United States Patent

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[33] **Great Britain**
[31] **17554/68**

[54] **TABLET-MAKING MACHINES**
8 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **107/17**
[51] **Int. Cl.** **B30b 11/08**
[50] **Field of Search** 107/1, 15, 17; 18/20, 1, 22; 25/99, 100

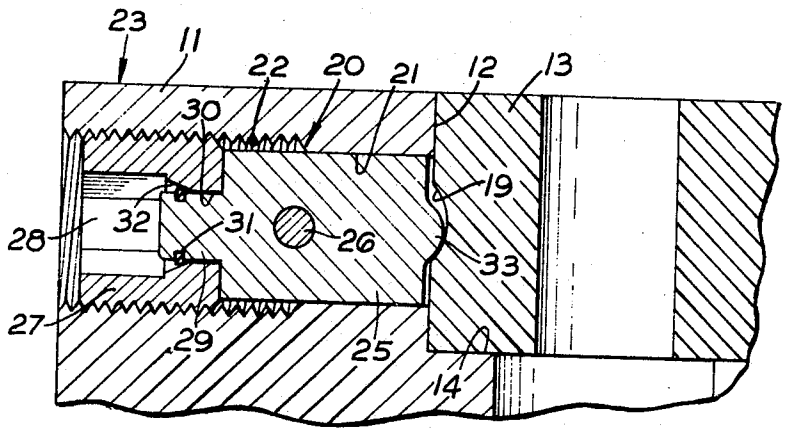
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ABSTRACT: In a tablet-making machine comprising a die table having one or more die holes extending therethrough, each such die hole accommodating a respective generally cylindrical die into which corresponding upper and lower punches enter to compress granular or pulverulent material to form it into a tablet, locking means, for the or each die, comprises a plug accommodated in a respective locking hole extending outwards from the die hole to the edge of the die table, the locking hole opening wholly into the die hole, and screw means engageable in the locking hole for urging the plug towards and into engagement with the die, that end of the plug which faces the die being concavely curved complementarily to the outer curved surface of the die and having a rib protruding therefrom for engagement in a circumferential groove around the die.



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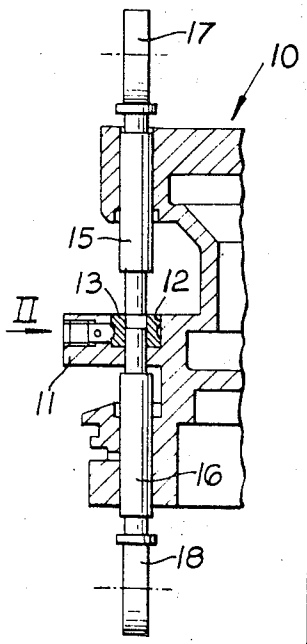


Fig. 1.

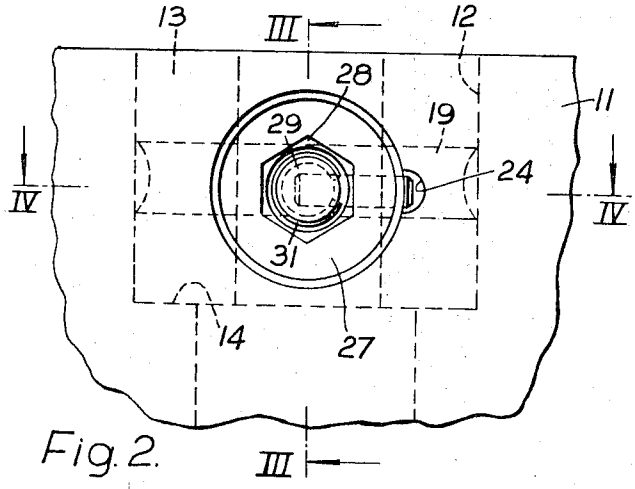


Fig. 2.

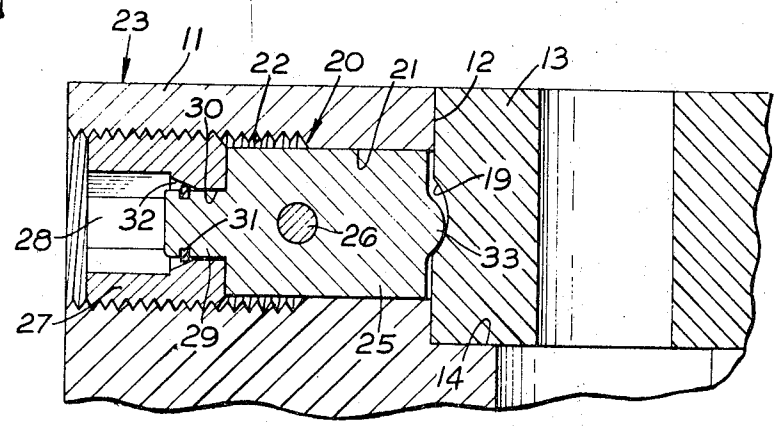


Fig. 3.

