic elastomers can be used for the process of the present invention, but I prefer to use a synthetic rubber of the "Buna-N" type particularly that type which has been modified for maximum resistance to hydrocarbons. This resistance is desirable because oils such as kerosene are frequently used as a parting agent between the surface of the core box and the sand and also as a cleaning agent, resulting in the retention of a thin film of kerosene along the surfaces of the core box. The Buna-N type rubber, which is a copolymerization product of butadiene and acrylonitrile is not affected by the presence of this film. However, if hydrocarbon oils are avoided, other materials such as the Buna-S type rubbers, consisting of a copolymer of butadiene and styrene may also be employed. The synthetic rubbers of the polymerized chloroprene group also form preferred materials for the process of the present invention.

As examples, I have listed below several different formulations which form acceptable, oil resistant sealing members in the process of the present invention.

Example I

Material:	Parts by weight
Buna-N rubber such as "Hycar 1011"-----	100
Zinc oxide-----	5
Carbon black pigment-----	40
Di-methoxyethyl phthalate (plasticizer)-----	15
Sulfur-----	1
Benzothiazyl disulfide (accelerator)-----	1.5
Vulcanization retarder, such as "Retarder-W"-----	0.75
"Unicel N. D." (blowing agent consisting of a mixture of 40 parts of di-nitroso pentamethylene tetramine dispersed in 60 parts of an inert inorganic filler)-----	3

Example II

Material:	Parts by weight
Buna-N rubber-----	100
Zinc oxide-----	5
Hard clay-----	60
Di-methoxyethyl phthalate-----	15
Sulfur-----	1
Benzothiazyl disulfide-----	1.5
"Retarder-W"-----	0.75
Red iron oxide-----	1
"Unicel N. D."-----	3

Example III

Material:	Parts by weight
Polymerized chloroprene (neoprene)-----	100
Stearic acid-----	0.5
"Neozone A" (antioxidant)-----	2
Magnesia-----	4
Carbon black-----	40
Zinc oxide-----	5
"Unicel N. D."-----	3

The preferred blowing agents for the purposes of this invention are those decomposable compounds which liberate nitrogen and/or ammonia under the conditions used for vulcanization of the elastomer. The di-nitroso pentamethylene tetramine previously mentioned is a particularly preferred reactant. Other suitable blowing agents include P,P'-oxybis-(benzenesulfonyl hydrazide) ("Gelogen"), diazoamino-methane, or a mixture of sodium nitrate and ammonium chloride. These materials provide, on expansion, a large number of individual small bubbles in the elastomer which provide it with the desired closed cell structure. This characteristic structure makes the gas expanded rubber substantially gas impervious, in contrast to ordinary sponge rubber which has connected pores providing a definite gas permeability in the product.

The swelling of the closed cell gas expanded rubber under the confined conditions of the present invention also provides the highly desirable effect of providing a smooth surface skin on the sealing member without any visible surface pores whatever even though the body of the sealing member has a large number of the unconnected voids present.

While the use of the blowing agent represents the preferred embodiment of the invention, successful results can be obtained without the swelling agent, provided additional care is employed. For example, a strip of material having all the ingredients except the blowing agent can be pressure molded into conformity with the grooves 28 and 34 and thereafter vulcanized. The disadvantage to this procedure, however, is the fact that vulcanization tends to shrink the strip, and so a controlled excess amount of material must be initially molded into the grooves.

After the strip or strip pieces 31 have been inserted into the groove 28, a mating, complementary second core box section 33 is joined to the section 20 in the normal assembled relationship. As best seen in Figure 4, the section 33 has a pre-cut generally V-shaped channel or groove 34 having flaringly angularly disposed walls 34a and 34b which come as close as practicable together at the root of the groove. As best seen in Figure 4, the width of the groove 34 is preferably made less than the width of the rectangular groove 28 with which it is associated but is as nearly as practicable centered relative thereto.

It will be appreciated that the grooves 28 and 34 may be varied substantially from the preferred cross-sectional shapes shown, to meet various conditions.

The two cavitated sections 20 and 33 in their assembled relation are then heated to a temperature sufficient to vulcanize the elastomeric material comprising the strip 31. Normally, this temperature will be in the range from 250° to 350° F., for periods of time extending from two to three hours. As the strip is brought up to temperature, and during the vulcanization reaction, the gas liberating agent decomposes, causing the liberation of gas, resulting in a swelling of the elastomeric material. At this time, the material expands into and fills all of the exposed surfaces of the cooperating lock-in groove 28 and the separable interlock groove 34, as best illustrated in Figure 4 of the drawings to form a tightly engaging sealing strip 36 about the periphery of the molding cavity 21. The elastomer, during this heating, also becomes securely bonded to the bonding agent disposed over the walls of the groove 28.

