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HYDRAULIC POWDER PRESS

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This invention relates to presses and relates more particularly to presses comprising hydraulic actuating means.

It is an object of this invention to provide a press comprising hydraulic actuating means which is simple and relatively unobjectional to manufacture and which may be readily operated by an operator.

A further object of this invention is to provide a press comprising both mechanical actuating means and hydraulic actuating means such that the only power required is that provided manually by an operator.

A more particular object of this invention is to provide a press whereby a material in powdered form may be subjected to pressures sufficiently high for causing the particles of the powder to cohere in the form of a cake or other body having substantial strength. One such application is that of compressing a cosmetic powder so that it may be used in cake form rather than as a loose powder. It is frequently considered desirable to form a cosmetic powder so that its composition as regards shade and other properties may be best suited for a particular individual; but when the cosmetic powder is specially blended in this way, it is produced in loose form while many users prefer that the powder be in the form of a coherent cake. However, facilities such as are used in a manufacturing plant for forming a cosmetic powder into a cake are not practical for forming into a cake a powder composition which has been formulated in only a small quantity intended for use by a single individual.

Accordingly, one of the special objects of this invention is to provide a compact, structurally simple press whereby a small quantity of powdered composition suitable for formation into a cake adapted to be used in a ladies' compact or the like may be quickly and readily formed into a cake merely by manual manipulation by an operator.

Features of this invention relate to the combination of elements and their coaction as comprised in the press as a whole. However, other features of this invention relate to certain structural subcombinations which may be separately employed without, however, obtaining the advantages of the combination comprised in the press as a whole. More particularly, features of this invention relate to mechanical and hydraulic means employed for reciprocating a pressure-applying piston in a cylinder having a closed end. Other features of this invention relate to the liquid system in respects applicable to the means provided for connecting a liquid reservoir with the closed end of the cylinder in operative combination with pump means, pressure relief means and the pressure release means. Other features relate to the means for actuating the mechanical and hydraulic means for reciprocating the pressure-applying piston and to the means employed for bringing the piston into operative compressing relation with a confined mass of powder or the like.

Further objects, features and advantages of this invention will be apparent from the following description of a typical preferred embodiment of this invention which has been shown for illustrative purposes in the accompanying drawings, wherein—

Figure 1 is a plan view of the press, the external liquid conduits being removed.

Figure 2 is a sectional elevation of the press on a larger scale, including the external liquid conduit means;

Figure 3 is a plan view of the press on the same scale as Figure 2 with certain of the elements cut away and others shown in section so as to more clearly show the interior construction, and

Figure 4 is an enlarged detail section taken on the line 4—4 of Figure 3.

In the embodiment of this invention shown in the accompanying drawings, the principal structural element is the cylinder body 10 which defines a cylinder 10a that is closed at the upper end and is open at the lower end.

Within the cylinder body 10 the piston 11 is reciprocable between the retracted position shown in Figure 2 and an advanced position with the lower end of the piston protruding from the lower open end of the cylinder and penetrating into the cup-shaped receptacle 12. The inner surfaces of the side wall of the cup-shaped receptacle 12 are such as to conform to the external surface of the lower end of the piston 11. The cylinder body 10 is cut away at 13 so as to provide a base 14 that is integral with the cylinder body 10 but substantially spaced from the lower end of the cylinder 10a for receiving the cup-shaped receptacle 12 with the inner surfaces thereof in substantial registration with the open lower end of the cylinder. The cup-shaped receptacle 12 is provided with a handle 15 so that it may be readily handled by an operator and when the receptacle 12 is in the position shown in Fig. 2, it is held so that upon advancing the piston 11, the piston will enter the cup-shaped receptacle 12 and compress the material in powdered form contained in the receptacle. In the bottom of the cup-shaped receptacle 12 there ordi

For initially advancing the piston 11, mechanical means is employed which in the embodiment shown comprises the shaft 17 that is mounted for rotation in the side wall of the cylinder body 10. The portion of the shaft 17 which is disposed alongside the piston 11 is provided with longitudinally extending gear teeth 18 that are in meshed coating relation with the teeth of the rack 19 which are machined into the side wall of the piston 11.

