Dec. 28, 1965 F. HANSBERG 3,225,396

SEAL FOR CONTROL SLIDE OF CORE AND MOLD MAKING MACHINE

Filed March 21, 1963 4 Sheets-Sheet 1

Fig.1

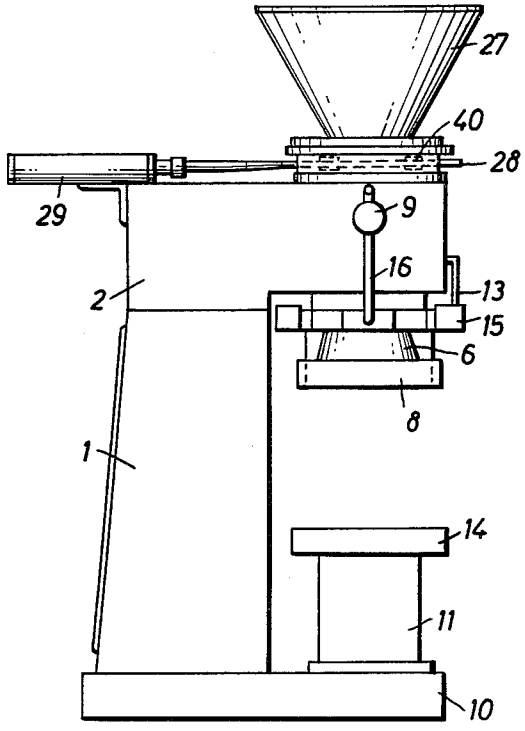

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Fig.2

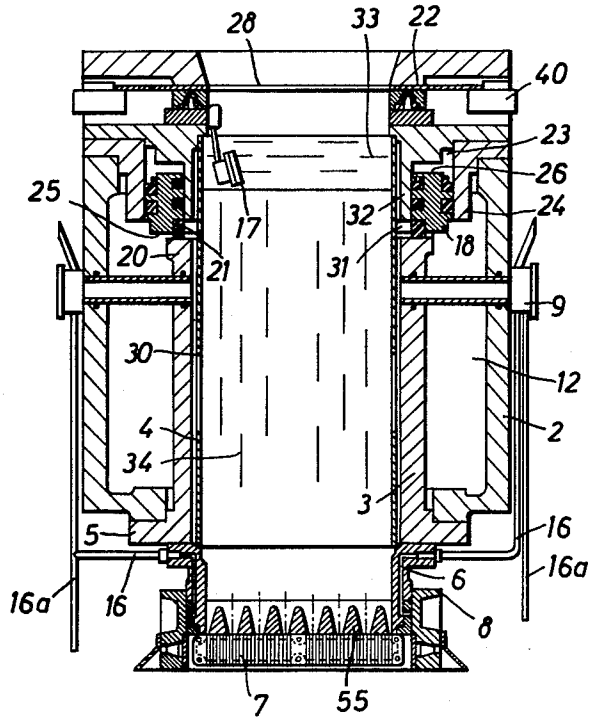

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Fig.3

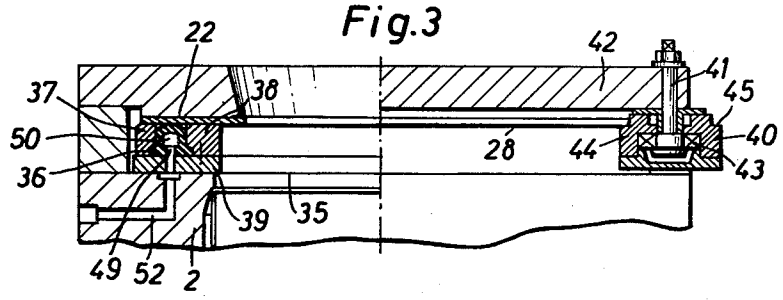

Fig.4

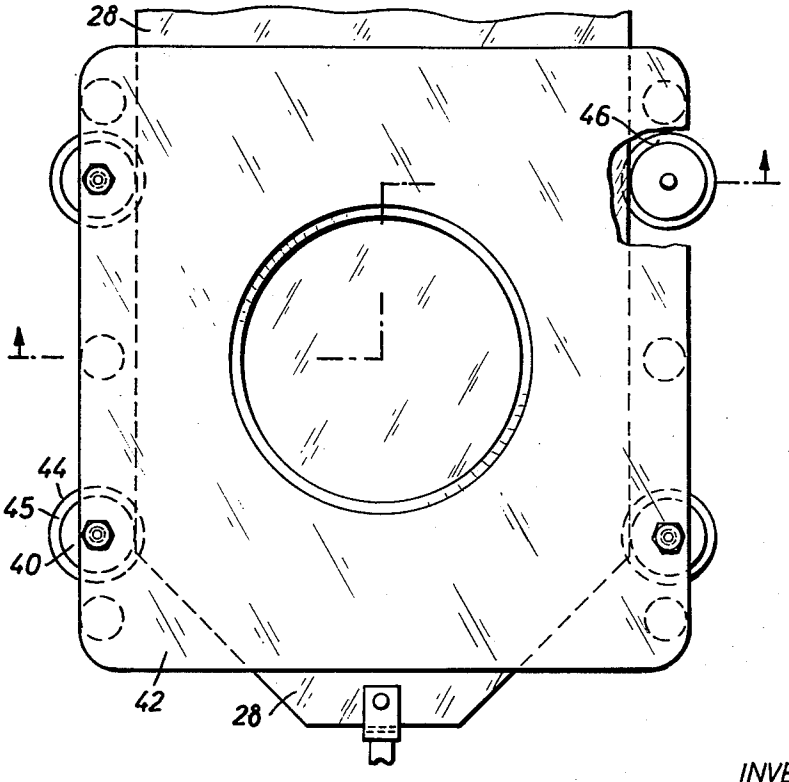

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Fig.5

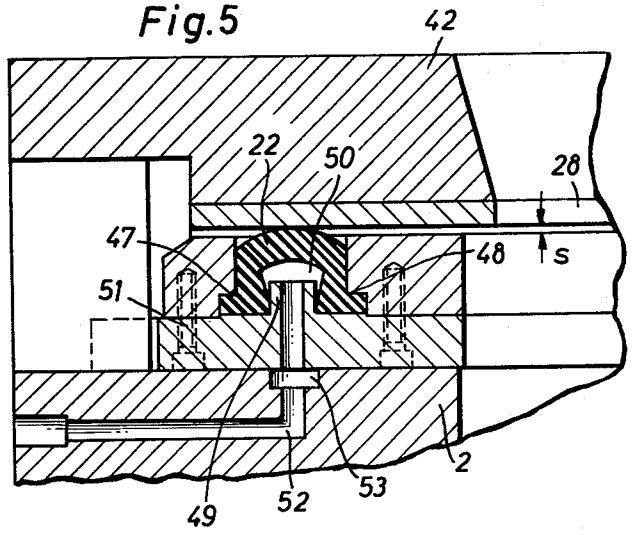
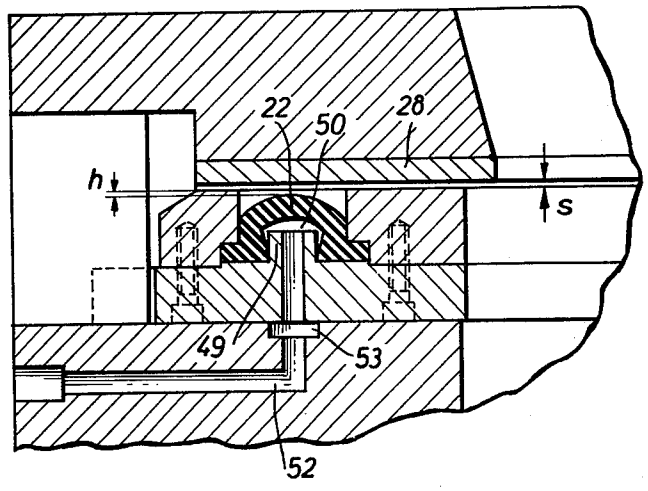


Fig.6



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3,225,396

SEAL FOR CONTROL SLIDE OF CORE AND MOLD MAKING MACHINE

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3 Claims. (Cl. 22—10)

The invention relates to a machine for investing mold boxes, etc. with a molding material, and more particularly to a machine for investing core and mold boxes with a molding material for the purpose of producing molds and cores as they are used in foundries.

There are known in practice machines in which the molding material such as molding sand is supplied to a supply container in the machine in which container air pressure is built up controlled by a pressure air control valve. The molding material is discharged from the supply container into the box to be invested. Various types of such mold and core making machines operating with pressure air are known. They are two basically different types of machines and modes of operation, to wit: the so-called true blowing machines in which a mixture of air and molding sand is blown out and the so-called "shooting" machines in which the molding sand is abruptly forced into the box to be invested without previously mixing the molding sand with air. To state it differently, in one type of machine, the molding material is made flowable by mixing it with air, whereas in the other type machine, the material remains substantially compacted and is propelled out of the machine in the form of a substantially solid core, somewhat similar to the manner in which a pellet is shot out of an air rifle. Machines of the shooting type are more fully described in U.S. Patents 2,793,409 and 2,983,971.