In order to avoid any entrapment of air as the elastomeric material expands into the grooves, and thus air pockets which would prevent the seal strip from expanding into complete conformity with the confining walls of the grooves, and to avoid any possible sticking, it has been found that a thin layer of a parting or releasing agent or separator or lubricant 37 applied to the walls of the groove 34 assists the elastomeric composition to rise into conformity with the walls and against the root of the groove and then freely separate therefrom after vulcanization. Suitable materials for this purpose comprise silicone separators, a suspension of super-fine mica particles or graphite in a vaporizable vehicle such as alcohol, or in a silicone wash.

After the vulcanization has been completed, it is found that at the separable faces of the ridge portion of the seal 36 where it mates within the groove 34, a tough, resiliently pliable and substantially impervious, or at least not visibly porous, skin 36a has been formed although internally the body of the seal has a fairly uniformly spongy, cellular structure. The skin 36a is of substantial value as a barrier, to penetration of sand or other substances into the body of the seal, and, of course, is an effective air barrier surface. In addition, at each side of the base of the ridge portion of the seal laterally extending por-

tions face toward the surface of the member 33 at each side of the groove 34.

After the core box is ready for use, a suspension of sand and binder may be introduced through the ports 22 into the molding cavity 21. The molded seal 36 effectively prevents blow-by of the sand at the mating faces of the molding units. Since the sealing strip has been molded into exact conformity with the grooves which receive the strip, it is not necessary to apply substantial amount of positive pressure in order to conform the sealing means into sealing engagement between the two molding members. All that is necessary is the application of sufficient holding pressure to keep the mold sections together and against blowing apart from internal pressure. The sealing strip is fixedly secured within the lower groove 28 because of its adherence to the bonding agent, but is releasably received in the upper groove 34. I prefer to employ an inverted V-type groove in the upper half because the resulting molded strip is then considerably more flexible. As a consequence, the application of the substantial pressures incident to the core blowing operation causes flexure of the seal and increased pressure of the seal against the confining walls of the grooves. In this respect, the seal becomes more effective as the blowing pressure is increased, which is naturally a highly desirable result.

With some types of foundry cores, it is desirable to provide additional means for venting gases through the body of the core during the pouring of the molten metal about the core. Provision for such a gas venting means can also be made in accordance with the method of the present invention, as evident from an inspection of Figures 1 and 5 of the drawings. As seen in these two figures, the core box section 20 may be provided with a longitudinally extending semi-circular recess 39 at each end thereof, and the section 33 similarly notched to provide another complementary semicircular recess 40 which registers with the recess 39 when the two sections are in engagement. The recesses thereby define a circular opening for the reception of a metallic rod 41 as shown in dotted outline in Figure 1 and in full line in Figure 5 of the drawings, the rod 41 extending through the molding cavity, and out the ends of the core box assembly. At the places where the groove 39 and the groove 28 intersect, an enlarged recess 41a is provided while where the groove 40 intersects with the groove 34 an enlarged recess 41b is provided, such recesses being filled with the sealing material in compressible volume to embrace the rod sealingly over a substantial section at each end portion. The rod 41 or a similar rod is placed in position during the time that the seal is formed so that the elastomeric seal material cures snugly thereabout and provides a lapped seal to prevent blowing of sand out along the rod from within the core box. End portions of the seal 36 are releasably interlocked in assembly with the body of sealing material in the recess 41b, as shown in Figure 5. After the sand core has been blown into the cavity, the rod 41 is withdrawn from within the core, leaving a longitudinally extending passageway through the core facilitating the liberation of gases.

It is important for the purpose of the present invention that the grooves 28 and 34 be in reasonably good registry with each other. A simplified, but highly effective means for accomplishing this result is illustrated in Figures 7 through 9 of the drawings.