At the free end of the shaft 17 a handle is mounted which is indicated generally by the reference character 20. The handle 20 is pivotally secured to the handle holding member 21 for pivotal movement about the pivot means 22 which is substantially spaced from the longitudinal axis of shaft 17 so that the handle 20 may be pivoted while disposed transversely to the axis of shaft 17.

The handle 20 has a short slot 23 therein for receiving a pin 24 at the end of the piston rod 25 that is coaxial with the shaft 17. When the parts just mentioned are in the position shown in Figs. 1 and 3, the knob 25 at the end of the handle 20 may be grasped and used to rotate the shaft 17. Because of the mechanical coating means above described between the shaft 17 and the piston 11, the shaft 17 when rotated in one direction will cause the piston 11 to be advanced while its rotation in the opposite direction will cause the piston to be retracted. It is apparent

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that an operator by means of the handle 20 may reciprocate the piston 11 by mechanical means so as to cause the lower end thereof to become inserted into the cup-shaped receptacle 12 and thereafter retracted therefrom.

The shaft 17 is located on the interior and as above noted, the piston extension 25 is disposed therein. The piston extension 25 is axially slidable with respect to the shaft 17 and has the pump piston 26 at the innermost extremity thereof. The pump piston 26 preferably has high pressure piston rings 27 mounted therein.

Disposed in the upper portion of the cylinder body is the liquid reservoir 28. Between the liquid reservoir 28 and the end of the pump piston 26, conduit means is provided and, as part of the pump means which comprises the pump piston, the ball check valve 29 is employed which serves as a one-way valve for permitting flow of liquid from the liquid reservoir 28 to the pump piston 26 on the suction stroke thereof while being adapted to prevent liquid flow in the opposite direction. The ball check valve 29 is comprised in the liquid line 30 that is connected with the block 31 which has a boring 32 therein communicating with the annular groove 33 in the enlarged end portion or rotor 34 secured to the end of the shaft 17. The annular groove 33 communicates by the passage 35 with the hollow interior of the shaft 17 at the end of the pump piston 26.

Valve controlled conduit means is also employed so as to provide communication between the pump piston 26 and the closed end of the cylinder block 10. For this purpose the line 36 is secured to the block 31 and communication with the pump piston is provided by the boring 37 which leads into the boring 32 that in turn is maintained in communication with the pump piston 26 in the manner above described. The line 36 comprises the ball check valve 38 which functions as a one-way valve to permit discharge of liquid under pressure into the closed end of the cylinder through the bores 39 and 40 while preventing return flow of liquid.

The mounting for the handle 20 has been described hereinabove and it is apparent that by reciprocating the handle about the pivot 22 the pump piston 26 is reciprocated and that liquid may thereby be pumped under high pressure from the reservoir 25 into the closed upper end of the cylinder in the cylinder body 10.

In order to facilitate the rotation of the shaft 17 the bushing 41 preferably is employed and expansion rings 59 in annular grooves 60 in the shaft 17 may be used in connection with the ends of the bushing 41 to keep the shaft 17 in place, and for providing a seal between the enlarged end or rotor 34 on the end of the shaft 17 and the block 31 suitable seal rings 42 may be employed.

