

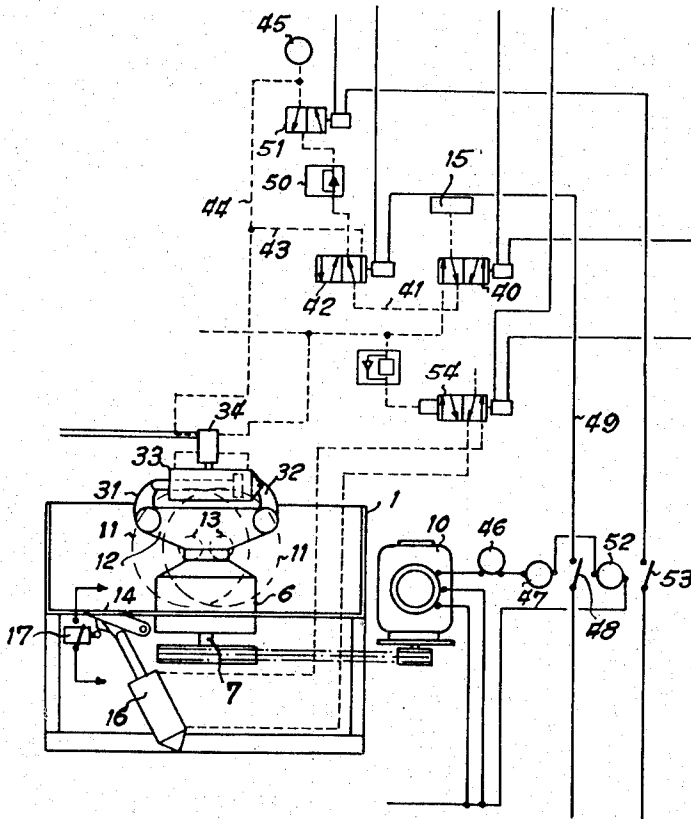
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R. A. M. RONCERAY

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MIXER-GRINDER

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INVENTOR
ROBERT ANDRÉ MARCEL
RONCERAY
BY
Woodham, Blanchard & Lynn
ATTORNEYS

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3,371,872

MIXER-GRINDER

Robert André Marcel Ronceray, 122 Ave. des Champs Elysees, Paris 8eme, France; Lena Sarah Yeomans, Andree Jacqueline Laure Ronceray, Françoise Monique Mary Ronceray, and Pierre Robert Ronceray, heirs of said Robert A. M. Ronceray, deceased

Continuation-in-part of application Ser. No. 365,993, May 8, 1964. This application Feb. 18, 1966, Ser. No. 528,513

Claims priority, application France, July 30, 1965, 26,753, Patent 89,802

3 Claims. (Cl. 241—132)

This application is a continuation-in-part of my patent application Ser. No. 365,993, filed May 8, 1964, in which the applicant has disclosed a mixer-grinder designed particularly for the treatment of foundry sands.

The mixer-grinder described in the parent application is principally characterized by the combination of a fixed tank, a motor assembly including a motor located externally of the tank and a speed reducer placed in the tank, and of an arm or crosshead fastened to the output shaft of the speed reducer and carrying the work moving members. The work members are principally comprised of grindstones, plowing disks and at least one scraper designed for the removal of the treated product.

In one preferred embodiment of the invention, the grindstones or grinders and the scrapers are mounted on the arm so as to be able to move toward and away from the bottom of the tank. Moreover, the movements of these two devices are coordinated so that while the grinders are in a working or lowered position, the scrapers are in the raised, inactive position and vice versa.

The vertical movement, particularly of the grinders, is effected by means of a power cylinder placed between two arms that are connected to cranks which support the grinders. Accordingly, when the power cylinder is retracted, the grinders are in the lowered position where they can engage the granular material contained in the tank in order to crush the granulated material. In the reverse position of the power cylinder, the grinders are raised and the scrapers are lowered.

The structure disclosed in the parent application provides for the regulation of the pressure with which the grinders act on the material to be treated by regulating the pressure of the compressed air admitted into the cylinder of the power cylinder.

The object of this continuation application is to increase the output of this mixer-grinder by reducing the time required to effect a cycle of grinding and by increasing the efficiency of this mixer-grinder. That is, the air pressure in the power cylinder of the parent application is varied according to the teachings in this continuation application, so that the power absorbed by the motor is substantially constant in the course of its operation.

In a normal cycle of work upon the foundry sand, the grinders of the mixer-grinder are lowered into the working position by the action of the power cylinder. The sand is thereafter introduced into the tank and, the motor having been started, the lumps of sand are broken by the grinders and, at the same time, the sand commences to take on the desired consistency.

In the known machines, the power absorbed by the motor tends to increase and it increases constantly until the end of the work cycle. It is at this moment, when the motor reaches its full power, that the grinder works with its maximum efficiency.

This cycle of operation is thus relatively long and it includes a period of operation in which the efficiency of

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the grinding operation is lower than that which it reaches precisely at the end of the cycle.

According to the invention in this application, the maximum pressure is applied to the grinders at the beginning of the cycle so that the motor attains its maximum power in a very short time and, by the aid of a control means, such as an ammeter relay, the pressure exercised by the power cylinder on the grinders is thereafter controlled so that the power output of the motor is maintained substantially constant until the end of the cycle of operation.