In Figure 7, the two mold sections 20 and 33 are shown in spaced apart relationship, the mold section 20 being provided with its rectangular cross-sectioned groove 28 and the object being the provision of a registering groove in the mold section 33. For this purpose, the surface of the mold section 20 at each side of the groove 28 may be given a light coating of a suitable powder 41 such as super-fine zinc oxide powder or the like, while the face of the mold section 33 may be coated with a thin black paint or varnish. While the paint 42 is still wet, the two

mold sections 20 and 33 are put into assembled relationship and held together for a short period of time. When the two mold sections are thereafter disengaged, all of the areas which had been in abutting contact will evidence a pick-up of the white powder 41 on the face of the mold section 33, while those surfaces of the mold face opposite to the relieved portion such as the groove 28 will stand out in black against the white background. This feature is shown in Figures 8 and 9 of the drawings, wherein the mold section 33 is shown as having a surface of black paint 43 and attached white particles 44 on the face thereof. A portion of the face which was opposite the groove 28, indicated by numeral 46 in the drawings is devoid of particles, making it simple for the machinist to cut a suitable groove, such as the groove 34 in exactly the correct location.

In Figure 10, there is illustrated a contour type core box assembly including a pair of cooperating core box sections 48 and 49 separated along an angular parting line 51 which may be jointed angularly as shown or curved. As shown, the molding cavity 52 extends angularly in the vertical direction. With this type of core box in the past, it has been substantially impossible to provide an effective sealing arrangement, but the process of the present invention provides a very adequate seal by means of the continuous homogeneous sealing strip 53 which surrounds the molding cavity. The process of the present invention lends itself very well to the production of seals for members of this type without any now known limitations.

In Figure 11, there is illustrated a three piece molding unit including a blow plate 54 from which extend locating pins 56. The blow plate 54 serves as means for holding assembled a pair of cooperating core box sections 57 having matching cavities 58 and respective recesses 59 therein which receive the locating pins 56. In this form of the invention, a sealing strip 61 is provided in a suitable groove of the mold section 57 about the cavity 58 and is notched at its extremities so as to receive separably a sealing strip 62 which is secured fast within a suitable groove provided in the blow plate 54. The material of the sealing strip 61 is sufficiently flexible and resilient so that it engages the sealing strip 62 in closely fitting relationship, and thus provides an effective seal.

The embodiment of the invention shown in Figure 12 is particularly useful for core boxes which have multiple cavities, each of substantial size. As shown, a pair of cavity defining walls 63 and 64 are each provided with ports 66 extending from their internal cavities 67 and 68, respectively to exhaust cavities 68a. A foraminous screen 69 is inserted in each of the ports 66 to trap sand particles, while permitting air to be vented from the interior of the molding assembly. In this form of the invention, the two mold sections are sealed at their joint by a double thickness, double rib sealing strip 65 which prevents blow-by between the adjoining cavities.

Once the sealing strips have been installed within an existing core box, they will last indefinitely. Experience has indicated that because of the effectiveness of the seal, and the lack of pressure required to maintain the seal, core boxes which have heretofore been useful only for a period of a few days of continuous use before refacing was necessary can be kept in production for periods of many months. Replacement of the sealing strip, of course, is also quite simple, as it requires merely removing the existing strip and remolding another strip in the same molding space.

If the facilities for remolding the seal are not present, it is also possible to patch up existing defects in the sealing strips by removing the portion of the strip which has been damaged and replacing the same with a metallic material such as powdered metal in a self-setting binder or by pouring a low melting point alloy or metal into the void space using the confronting grooves as the molding chamber. Such a joint seal is shown in Figure 13 where a ridged non-metallic strip 70 has a metallic insert section 71. The

alloy or metal should be one which expands slightly on solidification, so that the metal will conform to the walls of the grooves and press against the adjacent ends of the flexible sealing strip, which ends are preferably cut on a bias facing away from the core box cavity so that pressure from within the cavity will press the same against the complementary end of the metal seal insert and form an effective seal at the seal joints. Sometimes, also, it may be desirable to have one or more rigid portions in the seal formed as just described, to assure centering or alignment of the separable mold members, since the flexible seal is generally too flexible to be relied on alone for this purpose. A sprue hole 72 may be drilled into the portion of the groove to receive the metal insert 71 where a low melting point alloy is poured in place.

An apparently unique result of the resiliently flexible seal of the present invention, and more especially of the seal as molded in situ resides in that not only is sand prevented from escaping from the interior of the core box, but the sand is even prevented, irrespective of irregularities, from entering into the joint between the separable members of the core box assembly in the space between the seal and the corebox cavity. This is evidenced by the production of cores that are virtually flawlessly finless at the parting line of the mold.

Insofar as I can now determine, this is a phenomenon of back pressure or static pressure developed in the parting joint inside of the seal during blowing in of the core, arising from entrapment of air escaping into the inner portion of the joint and pressing against the resilient seal strip, pushing it toward the outer side of the seal groove chamber and at the same time developing a static back pressure barrier. During the blowing pressure within the core box cavity, the resilient seal is slightly flexed incident to the development of the static back pressure thereagainst.

