

May 16, 1944.

A. D. DECK

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APPARATUS FOR COMPACTING POWDERED SOLID MATERIALS

Filed Dec. 14, 1940

2 Sheets-Sheet 1

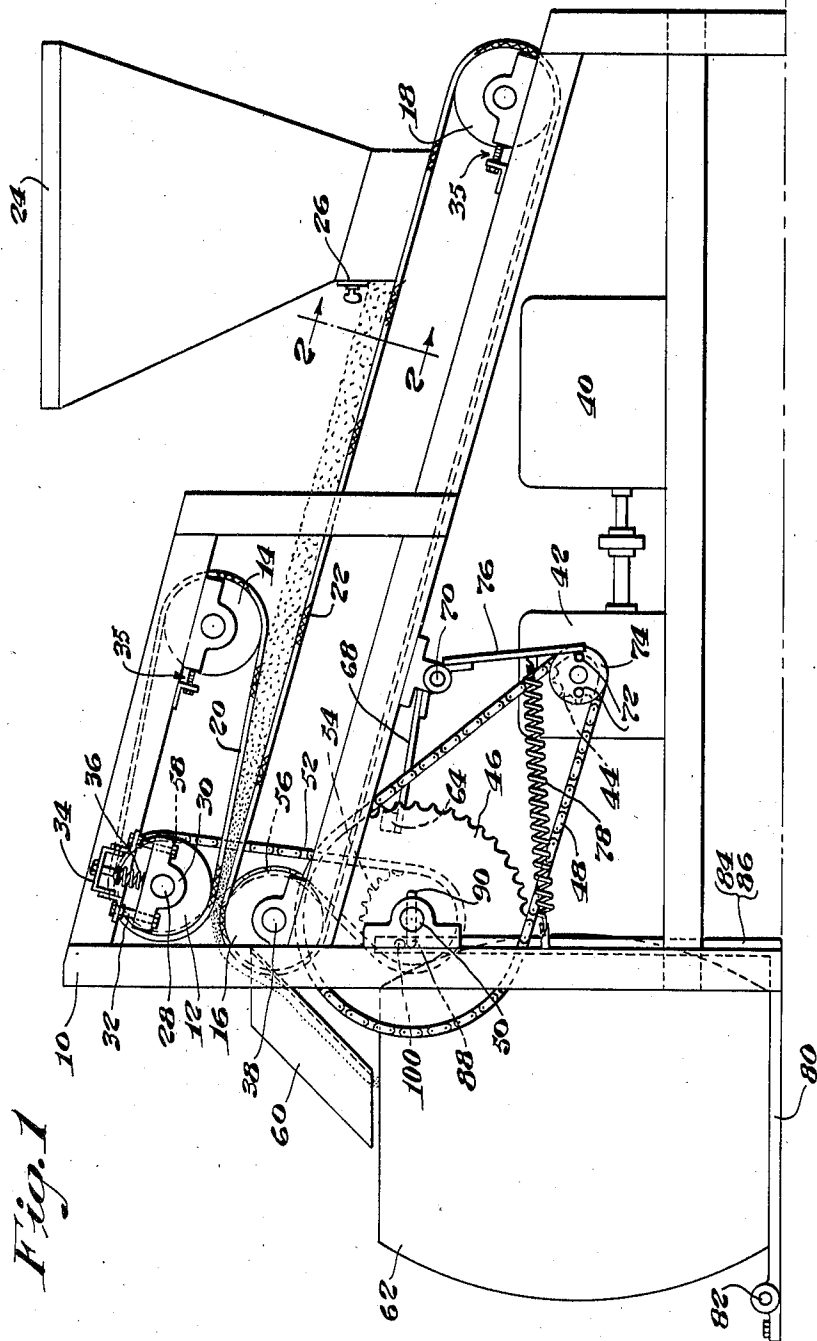


Fig. 1

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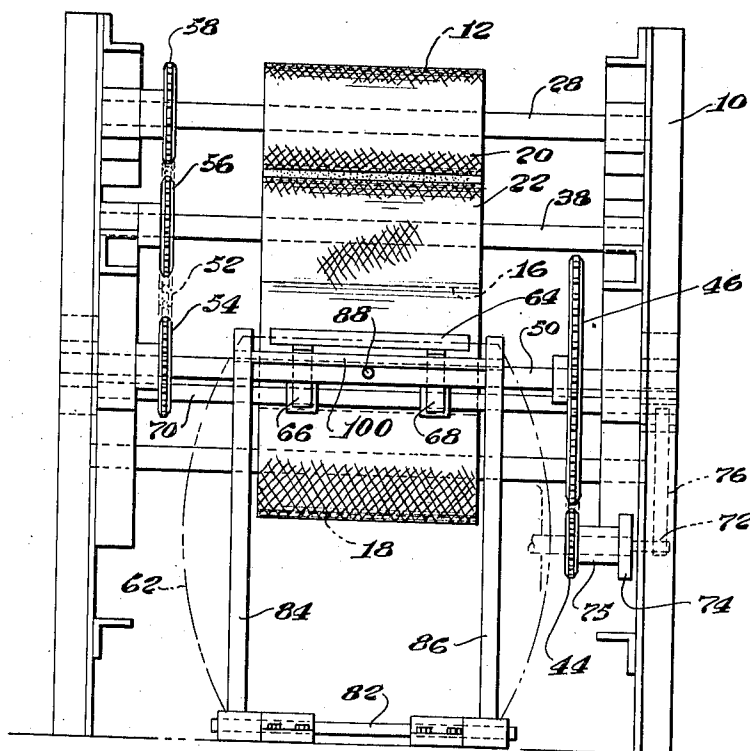
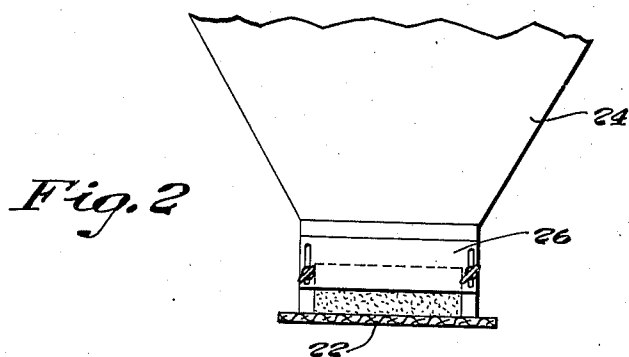


Fig. 3

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UNITED STATES PATENT OFFICE

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APPARATUS FOR COMPACTING POWDERED
SOLID MATERIALS

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7 Claims. (Cl. 100—35)

This invention relates to apparatus for compacting powdered solid materials.

It has been generally recognized that finely divided or powdered solid materials and particularly those powdered materials which have been produced by fine grinding operations have relatively large amounts of air or gas entrapped or occluded between the particles thereof.

An object of the invention is to provide novel and highly efficient apparatus for compacting powdered and finely divided materials such, for example, as powdered water paint, to free the same from a substantial part of the entrapped or occluded air or gas normally contained therein.

With these general objects in view and such others as may hereinafter appear, the invention consists in the apparatus for compacting solid powdered materials hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred apparatus embodying the invention, Fig. 1 is a side elevation of the apparatus; Fig. 2 is a sectional detail on the line 2—2 of Fig. 1; and Fig. 3 is a front elevation of the delivery end of the apparatus shown in Fig. 1.

In general, the present invention contemplates an apparatus for compacting powdered solid material between a pair of traveling belts arranged with respect to one another to converge toward the delivery end thereof. The material to be compacted is interposed between the belts at the diverging end thereof and during the progress of the material between the belts, the same is compacted. The belts may and preferably will be of substantial width whereby to operate upon a ribbon of the powdered material and in order to effect the compacting operation, at least one of the belts is made of a porous material of a nature such as to permit the air or gas normally occluded or entrapped between the particles comprising the mass of powdered solid material, to escape and be forced outwardly through the material of the belt, while retaining the powdered material and preventing the escape thereof with the air or gas. Provision is made for maintaining the belts in most efficient operating condition and for delivering the compacted solid material into a container. The apparatus may also be provided with mechanism for agitating the container to effect a settling of the material therein to the end that most efficient packaging of the material may be obtained.