The invention is particularly useful in connection with machines using the shooting principle.

In all mold and core making machines, the supply container for the molding sand or other molding material must be replenished from time to time. To control such replenishing of the supply of the material, a feed control slide is usually provided which can be slid into and out of a position closing the supply container at its top side. A feed hopper mounted above the supply container serves to direct a new supply of molding material into the container when the control slide is moved into the open position. With shooting machines, the hopper is usually in the form of a vibrated chute.

The continuous opening and closing of the feed control slide causes a considerable wear and tear of the slide. Such wear and tear has become even more pronounced since the replacement of the previously customary plastic stiff molding materials by semi-fluid materials, such as flowable molding sand, since the grains of such sands can creep readily into the narrow gaps at the guides for the slide and are highly abrasive. The wear and tear on the feed control slide is particularly marked with shooting machines, since in machines of this kind, the slide in its closed position must support the total weight of the hopper and slurry contained therein and the slider is opened and closed after each shooting operation, usually at time intervals of 5 to 20 seconds. In fully automatic operating mold or core forming lines, opening and closing of the slide may be effected more than a half-million times per year. Due to such continual wear in automatic operation, the feed control slide must be renewed rather frequently, which entails stopping of the entire mold and core forming line in a fully automatic and continuously operating assembly.

It is a broad object of the invention to provide a novel and improved core and mold making machine of the general kind above referred to in which penetration of molding material into the sealing for the slide is effectively prevented so that there is practically no wear and tear at the sealing.

The afore pointed out object and other objects, features and advantages which will be pointed out hereinafter are attained by providing in a machine for investing mold and core boxes with a molding material and in which the supply container for the slurry is open and closed by a feed control slide, an elastic sealing for the slide in the form of a pressure air operated sealing means which is elastically deformable to seal the slide and secured in position by a suitable pressure means such as pressure rings. Due to the mounting of the sealing by pressure rings, sand or other molding material can creep only as far as the sealing, but cannot penetrate into the sealing proper. Due to the elastic deformation of the sealing, the same is capable of closing the gap between the lower side of the slide and the surface along which the slide moves, which gap is necessary to permit easy sliding of the slide. Such closing of the gap effects sealing of the slide against the supply container for the sand.

In the accompanying drawing a preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

In the drawing:

FIG. 1 is a diagrammatic view of a core or mold making machine according to the invention.

FIG. 2 is a sectional view of the head portion of the machine on an enlarged scale.

FIG. 3 is a further enlarged sectional view of the upper part of FIG. 2, the right half of the section showing the support of the feed control slide by rolling guide means and the left side of the section showing the sealing means for the slide.

FIG. 4 is a plan view of FIG. 3, partly in section.

FIG. 5 is a detailed view of the sealing means for the feed control slide on an enlarged scale, the slide being shown in its position closing the sand container of the machine and the sealing means sealing the slide, and

FIG. 6 is a sectional view similar to FIG. 5 but showing the slide in its open position and the sealing means in the non-sealing condition.

Referring first to FIG. 1 in detail, the machine shown in this figure is a core and mold making machine of the shooting type as previously described. The illustrated machine is a large type machine and equipped with means for supplementary or after pressing of the slurry to be invested in a box.

The exemplified machine comprises a base plate **10** which supports an upright frame **1** and a lifting cylinder **11** which serves to lift and lower a machine table **14** upon which is placed a box (not shown) to be filled. The head portion **2** of the machine is mounted on frame **1** and accommodates a storage chamber for the pressure air effecting the shot like ejection of the molding material, such as sand and a sand supply container, as will be more fully described in conjunction with other figures. At the lower end of the sand container, the head portion **2** mounts the shooting head **6**. The shooting head, in turn, supports a vertically displaceable frame **8** for supplementary or after pressing of the sand. The frame is locked in a predetermined vertical position in reference to the shooting head, or released from this position by means of four hydraulic cylinder-piston units **15** of conventional design which are controlled by a pneumatic automatic control device mounted in the head portion **2** and connected to the cylinder-piston units by means of a conduit **13**. An automatically controlled venting valve **9** of the machine is connected by a pressure air conduit **16** to sealing means for sealing supplementary pressing frame **8** at the shooting head **6**. A hopper **27** is mounted

on top of head portion 2 and the supply of sand, is fed from the hopper to the sand container in the machine under the control of a feed control slide 28. Slide 28 is guided on horizontal guide rolls 40 and may be moved into and out of a position closing discharge of sand from hopper 27 into the supply container by means of a pressure air operated cylinder assembly 29 mounted on the frame or the head portion of the machine.