The device embodying the invention is, therefore, principally comprised of a distribution system for compressed air applied to the power cylinder, said circuit being characterized by an electrically operated valve capable of controlling the compressed air movement into the chamber of the power cylinder, notably for the lowering of the grinders, through two circuits. One of the circuits is a direct circuit permitting the rapid flow of air to the maximum pressure and the other circuit is a secondary circuit which is activated when the motor reaches its maximum power, and this latter circuit includes a relief valve for the compressed air.

Other characteristics of the invention will become apparent from the description which follows, upon examining the attached drawing which is provided for the purpose of illustration, only, and is not intended to limit the invention. The drawing illustrates schematically a control system conforming to the invention described herein.

As provided in the parent application, the sand to be treated is placed in the tank 1 in which is mounted a speed reduced 6 whose input shaft 7 is caused to rotate by the motor 10. On the output shaft of the speed reducer (such as a reduction gear unit) 6, is mounted an arm or crosshead 12 which supports the assembly of work members. The grinders, shown in broken lines at 11, are carried on the axles, shown in broken lines at 13, which are connected to the bell cranks 31 and 32, between which the air cylinder 33 is disposed. The bell cranks are mounted on the opposite end of the crosshead 12. The air cylinder is supplied by compressed air through a rotary connection 34. It is believed unnecessary to describe the foregoing assembly in further detail in order to understand the invention.

In accordance with the invention of this application, the compressed air, which operates the power cylinder 33, is supplied from a source 15 through the electrovalve 40. At the moment of opening of the door 14 for emptying of the sand, the switch 17 is closed and thereby energizes the electrovalve 40, which reverses the direction of the supply of air to the power cylinder 33. The air which then passes through this electrovalve 40 flows through the conduit 41 into an electrovalve 42 from which it reaches the air cylinder 33 by the conduit 43 and the conduit 44. This is the circuit of direct supply. As a result, the maximum pressure is exerted on the grinders and this pressure is read on the manometer 45. The power absorbed by the motor is indicated by the ammeter 46. The maximum pressure being applied, the power absorbed by the motor increases very rapidly until it attains a value which can be between approximately 75 and 95 percent of the maximum permissible value.

At this moment, the ammeter relay 47 is energized and its contact 48 is closed. This contact is connected by the conductor 49 to the electrovalve 42 so as to effect an interruption of the direct supply, described above, when said relay 47 is energized. The supplying of air pressure is then accomplished through a flow limiter 50 and the electrovalve 51, which directly supply the conduit 44. The supplying of compressed air to the air cylinder 33 is thus reduced and the rise in pressure is very slow.

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The absorbed power, which continues to increase, attains the nominal power of the motor and it is then that the ammeter relay 52 is energized. Its contact 53, which controls the electrovalve 51, cuts off the flow of air into the air cylinder and releases it to exhaust by a calibrated orifice.

The pressure on the grinders thus decreases slowly and, accordingly, the power absorbed by the motor also decreases slowly. While the pressure is returning to its normal value, the coil of the ammeter relay 52 is deenergized so that its contact 53 opens and the electrovalve 51 slowly supplies the air cylinder to re-establish the pressure.

The control of the pressure is in this way made saw-toothed during the entire period of the cycle. At the end of this cycle, a timer controls the electrovalve 40 so as to raise the grinder in order to lower the scrapers and to control the opening of the door 14 in the tank 1, by an assembly of circuits conveniently arranged. In particular, the electrovalve 54 operates the air cylinder 16 which controls the opening of the door 14.

The embodiment, which has been described only for the purpose of illustration, is not intended to limit the invention, and it will be understood that such description can be modified in detail without departing from the scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A mixer-grinder of the type described, comprising a stationary tank;
 - a driving unit consisting of a motor located outside of the tank and a reduction gear unit placed within said tank and having an output shaft;
 - an arm connected to the output shaft of the reduction gear unit;
 - at least two working members carried by said arm, one of said two working members being movable into and out of working position at any given time, said one working member being moved by said motor;
 - a power cylinder connected to said working members

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for controlling said movement into and out of said working position;

a source of air under pressure and a system controlling the flow of said air from said source to said power cylinder so that the power developed by the motor will be substantially constant during the operation of said one working member.

2. A mixer-grinder according to claim 1, wherein said system includes an electrovalve capable of directing said air into the chamber of the air cylinder, and said system includes a direct circuit, through which said air can flow to the power cylinder directly and rapidly, and an indirect circuit connected to the power cylinder when the motor achieves maximum power, said indirect circuit having a flow restrictor therein.

3. A mixer-grinder according to claim 1, wherein said one member is a grinder;

wherein said system includes an electrovalve capable of directing the air into the chamber of the air cylinder for lowering of the grinder; and

wherein said system has two circuits of which one is a direct circuit for the rapid achievement of maximum power by said motor and the other circuit is an indirect circuit coming into action when the maximum power of the motor is attained, said other circuit having a control for restricting the flow of the air.

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WILLIAM W. DYER, JR., *Primary Examiner.*

R. J. ZLOTNIK, *Assistant Examiner.*