This invention relates to means for removing gases from soft plastic materials and refers more particularly to a so-called vacuum-press adapted to comminute a plastic mass and to compress it again after the removal of gases from said mass.

Various plastic soft materials, for instance, materials used for building purposes, and/or materials used for the manufacture of edible substances, such as chocolate or caramels are often subjected to a gas removing process in a vacuum press of this type. The soft plastic material is usually comminuted by being pressed through a device having the shape of a sleeve and gases are removed by suction from this material. Then the comminuted material is again pressed together and carried out of the device.

It was found that it is hardly possible to provide means for carrying out a continuous process of this type in the course of which gases are continuously removed from the plastic material and the plastic material is continuously compressed after the removal of such gases. It was found that in many instances particles of the comminuted material collected in the exhaust passages for the gases and prevented these gases from escaping, so that a greater part of the gases remained within the material.

An object of the present invention is the provision of a continuously operable degassing and compressing device comprising means maintaining a free passage for the liberated gases in the course of the degassing and compressing process.

The above and other objects of this invention may be realized through the provision of a device comprising means for comminuting and compressing a soft plastic material, means for removing the gases liberated from the comminuted material and means for maintaining a free passage for said gases while the material is being compressed.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing preferred embodiments of the inventive idea.

In the drawings:
Figure 1 shows in section a horizontal vacuum press.

Figure 2 is a section along the line 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 shows in section a comminuting compressing and degassing device of the vertical type.

Figure 4 shows in section another device of the combined horizontal and vertical type.

Figures 5, 6, 7 and 8 show different means for maintaining a free passage for the liberated gases.

The device shown in Figs. 1 and 2 of the drawings comprises a transporting screw 10 which is firmly mounted upon a shaft 11. One end of the shaft 11 is provided with a pulley 12 driven by a belt 13 which may be operated by any suitable motor not shown in the drawings. The shaft 11 is supported by a bearing 14 of the cover of a casing 15, which forms a cylindrical chamber 16 surrounding the screw 10 and which is provided with an opening 16 formed by the converging walls of a spill 17.

The plastic material is inserted into the chamber 16 through the opening 16 and is transported through this chamber by the screw 10.

A wall 19 provided with openings 20, separates the chamber 16 from a chamber 21 formed by the casings 22 and 23 and by the nozzle 24. The casing 23 which is connected by screws 25 with the casing 22 and by the screws 26 with the nozzle 24, comprises a bearing 21 supporting one end of the shaft 11 and rigidly connected with the casing 23.

The plastic material transported by the screw 10 through the chamber 16 is pressed by the screw 10 through the openings 20 of the wall 19 and thus penetrates into the chamber 21 in a comminuted state. The comminuted material is compressed again by the screw 28 situated within the chamber 21 and rigidly mounted upon the shaft 11.

The chamber 21 forms the degassing chamber of the device. This chamber is closed at the top by the bottom 29 of a cylindrical casing 29 comprising a pipe 30 leading to a vacuum pump which is not shown in the drawings. The cylindrical casing 29 is closed by a cover 31 connected by screws 32 with the casing 29. Screws 33 are used for connecting the casing 23 with the casing 29.

The casing 23 should be connected with the nozzle 24 in an air tight manner and air tight packing should also be provided between the casing 23 and the casing 22, between the casing 23 and the casing 29, as well as between the casing 29 and the cover 31.

When suction is created within the pipe 30, the gases freed within the chamber 21 are sucked in through an opening 34 provided in the bottom 28 of the casing 28 and in a member 35 supporting the perforated wall 19 separating the chamber 16 from the chamber 21.

The screw 26 compresses the comminuted mass and transports it in a direction toward the nozzle 24. At the same time gases contained in
this mass are removed through suction created in the pipe 30 and pass through the opening 34 and the vacuum chamber 36 formed by the casing 29 into the pipe 30. The plastic mass is pressed by the screw 29 against the nozzle 24 and is conveyed through the opening 37 of this nozzle.

