United States Patent

Vasilkovsky et al.

[15] 3,659,642

[45] May 2, 1972

[54] APPARATUS FOR COMPACTING A MOULDING MIXTURE

[72] Inventors: **Lev Fedorovich Vasilkovsky,** Donetskoi oblasti, ulitsa Koroleva, 25, kv. 52, Slavyansk; **Vladimir Efimovich Sjusjuk,** ulitsa Shkadinova, 29, kv. 23, Kramatorsk; **Nikoloi Nikitovich Abrosimov,** ulitsa Voznesenskogo, 19, kv. 60, Kramatorsk; **Georgy Andreevich Geidebrekhov,** ultisa Sotsialisticheskaya, 72, kv. 9, Kramatorsk: **Vsevolod Andreevich Lyashenko,** ulitsa Bogdana Khmelnitskogo, 16, kv. 9, Kramatorsk; **Vladimir Ivanovich Podmogilny,** poselok Krasnogarka, ulitsa Deputatskaya, 120, Kramatorsk, all of U.S.S.R.

[22] Filed: **Dec. 22, 1969**

[21] Appl. No.: **887,223**

[52] **U.S. Cl.** **164/169,** 164/37, 164/202

[51] **Int. Cl.** **B22c 15/00**

[58] **Field of Search** ..... 164/37, 38, 195, 169, 200, 164/201, 202, 259, 261, 284, 285, 306, 308, 192, 193, 198; 18/5 BA, 30 WR, 42 RR; 25/DIG. 19; 239/504, 499

[56] **References Cited**

UNITED STATES PATENTS

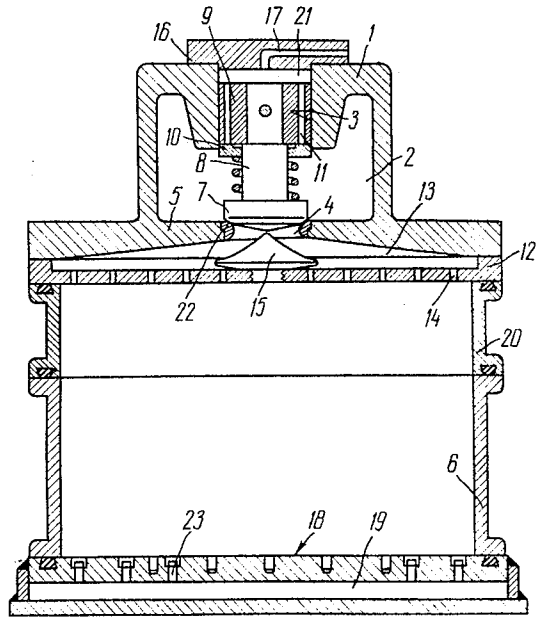
1,594,598	8/1926	Campbell	164/202
2,538,770	1/1951	Fea	164/200
2,692,409	10/1954	Herbruggen	164/200 X
3,529,941	9/1970	Tobiassen	239/504 X

