March 11, 1941. F. HERGLOTZ 2,234,644

METHOD OF AND APPARATUS FOR BRIQUETTING FINE-GRAINED, PULVERULENT, OR DUST-FINE MATERIAL

Filed Oct. 6, 1938

Fig. 1

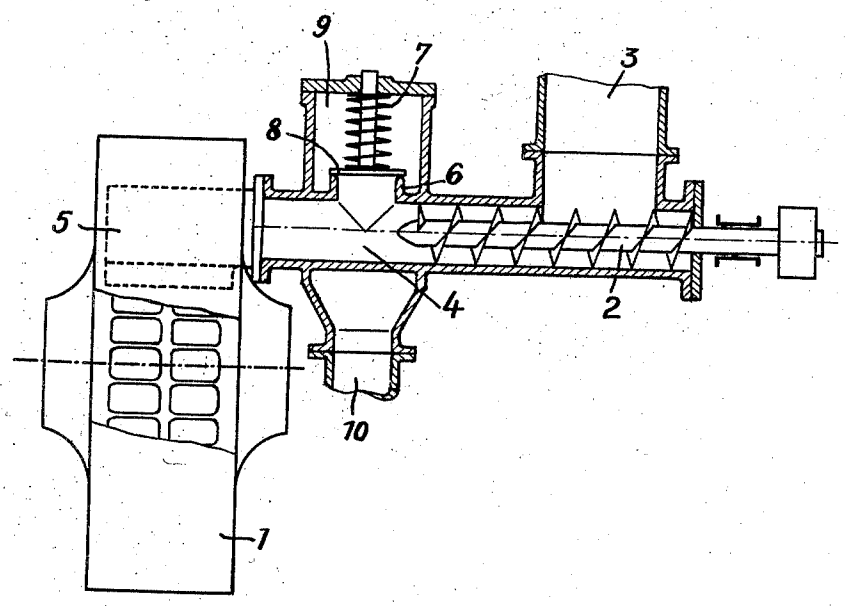


Fig. 2

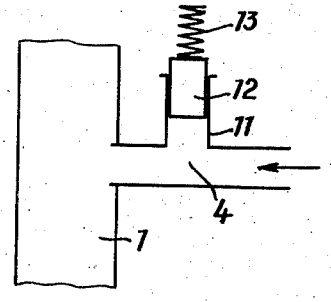
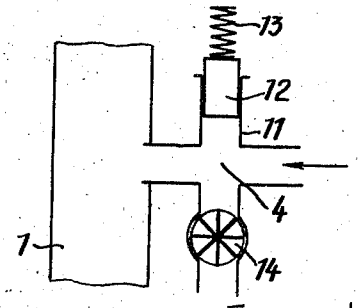


Fig. 3



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METHOD OF AND APPARATUS FOR BRIQUETTING FINE-GRAINED, PULVERULENT, OR DUST-FINE MATERIAL

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9 Claims. (Cl. 25—77)

This invention relates to a method of and apparatus for briquetting fine-grained, pulverulent or dust-fine material.

In briquetting fine-grained, pulverulent or dust-fine material it has been found advantageous to compact the material before introducing it into the briquetting press so as partly to extract from said material the air included therein. By this means the weight per unit volume of the material to be moulded, and hence the capacity of the briquetting press with respect to quantity and nature of the briquettes moulded therein can be substantially increased. This applies particularly to roller presses, which consist of a pair of rolls running in opposite directions, and also to ring roller moulding presses having a roll mounted eccentrically in a rotatable ring and rotating in the same direction as the latter. In view of the particularly great capacity of such presses for receiving and working material, it is particularly important to supply to the press per unit period material to be moulded of uniform density, in quantities which are as large and as uniform as possible.

According to the present invention, the compacting of the material to be moulded is effected, by passing said material, before moulding, through a worm conveyor or feeding screw travelling at high speed and damming the same by a resistance, for the purpose of maintaining the compression of the material produced by the high speed worm conveyor which would otherwise be wasted if the material were allowed to pass unobstructed out of the worm. The damming of the material to be moulded is very conveniently regulated by applying thereto an adjustable counter-pressure.

The degree of compacting of the material to be moulded can be regulated both by varying the speed of rotation of the worm and by adjusting the counter-pressure, or by both measures simultaneously. Practically all variations in pressure in the material to be moulded are equalised by the adjustable counter-pressure, thereby ensuring a completely uniform supply to the briquetting press.

The compacted material may pass either directly or indirectly to the actual moulding. The distance between the worm and the briquetting press, i. e. between the delivery end of the worm and the press mould, is dependent, per se, upon constructional factors and is not limited by the invention. In certain circumstances, the casing of the worm may be made relatively long or the damming of the material to be moulded may be maintained by wall friction in a correspondingly long or tapering tubular conduit.

The invention may be carried out by disposing the high speed worm in, and advantageously at the end of, the path along which the material to be briquetted travels to the press, thus compacting said material while feeding it to the press. To this end, only a small portion of the normal conveying device for the material need generally be in the form of a rapidly rotating worm, while feeding screws working at the usual speed, i. e. about 50 to 120 R. P. M., or similarly acting conveyors can be used in the major portion of said conveying device.

In carrying out the invention, the speed of rotation of the high speed worm may be selected in accordance with the nature of the material and the degree of compacting intended. It has been found that in order to achieve a degree of compacting suitable for the purposes of the present invention, the speed of rotation of the worm should preferably vary inversely with the degree of fineness of the material to be moulded. As a rule speeds lying between 300 and 2,500 R. P. M. preferably from 700 to 1500 R. P. M., are used.