As shown more clearly in Figure 1 of the drawings, the member 35 supporting the wall 19 has the shape of two concentric cylinders 38 and 39 interconnected by a web 40. Due to the shape of the supporting member 35 an annular chamber 41 is formed between the cylindrical walls 38 and 39. A plate or a similarly shaped member 42 is situated within the annular chamber 41 and is firmly attached to the rotary screw 28.

When the screw 28 is rotated, the member 42 will be rotated along with the screw and will remove any particles of the plastic material which can otherwise collect within the chamber 41 and clog the opening 34, thus preventing the gases from escaping into the chamber 36 within the chamber 34, the passage for the gases is kept free during the entire comminuting and compressing processes so that a continuous degassing of the comminuted substance is achieved. It is also possible to use a vertical reciprocating piston 43 for prevention of preventing the clogging of the opening 34. The piston 43 may be reciprocated by means of a rod 44 attached to said piston and passing through an opening formed in the cover 31, care being taken that the adjacent surfaces of the movable and stationary parts are maintained as air tight as possible. The rod 44 is pivotally connected with the lever 45 carried by a support 46 and driven by a rod 47 which is operated by a cam 48, carried by a shaft 49. A pulley 50 is used for driving the shaft 49 and is connected by a belt 51 with a pulley 52 firmly mounted upon the shaft 11.

The vacuum chamber 36 may be provided with an opening 53 covered by glass to enable the operator to inspect the interior of the vacuum chamber 36.

Fig. 3 of the drawings illustrates a comminuting and degassing device of the vertical type, which is provided with a cylindrical casing 60 having converging-upwards walls 61 forming an opening 62 for the plastic material. The casing 60 is connected by screws 63 with a lower casing 64 surrounding a chamber 65. A vertical shaft 66 is situated within the chamber 65 formed by the casing 64 and the chamber 67 formed by the casing 60, and is supported by a bearing 68 connected with the casing 64.

The shaft 66 is rotated by a belt 69 passing over a pulley 65 which is rigidly mounted upon the shaft 66. Another pulley 70 is firmly mounted upon the shaft 66 and is connected by a arm 71 with another pulley 72 mounted upon a shaft 73 which carries a cam 74. The cam 74 is used for reciprocating a piston 75.

The shaft 66 carries a screw 76 situated within the chamber 61 and another screw 77 situated within the chamber 65.

A wall 78 provided with openings 79 separates the chamber 67 from the chamber 65. Centrilocical cylindrical walls 80 and 81 are provided within the chamber 65. The annular space 83 formed between the walls 80 and 81 is used for the passage of the comminuted substance from the chamber 67 into the chamber 65. The annular chamber 84 formed between the concentric wall 81 and the adjacent wall of the casing 64 communicates through a passage 85 with a vacuum chamber 86 which is formed by a casing 87 rigidly connected with the casing 64 and with the casing 65. The casing 87 carries a pipe 88 leading to the vacuum pump which is not shown in the drawings. A plate 89 is firmly attached to the screw 77 and is rotatable along with said screw.

In operation, the comminuted substance is fed into the chamber 61 through the opening 62 and is transferred through the cylindrical walls 80 and 81 to the screw 76 driven by the shaft 66 through the medium of the pulley 65. The plastic material is pressed by the screw 76 through the openings 79 of the wall 78 into the chamber 65.

At the same time vacuum is created within the pipe 88 so that the gases contained in the plastic material escape through the annular space 84, the opening 85 and the chamber 86 into the pipe 88. The passage between the vacuum chamber 86 and the chamber 65 is kept free by the provision of the plate 89 rotating within the annular space 84 along with the screw 77. The comminuted material is compressed by the screw 77 and is pressed through the opening 90 of the nozzle 91 which is connected by screws 92 with the casing 64. The opening 85 can be maintained open from the side of the vacuum chamber 86 by means of the piston 75 which is moved toward the opening 85 by means of the piston 75 which is moved toward the opening 85 by the cam 74 and is then returned to its original position by means of the coil spring 93. The separating wall 78 situated between the chamber 67 and the chamber 65 is carried by a disc shaped support 94 which is rigidly connected with or forms an integral part of the cylindrical walls 80 and 81.