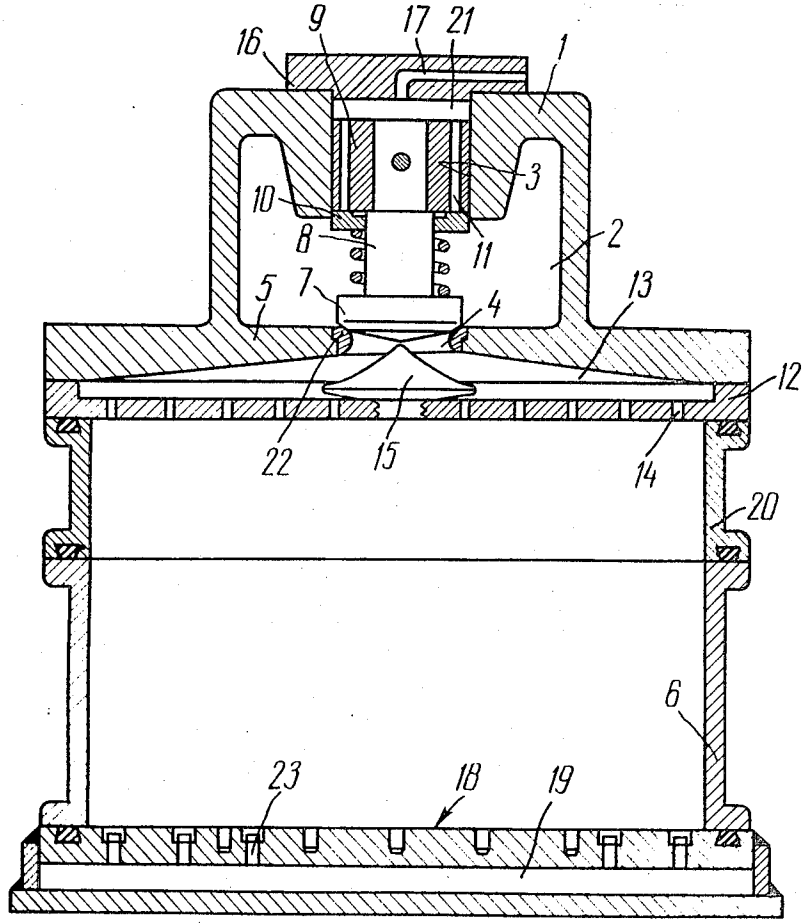
Primary Examiner—J. Spencer Overholser
Assistant Examiner—John S. Brown
Attorney—Waters, Roditi, Schwartz & Nissen

[57] **ABSTRACT**

A device for compacting a moulding mixture in which the latter is subjected to the action of compressed air by supplying the air into a reservoir under a pressure exceeding 20 kg/cm² in such an amount that 3 to 40 volumes of air under a normal pressure are provided per unit or volume of the mixture being densified. Then the reservoir is discharged during a time interval not exceeding 0.15 sec. by directing the flow of air into the mixture in a moulding box. The reservoir is formed by a chamber of a housing and at the external side of this housing under a discharge opening closed by a valve there is mounted a plate forming an additional chamber. The plate has holes for a uniform distribution of the air over the surface of the mixture being compacted.

4 Claims, 1 Drawing Figure




16
9
17
21
1
3
10
8
11
2
5
7
4
13
12
22
15
14
20
6
23
18
19

APPARATUS FOR COMPACTING A MOULDING MIXTURE

The present invention relates to foundry practice and more particularly, the invention relates to the compacting of a moulding mixture for fabrication of moulds and mould cores.

The sandblast method of compacting a mould mixture is widely used in the art. This method consists in passing compressed air under a pressure of 5–7 kg/cm² through a tank filled with a moulding mixture and mounted above a mould box.

The air passing through the tank produces a sand-air mixture which through the opening in the bottom of the tank is fed into the mould box.

The mixture particles gaining a speed, due to sudden braking action are compacted in the moulding box while the air passing through the openings (vents) in the master pattern plate is admitted into the atmosphere.

The compaction of the mixture in the moulding box is provided due to the kinematic energy of the mixture particles and the pressure drop of the air passing through the mixture layer.

On employing this method of compaction, it is possible to use only fluid and low-strength moulding mixtures which do not scaffold in the tank; this method does not provide for a required density of the mould, therefore, the moulding mixture filling the moulding box is to be additionally compacted. Furthermore, when using this method, it is very difficult to compact the mixture in large-size moulding boxes as in this case it is necessary to employ a large-size tank whereby whole device becomes very bulky.

An object of the present invention is to eliminate the above mentioned disadvantages.

The specific object of the invention is to provide means for compacting a moulding mixture in which the mixture charged into a moulding box is compacted by a flow of air preliminarily forced into a tank in a required volume and then during a very short time interval being discharged directly onto the moulding mixture.

This object of compacting a moulding mixture by subjecting it to the action of compressed air is attained according to the invention, by forcing the air into a tank under a pressure exceeding 20 kg/cm² and in such a quantity that 3 to 40 volumes of air under a normal pressure are taken per unit of volume of the mixture being compacted, thereafter, during a time interval not exceeding 0.15 sec the tank is discharged by directing the flow of air into the mixture in the moulding box.