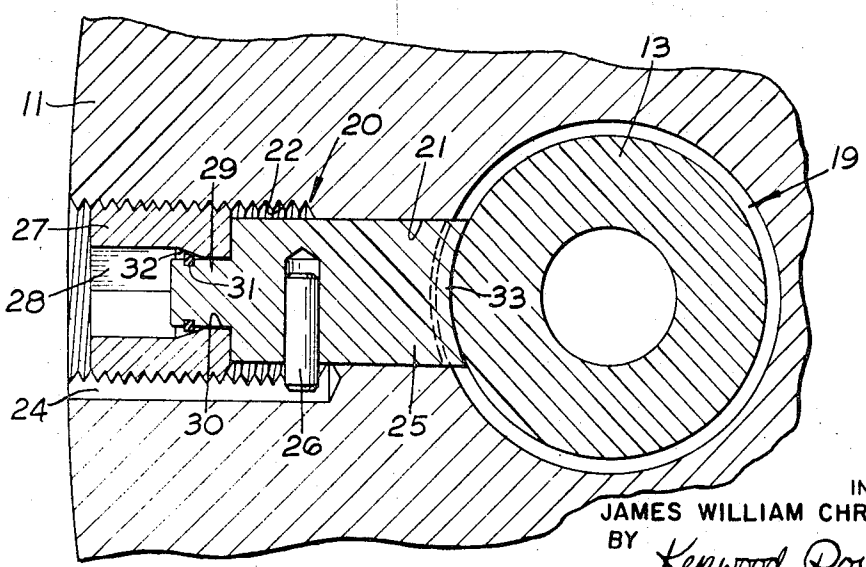


Fig. 4.

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TABLET-MAKING MACHINES

This invention concerns tablet-making machines of the type (hereinafter referred to as "of the type described") comprising a die table having one or more die holes extending therethrough, each such hole accommodating a respective generally cylindrical die into which corresponding upper and lower punches enter to compress granular or pulverulent material to form it into a tablet.

In rotary tablet-making machines, the die table is circular and usually each die is in the form of a sleeve of short axial length having a circumferential groove around its outer curved surfaces, locking of the die in its hole being achieved by a respective locking screw or plug accommodated in a respective locking hole in the table and extending tangentially relative to the die to engage tangentially in the circumferential groove thereof. Arrangements are known wherein the locking holes are approximately radially disposed relative to the table, so that there is a locking hole between each adjacent pair of die holes and the spacing between the adjacent die holes must, therefore, be such as to provide for the presence of such locking holes. The number of dies which can be provided around the table is, therefore, restricted somewhat in such an arrangement by reason of the necessity for leaving sufficient material between adjacent dies to accommodate the locking holes. Since the speed at which the table can be rotated is limited by practical considerations, the output of a tablet machine having the locking holes extending between the die holes is restricted somewhat, and attempts have been made to increase the output of such a machine, without increasing the diameter of the rotary table or the pitch circle of the die holes, by arranging the locking holes so as to extend chordally of the die table so that each such locking hole, in addition to extending tangentially relative to its respective die hole, is directed towards the next adjacent die hole and if extended would break into such next adjacent die hole.

This arrangement enables die holes to be arranged more closely together around their pitch circle on the die table, but nevertheless the locking holes still influence such spacing to some degree in that such locking holes are still partly disposed between the adjacent die holes and it is absolutely essential that there should be an adequate amount of the material of the die table between the adjacent dies to assure that no cracking or breaking-up of the table will occur. Thus, it is not practical, in the cases where the locking holes are tangential and extend at least partially between adjacent die holes, to arrange the die holes so closely together as to provide the maximum possible number of die holes in the table.

An object of this invention is to provide a locking arrangement whereby this latter desideratum can be achieved in rotary table-making machines as aforesaid, but which can be employed, also, if desired, in nonrotary tabletting machines.