The device illustrated in Fig. 4 of the drawings is a combination of the vacuum press of the horizontal and vertical type. The device comprises a casing 100 provided with converging walls 101 and surrounding a vertical shaft 102 carrying a screw 103. The lower end of the shaft 102 carries a screw 104 situated within a chamber 105 formed by a casing 106 connected by screws 107 with the casing 100. A wall 108 provided with perforations 109 separates the chamber 105 formed by the casing 106 from the chamber 107 formed by the casing 108. The separating wall 108 is carried by a support 110 consisting of a pair of concentrical cylindrical walls 111 and 112. An annular space 113 is formed between the walls 111 and 112. A vacuum chamber 114 is formed by a casing 115 and communicates with the chamber 105 through an opening 116.

The casing 105 is connected by screws with another casing 118 containing a horizontal screw 119 firmly mounted upon a shaft 117. The shaft 102 is driven by a pulley 120 while the shaft 117 is driven by a pulley 121. The rotation of the shaft 102 is transmitted to a pulley 122 connected by means of a belt 123 with a pulley 124 carried by a shaft 125. The shaft 125 drives a cam 126 which reciprocates a piston 127 situated within the vacuum chamber 114. The chamber 123 formed by the casing 115 communicates in a nozzle 128 provided with an opening 130.

The plastic material inserted into the chamber 110 through the spilt 101, is pressed by the screw 103 through the openings 109 of the separating wall 108 into the chamber 105. At the same time the pipe 131 connected with the vac-
uum chamber 114 is placed under vacuum so that the gases liberated within the chamber 105 are sucked through the space 113 and the opening 116 into the vacuum chamber 114. The screw 104 transmits the comminuted plastic material to the chamber 128 wherein this material is compressed by the screw 110 and is pushed through the opening 130 of the nozzle 129.

The passage between the chamber 105 and the vacuum pipe 131 is kept free from the comminuted material through the provision of a plate 132 which is situated within the space 113 and which is rotated along with the screw 104. The opening 116 can also be prevented from being clogged by the comminuted material through the provision of a piston 121 which is reciprocated by the cam 126 and the coil spring 133.

Several devices of different constructions may be provided for the purpose of cleaning the passage connecting the degassing chamber with the vacuum pipe. The device shown in Fig. 5 of the drawings comprises a degassing chamber 140 formed by a cylindrical casing 144 and connected through the medium of an opening 142 with a vacuum chamber 143. A vacuum pipe 144 is attached to the casing 145 constituting the walls of the vacuum chamber 143. The opening 142 of the vacuum chamber 143 is kept free from particles of the plastic material by a revolving scraper 146 firmly mounted upon a shaft 147, which is driven by a pulley 148. The pulley 148 is connected by a belt 149 with a pulley 150 firmly mounted upon a shaft 151, which carries the screw used for comminuting the plastic material within the chamber 140.

The device shown in Figure 6 of the drawings comprises a casing 160 containing a screw which is mounted upon a shaft 162. A casing 163 surrounds the vacuum chamber 164 which is connected with the chamber 160 by an opening 166 through the medium of a rotating roller 167. The casing 163 carries a vacuum pipe 168. The revolving roller 167 is driven by a pulley 169 which is rotated by a belt 170 passing over a pulley 171 which is firmly mounted upon the shaft 152. The provision of the roller 167, the plastic material is prevented from clogging the passage 166 so that gases liberated within the casing 165 will freely pass from the chamber 165 into the vacuum chamber 164 and the vacuum pipe 168.