Upon discontinuance of the blowing pressure, the static back pressure air apparently returns toward the cavity and wipes the sand core face adjacent the parting line to affectually preclude any projection into the parting line or joint of the surface sand on the core. Furthermore, it has been found that the cores are entirely free from "piping," "rat-holes" or soft spots adjacent the parting line. For all practical purposes, therefore, the surface of the cores produced in core boxes having the present invention have perfect outer surfaces or skin eliminating any need for patching or "mudding."

An important advantage of having a fairly deep and wide lock-in groove 23 for the spongy seal strip or member resides in that this affords a spongy, resiliently compressible body therefor of large cross-sectional area. Hence, even substantial accumulations of foreign matter or particles such as sand in the separable interlock groove of the assembly will not interfere with proper closing of the separable cavity enclosing members, since ample yielding of the seal body locally and conformably is thus enabled to accommodate the irregularities thereby presented.

From the foregoing, it will be apparent that the process of the present invention provides a unique and highly effective means for preventing blow-by in core boxes and other cavitated structures and indeed provides an effective sealing means for many type of molding assembly or enclosures. The sealing of a core box by the process of the present invention involves far less expense and maintenance cost than the conventional means for facing the core boxes.

It will be evident that various modifications can be made to the described embodiment without departing from the scope of the present invention.

I claim as my invention:

1. In a method of sealing the joint between a pair of members which in assembly define a cavity therein with confronting joint faces on the members adjacent the cavity, the steps of cutting a groove in the joint face of

one of the members, depositing a powdery material on said one member joint face at opposite sides of the groove therein, applying a coating of a fluent material that becomes tacky onto the area of the joint face of the other member that will confront said groove, while said coating is tacky placing the members in assembled relation with said faces generally abutting and thereby picking up on said tacky coating said powdery material for, on separation of the members, outlining a complementary area to said groove thereon, cutting a matching groove in said other member face as defined by said complementary area, reassembling the members with the grooves in confronting relation to define a seal space chamber therein, and forming in said chamber a moldable material into a chamber filling seal.

2. An assembly comprising at least two sections defining a cavity therebetween when in assembled relation, said sections having respective confronting grooves in the joint faces thereof adjacent to said cavity, one of said grooves being substantially straight sided and of substantial depth in cross-section and the other groove being generally V-shape in cross-section and with its widest portion at its mouth adjacent to the joint face but narrower at said mouth than said one groove but in assembly generally centered in confronting relation thereto, and a sealing strip material securely seated in said rectangular groove and having a ridge portion releasably projecting into said V-groove, said strip conforming to the walls of said grooves and having opposite side portions laterally of the base of said ridge portion facing toward the joint face at the opposite sides of the V-groove.

3. An assembly comprising at least two sections having opposed parting faces providing a parting joint and at least one of said sections being cavitated in its parting face for defining an enclosed cavity between the sections when in assembled relation and such cavity being in the use of the assembly subject to substantial pressure differential relative to the atmosphere surrounding the assembly, each of said sections having in the parting face thereof a groove located adjacent to said cavity, said grooves registering in the assembled relation of the sections to define a sealing chamber space, and a resiliently flexible sealing strip filling said grooves and extending in sealing relation across said parting joint as a pressure barrier against pressure passage through said parting joint incident to said pressure differential in said cavity, and provision for reception of a core rod across the sealed joint, comprising respective grooves opening at one end into the cavity and extending across said sealing chamber space grooves and opening at the opposite end externally of the assembly, there being deepening recesses in said sections at the intersection of said first mentioned grooves and said respective grooves, and said deepening recesses being filled with the resiliently flexible material of the sealing strip and engageable sealingly and embracingly about the core rod under compression.

4. The method of sealing against blow-by the abutment face joint between a multi-section cavitated assembly, which comprises forming confronting grooves adjacent and running alongside the cavity in the abutment faces of the sections of the assembly at the joint to define a seal chamber having one portion on one side of the joint and the remaining portion on the opposite side of the joint, disposing in said seal chamber a volume less than the volume of said chamber of a heat-curable composition capable of expansion during curing for conforming into a seal-chamber filling structure, thereafter heating the resulting assembly to a temperature sufficient and of long enough duration to cure and expand said composition into a form sustaining seal in conformity within said grooves and filling said chamber across said joint, and during said curing permanently securing the seal in one of the grooves but assuring separability of the seal from the other of the grooves so as to enable ready

separability and reassembly of the sections with the seal carried by the section having said one groove.

