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3,517,411
**MOLDING MACHINE FOR MAKING COMPACTED
ABRASIVE ARTICLES**

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5 Claims

ABSTRACT OF THE DISCLOSURE

A machine for making compacted abrasive articles (such as abrasive hones, and abrasive blocks that may be made into hones), from a loose mix of grits and binder material compacted under heavy pressure into molds or dies having various shapes and sizes oriented vertically, the molds or dies being readily removed from the machine after the mix has been uniformly compacted into the molds, and after the hones or blocks are removed from the molds they may be vitrified for use, the compacting operation being performed in a vacuum.

This invention relates to machines capable of producing heavy pressure for making abrasive hones, annular items, and abrasive blocks, and in particular, for compacting a loose mix of abrasive particles and binder material into a compacted state having form and shape, also as disclosed in my pending application Ser. No. 678,328 filed Oct. 28, 1967, now Pat No. 3,474,493, and in my pending application Ser. No. 827,315, filed May 23, 1969.

A disadvantage of compacting abrasive articles in machines now in use is that the compacted article is usually ejected from the mold while under pressure. This operation requires power and does not add to the quality of the product, is time consuming, and causes excessive wear on the sides of the mold. The molds are costly to make and expensive to maintain in production; also the machines are slow in operation to avoid the entrapment of air bubbles in the mix.

With the foregoing in view, it is an object of the invention to provide a machine and mold design for compacting and forming an abrasive mix into abrasive articles such as honing sticks, blocks, and annular items in a formed state for sintering, a vacuum being maintained in the compacting chamber to assure a bubble-free product of uniform structure at a relatively high production rate.

An object of the invention is to provide a machine vertically oriented which is loaded with a mix of grits and binder material vertically from the top and unloaded vertically thru the bottom after the compressing pressure is released.

An object of the invention is to maintain a vacuum chamber in which an abrasive and binder mix may be compacted in form.

An object of the invention is to provide a machine having opposed compaction chambers so that the elevated pressures of the compressing means relative to the opposed chambers counterbalance one another.

Another object is to provide a vertically reciprocating power unit operating an actuating head vertically in conjunction with opposed toggle arms, said toggle arms actuating opposed rams so that the forces exerted are counterbalanced relative to the power supply means and to the actuating head.

Another object is to provide molds that are readily loaded and unloaded vertically for forming abrasive articles in the shape and size suitably conforming to the

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finished article so that upon the mold being removed from the machine and the articles being removed from the mold, they are ready for curing or sintering.

Another object is to provide a machine which makes or produces a plurality of formed abrasive articles in one operation of the machine.

Another object is to provide molds that divide and compress a mix uniformly into 90° V-shaped channels oriented vertically on the inner faces of said molds, the peaks formed by joining faces of the channels in one inner face to be in mating relation with peaks formed by the channels in the opposite inner face.

Another object is to provide top and bottom covers for the compacting chambers that are easily assembled and easily removed so as to permit placing the molds into the compacting chambers and loading the mix between the said molds, so that said covers properly and adequately confine the mix during compacting of the articles, and so that the said covers may be readily removed after the articles are formed.

Another object is to provide a machine having opposed dual compacting chambers that are ablated cleanly during removal of molds and formed abrasive articles, leaving virtually no deposits of the mix.

These and other objects of my invention will become apparent by reference to the following description and drawings in which:

FIG. 1 is a top plan view.

FIG. 2 is a cross-sectional plan view taken on line B—B of FIG. 3, and indicates one chamber containing forming dies and compacted articles in the closed position, the opposite chamber contains forming dies in the open position, ready for filling with a mix to be compacted.

FIG. 3 is a side elevation view taken on line A—A of FIG. 1, and indicates one chamber containing forming dies and compacted articles in the closed position; the opposite chamber open, as it is after unloading a set of dies and articles.

Referring to the drawings wherein like numerals refer to like parts throughout the several views, it will be noted that side walls 11, and end walls 12, define a rectangular frame, an upper partial cover 13, is bolted to side walls 11, by cap screws 14, an aperture 15, is threaded for connection to a vacuum supply unit; a lower partial cover 16, is bolted to side walls 11, by cap screw 17. Cover 16, has a central opening 18, receiving a rounded section of actuating head 19, which is attached to the piston 20, of the cylinder 21; head 19, shown in fragmentary section 22, in the up position. Cylinder 21, is connected to cover 16, by suitable means.

Paired opposed rams 23, lie adjacent to each end wall 12, in spaced relation thereto. Toggle push links 24, lie between the actuating head 19, and the rams 23. The links 24, may have arced ends 25, fitting into sockets in the actuating head 19, and in the rams 23, as shown. Retraction springs 26, lie between the rams 23, to retract the rams 23, to the open position C—C, when the ram 19, is stroked to the upper position 22, by cylinder 21.

The compacting chambers C—C, are closed at the upper and lower ends by sliding covers 27, and clamps 28, retain said covers 27, in place during the compacting operation of the abrasive mix 29, after said mix 29, has been compacted into 90° V-shaped channels 31 in removable mold 30. The peaks formed by the channels 31 meet to form squares or rectangles 32 in cross section when the removable molds 30 are in closed position.

In operation head 19, is held in the up position 22, by cylinder 21, the lower sliding cover 27, is clamped in position by end clamp 28. Dies 30 are placed into the chamber and a predetermined amount of mix is loaded

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down between the dies whereupon upper sliding cover 27, is clamped in position, thus completing a practically airtight chamber. A vacuum supply source extracts virtually all air from the chamber. A hydraulic or air cylinder or other power means then lowers the operating head to the lower position and linkage means forces the paired opposed rams away from the head. The rams move forming dies 30 to a closed position, thus compacting the mix between the V-shaped channels 31 to form the plurality of square or rectangular cross-sectioned abrasive elements. The action is reversed for removing the articles and the dies.

Various changes may be made in the details, arrangement, and proportions of the parts without departing from the scope of my invention.

I claim:

1. A machine for molding abrasive articles into compacted shape from a mix of abrasive particles and binder material, comprising

a container having opposed compressing chambers, said chambers having opposed vertical walls for counterbalancing compression forces, said container having partial top covers and partial bottom covers, said covers being removably inserted, an actuating head in said container disposed vertically between said compressing chambers, a drive device attached to said head for reciprocating said head vertically in said container, a ram positioned between said head and each said compressing chambers, toggle links lying between said head and each said ram for moving each said ram forward to each compressing chamber and means for retracting said rams, and a two-part mold removably inserted in each said compressing chamber, the inner mating faces of said mold having a multiple of V-shaped channels formed therein, the said channels being in mating

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relation to each other, the side faces of the channels intersecting to form peaks.

2. In a machine as set forth in claim 1, said container being rectangular and said rams being located in opposition on at least one axis of the rectangle.

3. In a machine as set forth in claim 1, the said compressing chamber having end walls fitting together to form with said vertical walls and said top and bottom covers a virtually airtight chamber.

4. In a machine as set forth in claim 1, means to maintain a high vacuum in said container during the compressing operation.

5. In a machine as set forth in claim 1, wherein said V-shaped channels are formed with said side faces at an angle of 90°.

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