Referring now to the drawings, the apparatus illustrated therein embodies a frame work indi-

cated at 10, supporting two sets of pulleys comprising an upper set 12, 14, and a lower set 16, 18, around which a pair of endless belts 20, 22, respectively, are arranged to run. The pulleys are mounted to cause the belts to converge in the direction of their travel in order to effect compacting of a mass of powdered material delivered onto the upper run of the lower belt 22 from a supply hopper 24 through a delivery gate 26, as illustrated in Figs. 1 and 2. The gate may and preferably will be adjustably mounted as indicated, to control the thickness of the ribbon of material being withdrawn from the hopper by the upper run of the lower belt 22, as the latter passes under the hopper. The lower belt 22 is preferably arranged at an upwardly inclined angle in the direction of travel of the belt, as illustrated. The converging relationship of the upper belt 20 with respect to the lower belt 22, is arranged to be varied for different materials in order to change the space between the belts at the delivery end of the apparatus. As herein shown, the shaft 28, upon which the pulley 12 is mounted, is journaled in similar bearing members 30 provided upon either end of the shaft, each of which is supported upon a pair of bolts 32 depending from and adjustably mounted in a bracket 34 attached to the machine frame. Each bearing member 30 vertically slidable upon the bolts 32 and a helical spring 36 disposed between the bearing member 30 and the bracket 34 is arranged to normally retain the bearing member in its lowered position. In operation, adjustment of the bolts 32 vertically in the bracket 34 will effect a change in the distance between the upper and lower belts at the delivery end. In the event that a solid or incompressible mass is inadvertently fed between the belts, the bearing members 30 will slide upwardly on the bolts 32 to prevent injury to the operating parts. Suitable belt tightening devices, indicated generally at 35, may be provided for the driven pulleys 14, 18 in order to maintain the belts in a relatively taut condition.

At least one of the belts 20, 22 and preferably both belts are made of porous material of a character such as to permit air or gas to pass therethrough while preventing the passage of any of the finely divided solid material there-through, and when operating on powdered materials in the state of subdivision of ordinary powdered water paints, I have experienced particularly good results utilizing belts purchased in the market as "Four-ply solid woven cloth belts." It will be understood however that the particu-

lar grade and construction of the porous belt may be varied to suit the characteristics of different powdered materials.

The driving pulleys 12, 16 for the upper and lower belts 20, 22 are mounted upon shafts 28, 38 arranged to be driven from an electrical motor 40 mounted upon the machine frame through a reduction gearing 42 of known construction and through sprockets 44, 46 and chain 48 to a driven shaft 50. The pulley shafts 28, 38 and the driven shaft 50 are connected together by a chain 52 running over sprockets 54, 56, 58 on the ends of the driven and pulley shafts 50, 38, 28, respectively.

In the operation of the apparatus, a ribbon of the powdered solid material is delivered from the hopper 24 onto the upper run of the lower belt 22 and is conveyed thereby into a position where it is introduced between the lower run of the upper belt 20 and the upper run of the lower belt 22 at the diverging end thereof. As the material continues to be moved between the belts, the latter exert a compacting effect upon the ribbon or mass of material and the occluded or entrapped air or other gas is forced outwardly through one or both of the belts. When the material reaches the end of the converging compression chamber formed by the adjacent runs of the traveling belts, it will have been compressed into a compact dense ribbon and in such condition may be delivered into a discharge chute 60 as indicated in Fig. 1, and thence directed into a container 62 such as a barrel.

In order to maintain the lower belt 22 in a condition most suitable for permitting the escape of air therethrough, I have provided an agitating device in the form of a bar 64 mounted upon two levers 66, 68 fixed to a cross-shaft 70, and provision is made for rocking the same to cause the bar 64 to slap against the under surface of the lower run of the belt 22 to thereby free the belt of adhering solid powdered material. The slapping device is arranged to be operated by a pair of pins 72, formed on a disk 74 attached to the hub 75 of the driving sprocket 44, the pins being arranged to successively cooperate with an arm 76 depending from and secured at its upper end to the shaft 70. The pins 72 as they are rotated operate to rock the slapping device away from the belt and when a pin disengages with the operating arm, a heavy coil spring 78 operates to rock the shaft 70 and force the slapping device against the bottom of the belt 22 with substantial force, thus dislodging any particles of material which may have adhered to the belt and maintaining the belt in a porous condition most conducive to the escape of the air therethrough during the compacting operation above described.

In order to assist in compacting the material within the container 62, the latter is arranged to be supported upon a platform 80 hinged at 82 and having uprights 84, 86 to thereby lift the container 62 and platform 80 a short distance and permit the same, when a pin 88, or 90, fixed on shaft 50, disengages with the cross bar 100, to fall so that the successive jars imparted thereto operate to satisfactorily settle the material within the container.