5. The method of sealing against blow-by the joint between the abutment faces of a multi-section assembly having a cavity therein defined by the sections, which comprises forming confronting grooves in the abutment faces of the sections and between the cavity and the adjacent outer side of the assembly, applying a bonding agent into one of the grooves, applying a separating agent-lubricant material to the other of said grooves, placing a strip of an expansible cellular elastomeric material into one of said grooves, assembling the sections with the abutment faces joined together and said grooves in confronting relation, and thereafter heating the resulting assembly to a temperature sufficient to cause said composition to expand into a sealing strip in conformity within said grooves and across said joint and to effect bonding of the sealing strip within said one groove but separable from said other groove.

6. In a method of providing a seal for a cavitated assembly subject to pressure differential through a parting face joint, providing in, and opening from, the parting face of one section a groove of substantial width and depth, treating the surfaces defining said groove for bonding of an elastomeric material thereto during vulcanization, providing in, and opening from, the opposing parting face of a second section to be assembled with said one section a groove narrower than said first mentioned groove and located to register therewith but with the parting face of said second section alongside its groove lapping over said first groove, treating said narrower groove and the lapping second section parting face area to prevent adherence of said elastomeric material during vulcanization, assembling said sections with the grooves registering as aforesaid to provide a seal chamber and with an expansible unvulcanized mass of the elastomeric material partially filling the chamber, subjecting the assembly to vulcanizing temperature to expand and vulcanize the elastomeric material into a sealing strip and to fill the grooves and bond the same permanently in said first groove, and thereafter separating the sections and separating the vulcanizing strip from the narrower groove and said lapping parting face area.

7. In a pressure molding assembly including a pair of separable molding members having opposed parting faces providing a separable joint of substantial width alongside a molding cavity, said parting faces having therein and opening therefrom opposed coextensive grooves defining in assembly a seal chamber spaced from the molding cavity, one of said grooves being of generally V-shaped cross-section and substantial depth relative to mouth width and with the mouth opening through the parting face, and a resiliently flexible seal strip conformably permanently bonded within the other of said grooves and having a ridge portion of generally V-shaped cross-section complementary to said V-shaped groove projecting beyond the parting face of the molding member having said other groove and engageable sealingly but quickly separably in said V-shaped groove, said ridge portion being laterally flexible under transverse pressures through the separable joint during molding to hug sealingly the wall of the V-groove on the opposite side from imposition of the pressure.

8. In a pressure molding member having a parting face for confronting disposition in separable joint-forming relation to another member, said molding member having a groove of substantial width and depth in and opening

from said face, and an elastic air cell sponge-type compressible sealing strip with the body thereof conformed and adhered in said groove and having a ridge portion of generally V-shaped cross-section projecting substantially beyond said parting face, said ridge portion being narrower at juncture with said body than said groove and with a face on the strip body extending between said juncture and the adjacent side of the groove and facing in generally the same direction as said parting face for confronting the parting face of the separably related molding member with which the first mentioned member is separably assembled.

9. An assembly comprising at least two sections having opposed parting faces providing a parting joint and at least one of said sections being cavitated in its parting face for defining an enclosed cavity between the sections when in assembled relation and such cavity being in the use of the assembly subject to substantial pressure differential relative to the atmosphere surrounding the assembly, each of said sections having in the parting face thereof a groove located adjacent to said cavity, said grooves registering in the assembled relation of the sections to define a sealing chamber space, and a resiliently flexible sealing strip filling said grooves and extending in sealing relation across said parting joint as a pressure barrier against pressure passage through said parting joint incident to said pressure differential in said cavity, one of the sections having another parting face disposed angularly to the parting face of the other section, said angularly disposed parting face having a sealing strip mounted therein and provided with a notched extremity sealingly straddling said first mentioned sealing strip.

10. An assembly comprising at least two separable sections having opposing parting faces providing a parting joint and at least one of said sections being cavitated in its parting face for defining a cavity therebetween when in assembled relation, each of said sections having a groove therein adjacent to said cavity and opening through the respective parting face, said grooves registering when said sections are in assembled relation to define a sealing chamber space, and a compressible cellular elastomeric seal bonded in air tight relation throughout its length within one of said grooves and releasably engaged in the other of said grooves and extending in sealing relation across the parting joint, whereby upon separation of the sections the seal is carried inseparably by the section having said one groove and in assembly of the sections the seal is adapted to assume a ready sealingly conformable relation to the surfaces within said other groove.

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