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ROTARY TABLET PRESS HAVING MEANS TO ROTATE THE PLUNGERS

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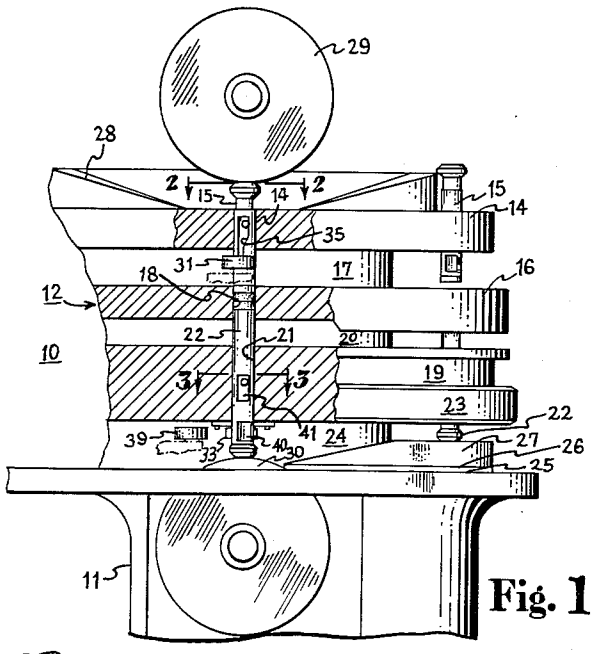

Fig. 1

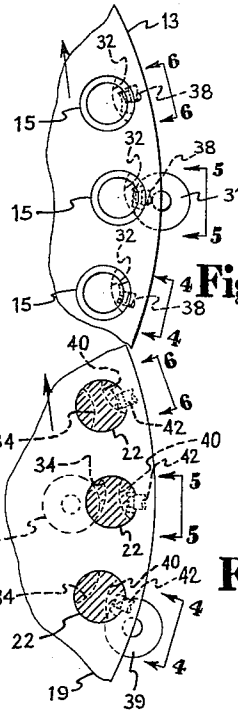

Fig. 2

Fig. 3

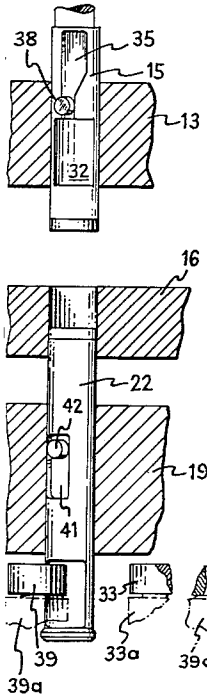

Fig. 4

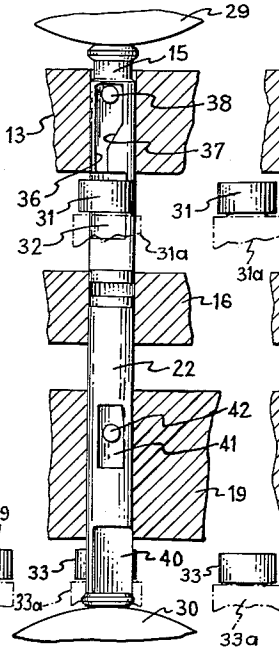

Fig. 5

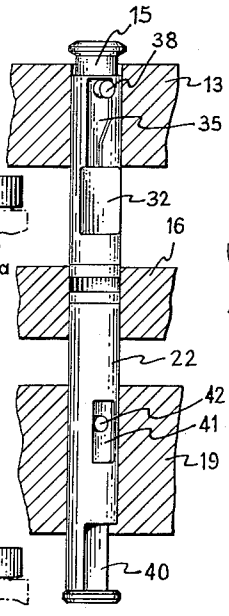

Fig. 6

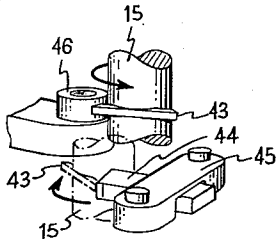

Fig. 7

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ROTARY TABLET PRESS HAVING MEANS TO ROTATE THE PLUNGERS

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This invention relates to tablet presses and, more particularly, to presses adapted to manufacture tablets from powdery and/or granular materials.