Worms having a low pitch have been found to be particularly suitable for carrying out the invention. The threads of the high-speed worm can be partly or wholly interrupted or can be partly or wholly replaced by helically disposed strips, pins, or similar projections. The density of the material is thereby rendered uniform. It is advantageous to use worms of small structural length and to mount such worm only at the end remote from the press.

A particularly advantageous method of carrying out the invention comprises continually supplying to the high-speed worm more material than the briquetting press will take, continually withdrawing between the press and said worm the excess supplied to the latter and regulating the counter-pressure when withdrawing the excess, i. e. providing the counter-pressure regulator in the member through which the excess is withdrawn.

In order to enable the invention to be more readily understood, reference is made to the accompanying drawing which illustrates diagrammatically and by way of example various embodiments of apparatus for carrying the invention into practical effect, and in which:

Fig. 1 shows a compacting device and the briquetting press, partly in section and partly in plan; and

Figs. 2 and 3 illustrate schematically two further embodiments;

In said drawing, like parts are denoted by like characters of reference.

Fig. 1 illustrates the charging of a roller press 1 by means of a high-speed worm 2, which takes the material to be briquetted from a supply conduit 3 and conveys the same into the free portion of the work casing 4, from which the compacted material passes by way of a partly closed filling member 5 between the rollers of the press. If desired, the worm may also occupy the entire length of the worm casing. The casing has a branch pipe connection 6 which is closed by a valve disc 8 loaded by an adjustable spring 7.

As soon as the pressure of the material dammed in the part 4, exceeds the counter-pressure of the spring 7, the valve 8 opens and allows excess material to be passed out into the chamber 9 from whence it can be withdrawn through a pipe 10, to be conveniently passed back to the supply pipe 3. The valve 8 may be loaded by a weight, or by pneumatic or hydraulic pressure, or by electromagnetic or similar means, instead of by spring pressure.

In Figs. 2 and 3, only the conduit 4 for feeding to the press the already compacted material to be moulded and the press 1 itself are indicated in purely schematic form.

The worm casing 4 has a branch cylinder 11 in which latter a piston 12, loaded by a spring 13, is adapted to move up and down under the pressure. As soon as the pressure of the dammed material to be briquetted rises, the piston 12 is raised under the load of the spring 13 until this load is in equilibrium with the pressure in the part 4. In this way variations in pressure occurring in the material to be briquetted are automatically equalised by the loaded piston. The piston may also be loaded in any other suitable manner, as described with reference to the valve 8 shown in Fig. 1.

The bucket wheel 14 shown in Fig. 3 enables any excess supplied to the worm to be constantly withdrawn while maintaining the damming pressure.

The hereindescribed method and apparatus have been found particularly suitable for the production of compact and solid briquettes from coal comminuted to dust fineness. Thus for example, it has been found possible by means of the invention, using a worm having a speed of 1000 R. P. M., to increase the weight per unit volume of pit-coal, dried to a moisture content of 1% and comminuted to a maximum grain size of 0.2 mm., from 0.4 to 0.7 gram, per cubic centimetre, and thereafter to compress said coal, without the addition of binders, into compact and solid briquettes, in a ring roller moulding press.

I claim:

1. In a method of briquetting fine-grained pulverulent material, the steps which comprise conveying said pulverulent material to a briquetting operation at a greater rate than that at which the briquetting operation takes place, whilst damming said material by a resistance during said conveying operation in order to compact the same, withdrawing excess of compacted material and thereupon briquetting the remainder of the compacted material.

2. An apparatus for briquetting fine-grained pulverulent material, comprising a casing having an inlet and outlet, a high speed worm rotating in said casing, a counter-pressure regulator beyond the delivery end of said worm, and a briquetting press located at the outlet of said casing.

3. An apparatus for briquetting fine-grained pulverulent material, comprising a casing having an inlet and outlet, a high speed worm rotating in said casing, a loaded valve serving as counter-pressure regulator beyond the delivery end of said worm and a briquetting press located at the outlet of said casing.

4. In a method of briquetting fine-grained pulverulent material, the steps which comprise rapidly agitating whilst simultaneously conveying said pulverulent material to a briquetting operation, damming said material on its way to the briquetting operation by a resistance in order to increase the bulk density thereof and thereupon briquetting said material.

5. In a method of briquetting fine-grained pulverulent material, the steps which comprise rapidly agitating whilst simultaneously conveying said pulverulent material to a briquetting operation, adjusting the degree of agitation and the rate of conveyance of said material, damming said material on its way to the briquetting operation by a resistance in order to increase the bulk density thereof and thereupon briquetting said material.

6. In a method of briquetting fine-grained pulverulent material, the steps which comprise rapidly agitating whilst simultaneously conveying said pulverulent material to a briquetting operation, at a greater rate than that at which briquetting operation takes place, damming said material on its way to the briquetting operation, by a resistance in order to increase the bulk density thereof, withdrawing excess of compacted material and briquetting the remainder of the compacted material.

7. An apparatus for briquetting fine-grained pulverulent material, comprising a casing having an inlet and outlet, a high speed worm rotating in said casing, a counter-pressure regulator associated with said casing and a briquetting press located at the outlet of said casing.

8. An apparatus for briquetting fine-grained pulverulent material, comprising a casing having an inlet and outlet, a high speed worm rotating in said casing, a loaded valve serving as counter-pressure regulator associated with said casing and a briquetting press located at the outlet of said casing.

9. An apparatus for briquetting fine-grained pulverulent material, comprising a casing having an inlet and outlet, a high speed worm rotating in said casing, a chamber opening from said casing beyond the delivery end of said worm, an outlet in said chamber, a counter-pressure regulator controlling the pressure of said material in said chamber, and a briquetting press located at the outlet of said casing.

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