In the wall 43 at the upper closed end of the cylinder in the cylinder body 10 a pressure relief valve is provided which is normally closed and which is adapted to be opened responsive to rise in pressure within the closed end of the cylinder above a predetermined pressure. The pressure relief valve is indicated generally by the reference character 44 and, as shown more particularly in Fig. 4, consists of a plug member 44 having a conduit extending therethrough which provides communication between the closed end of the cylinder and the liquid reservoir 28. The conduit is controlled by the normally closed plug member 44 that is under the influence of the spring 46 which is held under tension by the screw member 47 having a longitudinally extending passage 48 therein so that the liquid may pass from the closed end of the cylinder into the reservoir 28 when the pressure within the enclosed end of the cylinder exceeds a predetermined pressure at which the ball valve 45 becomes unsnapped and thereby opened from its normally closed position. The plug member 44 may be threadedly held in an opening in the wall 43, a seal being provided by the sealing means 49 as shown in Fig. 4.

A pressure release means also is employed as shown most clearly in Fig. 2. The plug member 50 is threaded into an opening in the wall 43 at the closed upper end of the cylinder and a seal is provided by the seal means 51. The plug 50 has conduit means extending therethrough so as to provide communication between the closed upper end of the cylinder and the liquid reservoir 28. This conduit means is controlled by the normally closed ball valve 52 which is held in normally closed position by the spring 53. Slidably mounted within the guide mounting 54 there is provided a pin 55, the lower end of which is restricted so that it may be brought into contact with the ball valve 52. At the upper end of the pin 55 there is the head 56 which is enlarged so that it may be conveniently pressed down by an operator of the press. The spring 53 exerts sufficient force so as to maintain the ball valve 52 in normally closed position. However, notwithstanding the development of very high pressure within the upper end of the cylinder and thereby permit liquid to flow from the closed upper end of the cylinder into the reservoir 28.

For the convenience of an operator a pressure gauge 57 is provided which is in communication with the closed upper end of the cylinder and which has its calibrated face disposed so as to be readily observable. Adjacent the upper end of the piston 11, suitable sealing means 58 is provided such as a seal ring.

The operation of the press hereinabove described may be exemplified in connection with use of the press to form a cake from a small body of powder. The powder to be formed into a cake is initially placed in the cup-shaped receptacle 12 which in effect provides a measure for measuring the amount of powder desired for the cake. The receptacle 12 is filled with powder while the receptacle is removed from the press and the receptacle is then inserted into the press while the piston 11 is retracted so as to be in registration with the lower end of the cylinder in the cylinder body. Thereupon the operator by manual operation of the handle 20 rotates the shaft 17 for advancing the piston and initially effecting partial compression of the powder. As soon as the initial compression has been effected by rotation of the shaft 17 within the limit readily attainable, the operator then manipulates the handle 20 to reciprocate the pump piston 26. The reciprocation of the pump piston 26 thereupon builds up hydraulic pressure within the closed end of the cylinder to whatever pressure is desired for compressing the powder within the receptacle 12. A suitable high pressure may be obtained very quickly. For example, in making a cosmetic cake from a cosmetic powder, a pressure of one ton per square inch is suitable. The pressure which is attained is indicated by the gauge 57. Moreover, in order to facilitate use of the press by an operator and to avoid over compression, the pressure relief valve 45 is preferably employed so that if the pressure should rise above a predetermined pressure such as one ton per square inch, the pressure relief valve will open and prevent further rise in pressure. After the desired pressure has been obtained, the compression of the powder is completed and all that remains is to remove the formed cake from the press. This may be accomplished by depressing the head 56 of the pin 55 so as to open the pressure release valve 50. When this is done, the handle 20 may be used to rotate the shaft 17 in the direction for reclosing the piston 11 and as soon as the piston 11 has been retracted sufficiently to permit removal of the receptacle 12 from the press, the receptacle 12 may be removed for taking therefrom the powdered cake which has been formed therein.

When reference is made herein and in the claims to a cylinder having a closed end, the reference is to a cylinder whose end is so sealed and closed off that a liquid under pressure may be confined therein for applying liquid pressure to the end of the piston within the cylinder.
While this invention has been described in connection with a specific embodiment thereof and a specific use, it is to be understood that this has been done for the purpose of exemplifying the nature of this invention in connection with a preferred embodiment which is typical of the invention and that variations may be made in the structure and in the parts utilized in combination and subcombination without departing from the scope of this invention.