From the above description it will be seen that the present apparatus is particularly adapted for compacting powdered and finely divided materials in order to free such materials from a substantial part of the entrapped or occluded air or gas in accordance with the present invention.

While the preferred embodiment of the appa-

ratus has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. Apparatus for compacting powdered materials containing occluded or entrapped air or gas comprising a pair of substantially smooth endless belts arranged to converge in the direction of their travel, at least one of said belts being porous and having sufficient porosity to permit the passage therethrough of the air or gas occluded or entrapped in said powdered material but having insufficient porosity to allow the passage of said powdered material therethrough, and means for moving at least one of said belts to convey the aerated powdered material from the divergent end of said belts to the convergent ends of said belts to compress and compact the material as it is conveyed therebetween, the occluded or entrapped air or gas being forced out of said material during the compacting thereof and escaping through said porous belt during the compacting operation, said porous belt being unsupported for substantially its effective width and for a substantial distance rearwardly of the convergent ends of said belts.

2. Apparatus for compacting powdered materials containing occluded or entrapped air or gas comprising a pair of pulleys, an endless belt extending over said pulleys, a second pair of pulleys, and a second endless belt extending over said second pair of pulleys, one of said belts overlying the other of said belts with the adjacent runs of the belts converging toward each other in their direction of travel, whereby to compress or compact the powdered material as it is conveyed therebetween, at least one of said belts having sufficient porosity to permit the passage therethrough of the air or gas occluded or entrapped in said powdered material for its full effective width but having insufficient porosity to allow the passage of said powdered material therethrough.

3. An apparatus as defined in claim 2, in which means is provided for varying the dimension of the space between the converging ends of said belts.

4. An apparatus as defined in claim 2, in which one of the pulleys at the discharge ends of the belts is yieldably supported to permit passage of an incompressible object without damage to the apparatus.

5. Apparatus for compacting powdered materials containing occluded or entrapped air or gas comprising a pair of pulleys, an endless belt extending over said pulleys, a second pair of pulleys, a second endless belt extending over said second pair of pulleys, one of said belts overlying the other of said belts with the belts converging toward each other in their direction of travel whereby to compress or compact the powdered material as it is conveyed therebetween, the lowermost belt having sufficient porosity to permit the passage therethrough of the air or gas occluded or entrapped in said powdered material but having insufficient porosity to allow the passage of said powdered material therethrough, and means for slapping the lower run of said lowermost belt with sufficient force to dislodge any particles of material adhering thereto whereby to maintain said lowermost belt in a porous condition.

6. Apparatus for compacting powdered mate-

rials containing occluded or entrapped air or gas comprising a pair of pulleys, an endless belt extending over said pulleys, a second pair of pulleys, a second endless belt extending over said second pair of pulleys, the first-mentioned belt overlying and being shorter than the other of said belts, means for depositing a layer of loose powdered material upon the upper run of said second belt, the adjacent runs of said belts gradually converging toward each other in their direction of travel whereby to compress or compact said powdered material as it is conveyed therebetween, the lowermost belt having sufficient porosity to permit the passage therethrough of the air or gas forced out of said powdered material by the compacting operation but having insufficient porosity to allow the passage of said powdered material therethrough, and means for slapping the lower run of said second belt with sufficient force to dislodge any particles of material adhering thereto whereby to maintain said belt in a porous condition.

7. Apparatus for compacting powdered materials containing occluded or entrapped air or gas

comprising a pair of pulleys, an endless porous fabric belt extending over said pulleys, a second pair of pulleys, a second endless porous fabric belt extending over said second pair of pulleys, the first-mentioned belt overlying and being shorter than the other of said belts, means for depositing a layer of loose powdered material upon the upper run of said second belt, adjustable means for regulating the thickness of said layer of powdered material, the adjacent runs of said belts gradually converging toward each other in their direction of travel whereby to compress or compact said powdered material as it is conveyed therebetween, both of said belts having sufficient porosity to permit the passage therethrough of the air or gas forced out of said powdered material by the compacting operation but having insufficient porosity to allow the passage of said powdered material therethrough, and means for slapping at least the lower run of said second belt with sufficient force to dislodge any particles of material adhering thereto, whereby to maintain said belt in a porous condition.

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