Rotary tablet presses employing traveling tool assemblies are conventionally provided with opposed upper and lower punches which cooperate in a die to form tableted products between them as they are passed between upper and lower pressure rolls. In the use of such presses for manufacturing detergent tablets as described, for example, in the copending application of Richard P. Laskey, filed December 31, 1959, Serial Number 863,173, it was discovered that the characteristics of some detergent materials were such as to stick or cling to the punch surfaces thereby spoiling the smooth finish of the completed tablet. Several methods of overcoming this problem were attempted but each was either unsuccesful or commercially unfeasible.

The prime object of this invention is the provision of means for rotating the punches at the point of maximum compression in a rotary tablet press thereby producing tablets with smooth and polished surfaces.

Another object of this invention is the provision of automatic reset devices for the punches whereby they are returned to their original position after the tablet has been completed to ready the punches for the next cycle.

Briefly stated, in accordance with one aspect of the invention, a rotary tablet press is provided in which a tool head having die openings is moveably supported on a frame; upper and lower punches are moveably supported on the tool head in opposed pairs so that each pair of punches may enter a die opening from opposite sides; upper and lower pressure rolls are provided to act on the outer ends of the punches simultaneously at the point of maximum compression as well as the approach and departure therefrom; and means are provided to rotate the punches as they are being moved through the area of maximum compression where the pressure rolls are acting upon them in order to make a smooth finish on the tablet and prevent sticking of the tablet on the punches.

For a more complete understanding of the invention reference is made to the appended drawings in which:

FIGURE 1 is a fragmentary elevation, partially in cross section, of so much of a rotary tablet machine as is necessary to illustrate the present invention; and

FIGURE 2 is a schematic plan view showing several positions of the upper punches taken along the line 2—2 of FIGURE 1; and

FIGURE 3 is a schematic plan view showing several positions of the lower punches taken along the line 3—3 of FIGURE 1; and

FIGURE 4 is a fragmentary elevation, partially in cross section, taken along the line 4—4 of FIGURES 2 and 3 and showing the relative position of the punches prior to compression; and

FIGURE 5 is a fragmentary elevation, partially in cross section, taken along the line 5—5 of FIGURES 2 and 3 and showing the punches at the point of maximum compression; and

FIGURE 6 is a fragmentary elevation, partially in cross section, taken along the line 6—6 of FIGURES 2

and 3 and showing the position of the punches after moving beyond the point of maximum compression; and

FIGURE 7 is a fragmentary isometric view showing another means for providing rotation of the punches at the ponit of maximum compression.

In the drawings, the reference numeral 10 indicates a rotary tableting machine of the type generally described in U.S. Patent 2,068,619 issued to Bailey and reference is made thereto for details as to its general construction and mode of operation. Essentially, the tableting machine 10 comprises a pedestal mount 11, above which is positioned a rotary tool head 12 which is rotatable about a central vertical spindle (not shown) affixed to pedestal 11. Tool head 12 includes three superposed and spaced tiers which move as a unit. The top tier 13 is a horizontal annular disk provided at arcuate intervals adjacent to its periphery with a series of vertical openings 14 receiving upper punches 15. The middle tier 16 is a horizontal annular disk positioned beneath disk 13 and spaced therefrom by neck portion 17. Tier 16 is provided at arcuate intervals with a series of vertical die openings 18 which are vertically aligned with openings 14 in disk 13. The bottom tier 19 is an annular disk which is positioned beneath disk 16 and is spaced therefrom by a neck 20. Tier 19 is provided at arcuate intervals with a series of vertical openings 21 aligned vertically with openings 14 and 18 in disks 13 and 16, respectively, for receiving lower punches 22. The outer edge of disk 19 is provided with gear teeth 23 which cooperate with a worm (not shown) in a conventional arrangement for rotating the entire assembly, including disks 13, 16 and 19, as a unit about their vertical axis above pedestal 11. Head 12 is spaced above pedestal 11 by means of a neck portion 24. Pedestal 11 is provided with a series of cams 26 extending about the periphery of its top surface 25 which cooperate with the heads of lower punches 22 to move lower punches 22 up and down in the conventional manner. These cams include an ejection cam 27. Above head 12 there is mounted, affixed to pedestal 11, a series of cams 28 which cooperate with the heads of upper punches 15 to move upper punches 15 up and down in the conventional manner.