I claim:

1. In a press adapted to compress a powdered material into cake form, the combination comprising a vertically disposed cylinder having a closed upper end and an open lower end, a pressure-applying piston axially slidable within said cylinder between retracted position and position with one end thereof protruded from the open lower end of said cylinder, a cup-shaped powder receptacle the inner surface of the side wall of which conforms with the external surface of said end of the piston for receiving said piston therein, means for holding said cup in opposed registered relation with respect to said open lower end of said cylinder to receive said end of said piston therein in pressure contact with powder contained in said receptacle, a hollow shaft rotatably mounted on the side wall of said cylinder for rotation about its longitudinal axis, a handle secured to said shaft for manually rotating said shaft, mechanical means operatively connecting said shaft and said piston for reciprocating said piston in said cylinder responsive to manual rotation of said shaft, a liquid reservoir, a pump piston reciprocatable within said hollow shaft, a manually reciprocatable part comprised in said handle operatively connected with said pump piston for reciprocating same, first conduit means connecting said liquid reservoir with said closed end of said cylinder, pump means compressed in said conduit means and compressing said pump piston for pumping liquid from said reservoir into said closed end of said cylinder, second conduit means connecting said liquid reservoir with said closed end of said cylinder, normally closed pressure relief valve means controlling said second conduit means adapted to be opened responsive to pressure of liquid within said closed end of said piston above a predetermined pressure, third conduit means connecting said liquid reservoir with said closed end of said cylinder, and normally closed valve means controlling said third conduit means adapted to be manually opened to permit flow of liquid from said closed end of said cylinder into said liquid reservoir.

2. In a press adapted to compress a powdered material, the combination comprising a substantially vertically disposed cylinder having a closed upper end and an open lower end, a pressure-applying piston axially slidable within said cylinder between retracted position and position with the lower end substantially protruded from said open lower end of said cylinder, a base substantially spaced from the lower end of said cylinder and rigidly secured thereto, a removable cup-shaped receptacle adapted and shaped to be disposed between said lower end of said cylinder and said base with the inner surface of the side wall thereof in substantial registration with the inner surface of said cylinder for receiving said lower end of said piston, means cooperating with external surface presented by said receptacle for positioning said receptacle with the inner surface of the side wall of said receptacle in substantial registration with the inner surface of said cylinder and means for advancing and retracting said pressure-applying piston for first compressing powder within said receptacle and then withdrawing said piston therefrom for permitting removal of said receptacle from said base.

3. A press comprising a vertically disposed cylinder having a closed upper end and an open lower end, a pressure-applying piston reciprocatable in said cylinder between retracted position and position protruding from said lower end of said cylinder, a cup-shaped receptacle whose inner side surface is adapted to receive the lower end of said piston, means for holding said receptacle in gauged position to receive the lower end of said piston, a rotatable member, means for rotating said member, mechanical means for reciprocating said piston responsive to rotation of said shaft between retracted position and position with the end of said piston penetrating into said cup-shaped receptacle, and means for pumping liquid under pressure into said closed end of said cylinder after said piston has been advanced so as to penetrate said cup-shaped receptacle for pressuring said piston against material contained in said receptacle, and pressure release means for thereafter releasing liquid from said closed end of said cylinder, whereby said piston is rendered retractable from said receptacle by rotation of said member.

4. A press according to claim 3 which comprises a liquid reservoir integral with said cylinder and disposed above said closed upper end of said cylinder from which said liquid is pumped into said closed end of said cylinder by said means for pumping liquid into said closed end of said cylinder and to which liquid is returned by said pressure release means, and pressure-control means for releasing liquid from said closed end of said cylinder into said liquid reservoir responsive to rise in pressure in said closed end of said cylinder above a predetermined pressure.

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