To achieve the above, a device is proposed having a housing provided with a chamber which through one opening is connected with a pressure source and through the other opening located in the housing bottom is connected with a moulding box, in which, according to the invention, the opening in the housing bottom is closed with a valve so that a tank for storage of compressed air is formed in the above-said chamber, while mounted on the external side of the bottom of the housing is a plate forming therewith an additional chamber, the plate being provided with a hole for uniform distribution of the air over the surface of the mixture to be compacted.

The plate is preferably provided with a conical projection arranged under the opening in the housing bottom and facing this opening with its apex.

Such a construction provides for more uniform distribution of the air flow throughout the additional chamber.

The valve closing the opening in the housing bottom is preferably rigidly connected with a piston having passages for communicating the chamber with the pressure source, whereas a non-return valve is mounted between the piston and the valve, said non-return valve being controlled by the pressure source through said passages.

Such a construction of the valve provides for quick and reliable opening of the passage connecting the compressed air chamber with the additional chamber.

It is most expedient to make the additional chamber widen, in which case its height decreases in towards the periphery of the plate.

Such a shape of the additional chamber provides for a uniform distribution of the air flow therein.

The apparatus for compacting a moulding mixture ensures a uniform distribution of the mixture over the whole surface of the mould and an advantageous distribution of the density by the height of the moulding box (the largest density is in the lower layers, and the density decreases to the upper layers but remains sufficient and the mixture does not require additional compaction), in addition, this method is suitable for making moulds of any size.

The above and other objects and features of the invention will appear more fully hereinafter from a consideration of the following description taken in connection with the sole figure of the accompanying drawing illustrating in longintudinal section a device for compacting a moulding mixture by subjecting it to the action of compressed air, according to the present invention, and a moulding box with a filling frame mounted on a master pattern plate.

There is contemplated a compacting of a moulding mixture by operation with compressed air. The air is preliminarily forced into a tank under a pressure not exceeding 20 kg/cm² in such an amount that 3 to 40 volumes of air under a normal pressure are taken per unit of volume of the mixture being compacted. After that, this mixture with compressed air is discharged by admitting the air onto the mixture in the moulding box during a very short time interval (not exceeding 0.15 sec).

Due to the rapid discharge of the compressed air, the latter instantaneously expands, and the pressure in the space above the moulding mixture rises acting uniformly on the whole surface of the moulding mixture in the moulding box. Under such an action, separate volumes of the mixture in the moulding box can move relative to each other during the process of compaction travelling to that part of the moulding box in which the mixture is less compacted. As a result, the mixture is uniformly compacted throughout the whole volume of the moulding box.

The air consumption per unit of volume of the mixture to be compacted is selected depending on the height of the moulding box: the greater the height, the lesser quantity of air per unit of volume. For example, for a moulding box 600 mm high, 5 volumes of air under a normal pressure is taken per unit of volume of the moulding mixture, whereas for a moulding box 100 mm high, 30 to 40 volumes of air is taken. Such a selection of the consumption of air per unit of volume of a moulding mixture to be compacted provides for the maximum compaction of the mixture at the surface of the mould.

For carrying the above operations into effect a device is provided for compacting a moulding mixture by means of compressed air acting upon the mixture.

A housing **1** of the device has a chamber **2** and an opening **3**. The chamber communicates through an aperture **4** in the bottom **5** of the housing **1** with a moulding box **6** containing a moulding mixture.

The aperture **4** is closed with a valve **7** so that a reservoir is formed for storage of compressed air. The value **7** is rigidly connected by a rod **8** with a piston **9** positioned in the opening **3**. Mounted on the rod **8** between the piston **9** and the valve **7** is a non-return value **10**. For supplying the chamber **2** with compressed air, the piston **8** is provided with passages **11** through which the air is fed into the chamber **2**. The non-return valve **10** has the same diameter as piston **9** (as seen in the drawing) and the valve **10** faces the passages **11** and is urged by a spring against piston **9** to block passages **11**.