As is well known in such rotary tablet presses, punches 15 and 22 oppose each other in die cavity 18 to form tableted products between their ends. The general operation commences in a fill position in which upper punch 15 is withdrawn from cavity 18 and in which lower punch 22 is depressed slightly in cavity 18 from the position shown in FIGURE 1. In the fill position the powdered material which is to be tableted is placed into cavity 18 above the punch 22. Thereafter as head 12 rotates from the fill position the operation of cams 28 lowers upper punch 15 into cavity 18 to about the same extent that lower punch 22 extends into cavity 18.

The pair of opposing punches are then passed between vertically aligned upper and lower pressure rolls which are mounted on pedestal 11. Upper pressure roll 29 is freely rotatable about a horizontal axis and is positioned such that the lower portion of its edge rides over the head of upper punch 15, forcing punch 15 down in die cavity 18. At the same moment, lower roll 30 which is also mounted about a horizontal axis, rides under the head of lower punch 22 forcing lower punch 22 up in die cavity 18 opposing the downward movement of punch 15 to compress the powdery or granular material in die cavity 18 between the punches.

After the compression operation, the rotation of head 12 carries upper punch 15 onto a cam which lifts it from die cavity 18. As this action takes place, lower punch 22 rides onto ejection cam 27 which forces the upper end of punch 22 upwardly through die cavity 18 to eject the tableted product. After ejection, cams 26 carry lower

punch 22 down to the fill level and the entire cycle is again repeated. In actual practice, of course, head 12 will carry a number of such opposing punches, together with their associated die cavities 18, as tool assemblies. The press, moreover, can be constructed to provide more than one cycle of operation in a single rotation of the tool head.

Insofar as tablet press 10 has been described above, its construction is entirely conventional. The present invention is particularly concerned with the provision of means to rotate the upper punches 15 and the lower punches 23 simultaneously in opposite directions while moving between the pressure rolls 29 and 30. In other words, the punches are rotated in opposite directions at the point of maximum compression to prevent the material being tableted from sticking to the punch surfaces.

Referring more particularly to FIGURES 2 through 6, it will be noted that an upper rotation roller 31 which is attached to the pedestal 11 by a bracket indicated generally at 31*a* in FIGURE 6, engages the cam surface 32 on the upper punch 15 as it passes under the pressure roll 29. This causes the upper punch 29 to rotate. Similarly, a lower rotation roller 33 which is attached to the pedestal 11 by a bracket 33*a*, engages a cam surface 34 (FIGURE 3) on the lower punch 22 which is on the side opposite the cam surface 32 of the upper punch 15. This causes the punches 15 and 22 to rotate in opposite directions at the point of maximum compression as they pass between the rolls 29 and 30.

Mechanism is also provided to reset or to return the punches to their initial position prior to the next compression stroke. The upper punch 15 is slotted at 35. The slot 35 has a straight side 36 and a curved side 37. A pin 38 mounted within the top tier 13 rides within the slot 35 to return the upper punch 15 to its initial position. The pin 38 bears against the surface 37 after the punches have been rotated through maximum compression. When the punch 15 is raised by the cam 28, the pin 38 bearing against the surface 37 rotates the punch to its original position where it remains until it is again rotated by the roller 31.