With this object in view, the present invention provides a tablet-making machine of the type described wherein locking means, for the or each die, comprises a plug accommodated in a respective locking hole extending outwards from the die hole to the edge of the die table, the locking hole opening wholly into the die hole, and screw means engageable in the locking hole for urging the plug towards and into engagement with the die, that end of the plug which faces the die being concavely curved complementarily to the outer curved surface of the die and having a rib protruding therefrom for engagement in a circumferential grove around the die.

As applied to a rotary tablet-making machine having a circular die table, the each locking hole is advantageously radially disposed relative to the respective die hole and is preferably also disposed radially relative to the die table.

The or each plug and the respective screw means are conveniently connected together in such a manner as to be rotatable relative to one another, so that withdrawal of the screw means from the locking hole is accompanied by positive withdrawal of the plug.

In order that the invention may be fully understood, it will be described further, by way of example, with reference to the accompanying drawings which illustrate a preferred embodiment thereof, it being understood that the following description is illustrative and not limitative of the scope of the invention.

In The Drawings

FIG. 1 is a sectional elevation showing a rotary tablet-making machine conforming to the invention, only sufficient of the machine necessary for the understanding of the invention having been shown;

FIG. 2 is an enlarged fragmentary elevation taken in the direction of the arrow 11 in FIG 1;

FIG. 3 is a sectional elevation taken on the line III–III of FIG. 2; and

FIG. 4 is a sectional plan taken on the line IV–IV of FIG. 2.

An illustrated rotary tablet-making machine conforming to the present invention, indicated at 10 in FIG. 1, is generally of conventional basic construction and comprises a substantially horizontal circular die table 11 arranged for rotation about a vertical axis and having a plurality of die holes 12 extending vertically therethrough, such die holes 12 being disposed on a circle close to the outer periphery of the die table 11 and equispaced therearound. Each such die hole 12 contains a respective die 13 which is in the form of a annular sleeve of short axial length and seats down on a shoulder 14 (FIG. 3) in the respective die hole 12, and cooperating with each such die 13 are respective upper and lower punches 15, 16 which are raised and lowered, upon rotation of the die table 11, by engagement with respective cam tracks (not shown), and pressure rollers 17, granular or pulverulent material fed into the successive dies 13 by a feed arrangement (not shown) disposed above the die table 11.

Each die 13 has a circumferential locking groove 19 extending around its outer curved surface, midway between the ends of the die 13.

The machine of the invention differs from the conventional or known machines, however, in the manner in which the dies 13 are retained and locked in their respective die holes 12, and in the following the locking arrangement of just one of the dies 13 in its respective die hole 12 will be described, it being understood that all of the dies 13 are similarly locked.

A locking hole, indicated generally at 20, FIGS. 3 and 4, is provided in the table 11, in association with the die hole 12, and this locking hole 20 extends radially inwards from the outer peripheral edge of the table 11, being contained in the thickness of the table 11, so as to extend radially both of the die hole 12 and of the die table 11. Thus the axis of the locking hole 20 is disposed on that radius of the die table 11 which extends though the center of the die hole 12.

The locking hole 20 may be regarded as being in two parts, namely an inner smooth smaller diameter part 21 which opens into the die hole 12, and an outer internally-threaded larger diameter part 22 which opens to the outer periphery of the die table 11, and the disposition of the hole 20, in the thickness of the table 11, is such that its axis is spaced from upper surface 23 of the die table 11 by a distance just slightly greater than one-half of the axial length of the die 13 which seats into the die hole 12 with its upper surface flush with the upper surface 23 of the table 11.

A keyway 24 is cut into the material of the table 11 along the internally-threaded larger diameter part 22 of the bore 20 and extending slightly into the inner smooth smaller diameter part 21 of the locking hole 20, so as to be substantially radially disposed of such locking hole 20.

Locking means for the die 13 comprises a circular sectioned plug 25 which is a snug sliding fit into the smaller diameter part 21 of the locking hole 20, and has a radial peg 26 projecting radially therefrom, this peg 26 engaging in an cooperating with the keyway 24, whereby the plug 25 is precluded from rotating in the locking hole 20, but is axially slidable therein. Abutting one end of such plug 25 is screw means in the form of an Allen screw 27 (i.e. a headless screw having a hexagonal

socket 28 in its end remote from the plug 25, whereby the screw 27 may be rotated), the plug 25 and the Allen screw 27 being connected together by a reduced diameter shank 29 of the plug 25 extending through an axial bore 30 in the Allen screw and being retained therein by a circular spring clip 31 which engages in a groove around such shank 29 and locates in a frustoconical transition 32 between the socket 28 and the bore 30 of the screw 27. Thus, the shank 29 and clip 31 connect the Allen screw 27 firmly to the plug 25 whilst at the same time permitting them to rotate relative to one another.