Mounted on the external side of the bottom **5** under the aperture **4** is a plate **12** which together with the bottom **5** form an additional chamber **13**. The whole surface of the plate **12** is provided with holes **14** through which the compressed air is uniformly distributed over the whole surface of the mixture to be compacted.

In the middle of the plate under the aperture **4** there is provided a conical projection **15** whose apex faces this aperture. This projection helps to distribute more uniformly air within

the additional chamber **13**, which for this purpose is made so that its height is largest in the middle and the smallest at the periphery.

The housing **1** is closed with a cover **16** having a passage **17** through which the compressed air is supplied into the chamber **2**.

The device for carrying into effect the method according to the present invention operates as follows.

The moulding box **6** filled with a sand-clay moulding mixture is installed on a master pattern plate **18** which has an air discharging chamber **19**. A filling frame **20** filled with the same mixture is put on the moulding box **6**. The device for compacting the moulding mixture is placed on the frame **20** from above and is reliably secured thereto for providing for a leaktight joint and for resisting the forces produced in the process of compaction. Thereafter, the compressed air is forced into the chamber **2** by passing through the passages **17** and **11** open the non-return valve **10** and fill the chamber **2**.

For compacting the mixture in a moulding box having an area of 800 × 700 mm and a height of 400 mm at a volume of the chamber 2–14 dm^3, the air pressure should be equal to 100 kg/cm^2. At these parameters, 1 dm^3 of the mixture being compacted corresponds to approximately 6 dm^3 of air under a normal pressure.

After filling the chamber **2** with compressed air in a required amount, the space **21** located above the piston **9** is communicated with the atmosphere through the passage **17**. Thereupon, the non-return valve **10** is forced against piston **9** to block passages **11** and due to the difference in the areas of the piston **9** and the valve **7**, the piston **9** together with the valve **7** are rapidly moved upwards under the action of the compressed air in the chamber **2** to open the aperture **4** which is provided with a ring **22** made in the form of a widening nozzle. The compressed air uniformly fills the additional chamber **13** within a fraction of a second and simultaneously, through the holes **14**, is directed onto the moulding mixture thus compacting the mixture. The compressed air passing through the moulding mixture and through the holes (vents) **23** provided in the master pattern plate **18** is fed into the chamber **19** and therefrom into the atmosphere.

In the described embodiment the density of the mixture in the region of the mould is equal to at least 1.7 g/cm^3.

The moulds produced by the above-described apparatus from sand-clay moulding mixtures provide for making castings with an increased accuracy.

The device for compaction of a moulding mixture accomplished according to the present invention is reliable in operation and features a long service life. In addition, it can be installed on working moulding machines without large capital investments.

We claim:

1. A device for compacting a moulding mixture comprising a moulding box for the moulding mixture, a housing mountable on the moulding box, said housing having a chamber with a first opening for communication with an air pressure source and a second opening for communication with the moulding box, valve means for controlling the flow of air to and from the chamber via said openings, and a plate mounted externally on said housing between the housing and moulding box and defining an additional chamber with said housing, said plate having holes which open into said additional chamber and said moulding box to provide uniform distribution of air over the entire surface of the mixture in the moulding box when the valve means is in a state in which compressed air flows from the first said chamber to said additional chamber, said valve means comprising a first valve member for opening and closing said second opening, and a second valve member at said first opening to open the same under the pressure of the air from said source to permit the first chamber to be pressurized to a particular value whereupon the second valve member closes said first opening, said first valve member being closed when the second valve member is open and being open when the second valve member is closed.

2. A device as claimed in claim **1**, wherein said valve means further comprises a piston rigidly connected to said first valve member, said piston having passages leading from the pressure source towards said first chamber , said second valve member being between said piston and said first valve member in facing relation with said passages to move away therefrom under the pressure of the air from said source to permit the first chamber to be pressurized, said second valve member being displaceable against said piston to block further flow of air through said passages when said first chamber is pressurized.

3. A device as claimed in claim **1**, comprising a conical projection on said plate under said second opening in the housing, said conical projection having an apex which faces said second opening.

4. A device as claimed in claim **3**, wherein said additional chamber has a height which decreases towards the periphery of the plate.

* * * * *