The lower punch 22 is reset by a cocking roller 39 which bears against the surface 40. The cocking roller 39 is mounted on the pedestal 11 of the press by bracket 39*a* (FIGURE 4) at a point before the punches reach the roll 30 so that the lower punches 22 will be returned to their initial position just before being rotated at maximum compression by the rotation roller 33. The lower punches 22 are also provided with a wide slot 41. A pin 42 mounted in the bottom tier 19 rides within the slot 41 in order that the lower punches 22 will not be excessively rotated.

Another means of rotating the punches is illustrated in FIGURE 7. In this embodiment, the punch 15 is provided with a projecting member 43. A cam surface 44 attached to the pedestal 11 by the clamp 45 is provided. A rotation roller 46 is also attached to the pedestal 11 approximately in line with the pressure roll. As the punch 15 approaches the maximum point of compression, one end of the member 43 strikes the cam surface 44 to place it in position for rotation. As the punch continues on its cycle, the other end of projecting member 43 strikes the rotation roller 46 as the punch 15 moves under the pressure roll 29 to give rotation to the punch at the point of maximum compression. A similar mechanism is provided for the lower punch in order to achieve counter rotation of the upper and lower punches at the point of maximum compression.

While particular embodiments of the invention have been illustrated and described it will be obvious to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention and it is intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed as new is:

1. In a tablet press, the combination comprising a frame, a die head movably supported on said frame, at least one vertical die opening in said head, a lower punch positioned beneath said head with its upper end extending into the die opening, a lower pressure roll mounted below said die head and in alignment with the path of travel of said lower punch to move it upwardly into maximum compressive pressure, an upper punch positioned above said die head with its lower end in axial alignment with the die opening including means for moving the said lower end into the die opening, an upper pressure roll mounted above said die head and in alignment with the path of travel of said upper punch to move it downwardly into maximum compressive pressure simultaneously with the compressive movement of said lower punch to form a tablet, means for rotating the upper punch in one direction and means for rotating the lower punch in the opposite direction during the period of maximum compressive pressure to eliminate sticking of tablet material to the punches, at least one of said rotating means including a cam surface on at least one of said punches, a cooperating rotation roller mounted on the frame to engage the said cam surface of said punch as it moves through the period of maximum pressure in the compressive cycle, said cam surface engaging said rotation roller so that rotation of the punch is initiated with a minimum of impact.

2. The tablet press claimed in claim 1 including means for resetting the punches and returning them to their original positions prior to the next compression cycle.

3. The tablet press claimed in claim 2 wherein said resetting means includes a cocking roller engaging a reset cam surface on the lower punch and a follower engaging a curved slot cut in the cylindrical surface of the upper punch.

4. In a tablet press, the combination comprising a frame, a die head movably supported on said frame, at least one vertical die opening in said head, a lower punch positioned beneath said head with its upper end extending into the die opening, a lower pressure roll mounted below said die head and in alignment with the path of travel of said lower punch to move it upwardly into maximum compressive pressure, an upper punch positioned above said die head with its lower end in axial alignment with the die opening including means for moving the said lower end into the die opening, an upper pressure roll mounted above said die head and in alignment with the path of travel of said upper punch to move it downwardly into maximum compressive pressure simultaneously with the upward compressive movement of said lower punch to produce a tablet, means for rotating the upper punch in one direction and means for rotating the lower punch in the opposite direction during the period of maximum pressure in the compressive cycle to eliminate sticking of tablet material to the punches, at least one of said rotating means including a member attached to and projecting from the body portion of at least one of said punches, means mounted on the frame of said press to engage one end of said projecting member and rotate said punch as it moves through its period of maximum pressure in the compressive cycle simultaneously with the rotation of said other punch as it moves through the period of maximum compression, and means for returning the punch to its original position by engaging the other end of said projecting member and causing the punch to counter-rotate prior to the next compressive cycle.

References Cited in the file of this patent

FOREIGN PATENTS

81,019 Denmark ---------- May 22, 1956