The head portion 2 is hollow and according to FIG. 2, a cylindrical supply container 3 for sand or other slurry material is inserted into head portion 2 from below. Container 3 is secured in position by means of a flange 5 and fastening means, such as bolts, extended through the flange. An annular chamber 12 defined in head portion 2 by container 3 serves as a storage chamber for the pressure air used to effect the abrupt or shot-like ejection of the sand from the machine and into the box to be invested. The storage chamber 12 for the pressure air is continued in head portion 2 as far as the wall of the frame structure 1. Supply container 3 is continued adjacent to the upper part of the annular chamber 12 by a ring-shaped partition wall 32 whereby an annular gap 31 is left between partition wall 32 and the upper edge of container 3. Wall 32 together with a cylinder 24 of somewhat larger diameter than wall 32 defines an annular cylindrical space 23 in which a ring valve 18 is vertically movable. Ring valve 18 is subjected at its upper surface 26 to control pressure air supplied to space 23 by a control air conduit (not shown) while the lower surface 25 of the valve is exposed to the pressure of the air used for ejection of the sand from the machine and stored in chamber 12. The lower surface 25 of valve 18 mounts a seal 21 with which the valve is seated upon the top end 20 of the supply container 3. As a result, the lower surface 25 of valve 18 is exposed to the pressure air stored in annular chamber 12 over a smaller area than the area which the upper surface 26 offers to the control pressure air contained in the annular space 23. Consequently, the pressure air in space 23 is capable of pressing the valve 18 strongly against the top end 20 of supply container 3 against the pressure of the pressure air stored in chamber 12, whereby the annular gap 31 is sealed against the interior of container 3. However, when space 23 is vented, the pressure air stored in annular chamber 12 forces valve 18 abruptly into its upper limit position and the pressure air can then flow from chamber 12 into the interior of container 3 through annular gap 31.

A perforated insert 4 is fitted in the interior of supply container 3. The insert defines between its outer wall and the inner wall of container 3 an annular space 30 into which pressure air from the storage chamber 12 can flow through ring gap 31 when valve 18, for controlling the expulsion of sand from the machine, is actuated. The pressure air will then flow downwardly in space 30. Insert 4 has in its wall along nearly the entire height thereof, a plurality of short vertical slits 34, the width of which may be a fraction of a millimeter. The upper end of insert 4 includes a plurality of short horizontal slits 33 which also have a width of a fraction of a millimeter.

As it is evident, the pressure air stored in annular chamber 12 for effecting expulsion of the sand, when flowing downwardly in space 30 upon opening of gap 31 by operation of valve 18, will penetrate through slits 34 into insert 4 and act upon the compacted sand therein in radial direction. In addition, the pressure air will enter the insert through the upper horizontal slits 33 and act upon the top side of the sand in insert 4 in axial direction. As a result of the radial action of the pressure air, the compacted mass or core of sand will be somewhat radially compressed so that it becomes free of the inner wall of insert 4 and is hence in effect momentarily floating, thus facilitating the shot-like expulsion of the sand from the machine. After the sand is expelled from the machine, container 3 is vented by means of the automatically controlled venting valves 9 disposed on opposite sides of head portion 2.

The automatic recharging of supply container 3 is initiated by a diaphragm controlled valve 17 disposed within container 3. The valve controls the movement of feed control slide 28 closing and opening respectively the open top side of container 3 and is controlled by a suitable automatic control system (not shown). The slide 28 is sealed from below in its closing position by means of a pressure air seal 22.

The bottom end of container 3 mounts a shooting head 6. This shooting head, which may be fixedly or detachably mounted and serves to invest core or mold boxes with slurry, is provided with a grid shaped plate 55 including slot type nozzles 7. The sand which is compacted in insert 4 of container 3, is driven through nozzles 7 into a box (not shown) placed on table 14.

Shooting head 6 is equipped with a vertically movable frame 8 for applying a supplementary or after pressure to the sand in the box. The vertical surfaces along which frame 8 is movable may be sealed by means of a pressure air seal which is connected by a pressure air conduit 16 either with venting valve 9 and thus with the pressure air control conduit 16*a* thereof (to the right in FIG. 2), or directly with the control air conduit 16*a* of venting valve 9, as is shown at the left side of FIG. 2.