In the modification shown in Figure 7 of the drawings the degassing chamber 180 formed by the casing 181 is in communication with the vacuum chamber 182 formed by the casing 183 by means of an opening 184, which is partly covered by rollers 185 and 186 revolving in two different directions. The roller 185 is driven by a belt 187 rotated by the shaft 188. The rotating rollers 185 and 186 prevent the plastic material from clogging the opening 184 so that the gases liberated within the chamber 180 can freely pass into the vacuum chamber 182.

The device shown in Figure 8 comprises a degassing chamber 190 formed by a casing 191 and connected casing 194 by means of an opening 192, through the medium of a rotating roller 193 formed by a casing 194. A screw 195 mounted upon a shaft 196 is rotated within the passage 192. The purpose of this screw is to prevent the material from clogging the passage 192.

As shown in Figure 8, an air tight packing is produced through the provision of a stuffing box 197 provided with packing glands 198 which are lubricated from the containers 200.

Various changes can be made in the shown constructions without departing from the spirit of this invention, which is limited only by the appended claims.

What is claimed is:

1. A vacuum press and the like comprising a casing, a rotary screw within said casing, means forming a degassing chamber, another rotary screw within said chamber, a perforated separating wall situated between said degassing chamber and said casing, means forming a vacuum chamber, said vacuum chamber being connected by a passage with said degassing chamber, and means connected with the second mentioned screw for removing a plastic material from said passage.

2. A device in accordance with claim 1, comprising separate reciprocating means for maintaining said passage free from the comminuted material.

3. A vacuum press and the like comprising in combination with a preliminary compression and comminution chamber, a degassing chamber directed directly connected with said compression and comminution chamber and a rotary screw extending through said chambers for transporting the material to be treated from said compression and comminution chamber through said degassing chamber; means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber and means in said vacuum chamber for intermittently opening and closing said passage.

4. The combination with a vacuum press and the like comprising a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said chambers; of means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, means in said vacuum chamber for intermittently opening and closing said passage and synchronizing means for transporting the material to be treated through said chambers.

5. A vacuum press and the like comprising in combination with a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said chambers; of means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, means in said vacuum chamber for intermittently opening and closing said passage comprising at least one piston adapted to be reciprocated in said passage.

6. The combination with a vacuum press and the like comprising a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said chambers; of means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, means in said vacuum chamber for intermittently opening and closing said passage comprising at least one piston adapted to be reciprocated in said passage, and synchronizing means for transporting the material to be treated through said chambers.
material may be cleared from said passage when in closed position.

7. The combination with a vacuum press and the like comprising a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said chambers; of means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, and means in said vacuum chamber for intermittently opening and closing said passage comprising a segment-shaped scraper adapted to be rotated adjacent said passage.

8. A vacuum press and the like, comprising in combination with a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said degassing chamber; means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, a segment-shaped scraper, and means for rotating said segment in a circle adjacent said passage to intermittently open and close said passage.

9. A vacuum press and the like, comprising in combination with a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said degassing chamber; means forming a separate vacuum chamber, means forming at least one passage connecting said vacuum chamber with said degassing chamber, means in said vacuum chamber for intermittently opening and closing said passage, and movable synchronized ventilating and cleaning means in said degassing chamber an annular space which is free from the material to be treated and passing adjacent said passage when said passage is closed by the third-mentioned means.

10. A vacuum press and the like, comprising in combination with a preliminary compression and comminution chamber, a degassing chamber and a rotary screw for transporting the material to be treated through said degassing chamber; means forming a separate vacuum chamber, means forming a passage connecting said vacuum chamber with said degassing chamber, a plurality of rotatable rollers situated adjacent to said passage for maintaining said passage free from the material to be treated, and movable ventilating and cleaning means in said degassing chamber, the last-mentioned means maintaining in said degassing chamber an annular space which is free from the material to be treated.

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