FIGS. 3 and 4 show more in detail the guidance of feed control slide 28 on horizontally disposed guide rollers 40. These rollers are rotatable about vertical pins 41 and suspended by means of these pins from a head plate 42. To facilitate rotation of the rollers on the pins, suitable bearings such as deep groove type radial ball bearings may be provided. Rollers 40 are formed with peripheral shoulders 44 and slide 28 is supported by the horizontal surface 45 of the shoulders and slides along this surface. As a result of the slider movement, any sand particles which may adhere to or accumulate on surfaces 45 and 46 of the rollers are continuously wiped off, thereby effecting a continuously self-cleaning of rollers 40.

As shown in FIGS. 3, 5 and 6, a flexible sealing 22 is provided at the surface 35 of head portion 2 to seal slide 28 against the surfaces along which it moves. Seal 22 is preferably a pressure air seal. It is shown as a ring tube from which extend two lateral flanges 36. The sealing tube is secured airtight by means of these flanges and two pressure rings 37 and 38 to a mounting ring 39. To obtain a strong grip between flanges 36 and pressure rings 37 and 38, the latter are formed at the lower side with wedge shaped pressure surfaces 47 and 48 which are forced into flanges 36 when the pressure rings are tightened against the flanges. To prevent deformation of the sealing tube toward its mid-portion when flanges 36 are compressed by rings 37 and 38, a ring shaped rib 49 is provided on mounting 39. This rib protrudes into the interior 50 of the sealing tube, thus limiting deformation of the same.

Slide 28 when moving into and out of its position closing container 3 is spaced from the upper side of pressure rings 37 and 38 only by a very small gap *s* generally in the order of a few tenths of a millimeter. Experience shows that sand tends to creep into the gap *s* and to accumulate gradually therein, thereby causing a jamming of slide 28 and also wear and tear at the slide. To prevent, or at least to impede, such creeping of sand, it is essential that the upper surfaces of pressure rings 37 and 38 facing the slide are smooth, that is, not interrupted by any inserted screw heads or nuts. As is shown in the figures, the pressure rings are secured to the mounting ring 39 by means of screws 51 inserted from below, thus preserving the integrity of the upper surfaces of rings 37 and 38. When the sealing tube is in its relaxed condition, that is, not filled with pressure

air, the upper edges of rings **37** and **38** are higher than the top of sealing tube **22** by the distance *h* which may be about 0.5 millimeter. Pressure air may be applied to sealing tube **22** through a pressure air duct **52** which is connected through an air distributing duct **53** to the interior **50** of the seal. The sealing tube is made of a suitable flexible material, such as rubber, and is hence elastically expandible by air pressure within the tube. Due to the expansion of the sealing tube, the same will close the gap *s* between slide **28** and the upper surface of rings **37** and **38** and also press slide **28** from below against the head plate **42**, thus sealing the open top side of container **3** (see FIG. 5). Since the seal is pressed airtight against mounting ring **39** by means of flanges **36** and pressure rings **37** and **38**, the sand can readily penetrate into gap *s* up to pressure seal **22**, but cannot creep past the pressure seal mounting and, in particular, not enter into the inner space **50** of the seal, so that there is no danger that sand will reach through duct **52** the rather sensitive pressure control valves causing jamming of the same when the pressure seal **22** is released.

While the invention has been described in detail with respect to a certain now preferred example and embodiment of the invention, it will be understood by those skilled in the art, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications in the appended claims.

I claim:

1. A machine for investing mold and core boxes with a molding material, said machine comprising a supply container for the molding material having a filling opening at the top, pressure-operated means for discharging the material from said container and into boxes to be invested, a feed-control slide slidable parallel to a wall portion of the container having said opening separated from said wall portion by a gap, the slide being slidable into and out of a position closing said filling opening, a hollow elastic sealing means positioned in said gap, said sealing means having a generally U-shaped cross-section facing downwardly and being deformable by application of a pressure fluid from a non-sealing configuration leaving said gap open to a sealing configuration closing said gap, thereby sealing the container against the slide in the closing position of the latter, mounting means securing said sealing means in said position in the gap, said mounting means including a mounting ring disposed at the top of the container and encompassing the filling opening therein and ring-shaped pressure means placed upon said ring for compressing said sealing means against said mounting ring in airtight sealing engagement therewith, said sealing means having elastic lateral flanges and said ring-shaped pressure means including two concentric rings, each of said rings being secured to said mounting ring and pressing against one of said flanges, a feed conduit for feeding pressure fluid into the interior of the sealing means, and a ring-shaped protrusion extending into the interior of the sealing means to prevent deformation thereof beyond a predetermined limit by the pressure of the mounting means.

2. A machine according to claim **1** wherein said protrusion constitutes the terminal portion of said feed conduit.

3. A machine according to claim **1** wherein the height of said pressure means is slightly in excess of the height of the sealing means in the non-compressed configuration thereof.

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