The Allen screw 27 fits, of course into the larger-diameter internally threaded portion 22 of the locking hole 20.

At its end remote from the Allen screw 27, the plug 25 is concavely formed (as can be seen in FIG. 4) complementarily to the curvature of the outer curved surface of the die 13, and a rib 33 (see FIG. 3) protrudes from the concavely curved end face of the plug 25, for engagement in the circumferential grove 19 in the die 13, the height of the rib 33 being such that upon urging the plug 25 towards the die 13, the concave end of the plug 25 is clearance spaced from the die 13 when the rib 33 is firmly in engagement with the circumferential groove 19, as has been shown in FIG. 3.

As will be evident from the foregoing, the Allen screw 27, in position in the threaded larger-diameter part 22 of the locking hole 20, serves, upon tightening up of such screw 27, to urge the plug 25 against the die 13, with the rib 33 in engagement with the die 13 to retain the latter firmly in position. Because the center of axis of the locking hole 20 is disposed below the top surface 23 of the die table 11 just slightly more than one-half of the axial length of the die 13, and the rib 33 on the concavely curved end of the plug 25 is in a position effectively diametrically across the end of the plug 25, such rib 33 engages with the bottom surface of the groove 19 around the die 13, and assures that the die 13 is firmly held down against the shoulder 14 in the die hole 13, as has been illustrated in FIG. 3.

With such an arrangement no part of any of the locking holes 20 is disposed so as to extend into the material between adjacent ones of the die holes 12. Accordingly, it is possible to pack the die holes 12 very closely around their circle on the die table 11 whilst still leaving sufficient material between adjacent ones of the die holes 12 without fear of weaknesses existing at such material. This, therefore enables considerably more of the dies 13 to be incorporated into the table 11 than hitherto with corresponding increase in the productivity of the machine without any increase in the actual running speed of the machine.

The invention is not confined to the precise detail of the foregoing example and variations may be made thereto. Thus, for example, in a modification the shank 29 which is formed integraly with the plug 25 and projects into the Allen screw 27 has its free end riveted over or otherwise deformed to render the plug 25 and the Allen screw 27 inseparable whilst at the same time permitting relative rotation thereof. The shank 29 can, if desired, be omitted completely and a screwed screw, having its head accommodated in the socket 28 and screwed into the plug 25 substituted therefor.

In the described embodiment, as applied to a rotary machine, the locking holes 20 are each disposed so as to lie radially both with respective to the respective die hole 12 and to the die table 11. However, it is not essential that each locking hole should lie in this precise disposition, and variation may occur. In order that the plug 25 may properly confront the respective die 13, by its inner end, the locking hole 20 must necessarily open wholly into the die hole 12. At its outer end, each locking hole 20 may open at the periphery of the table 11 at any convenient position which is not so disposed as to reduce the material between the respective die hole 12 and the next adjacent die hole 12.

The invention is not limited to rotary tablet-making machines and can, if desire, be applied to single-punch stationary tabletting machines and any other tabletting machines where a die requires to be locked in respective hole through a die table of the machine.

We claim:

1. A tablet-making machine comprising a die table having a die hole extending therethrough, the die hole accommodating a respective generally cylindrical die into which corresponding upper and lower punches enter to compress pulverulent material to form it into a tablet wherein locking means, for the die, comprises a plug accommodated in a respective locking hole extending outwards from the die hole to the edge of the die table, the locking hole opening wholly into the die hole, and screw means engageable in the locking hole for urging the plug towards and into engagement with the die, that end of the plug which faces the die being concavely curved complementarily to the outer curved surface of the die and having a rib protruding therefrom for engagement in a circumferential groove around the die.

2. A tablet-making machine as claimed in claim 1, wherein the machine is a rotary machine and the die table is circular, the locking hole being radially disposed relative to the die hole.

3. A tablet-making machine as claimed in claim 2, wherein the locking hole is radially disposed relative to the die table.

4. A tablet-making machine as claimed in claim 1, wherein the plug and the respective screw means are connected together in such a manner as to be rotatable relative to one another.

5. A tablet-making machine as claimed in claim 4 wherein the screw means is in the form of an Allen screw.

6. A tablet-making machine as claimed in claim 5 wherein a shank of the plug projects axially into the Allen screw and is formed to connect the plug to the Allen screw.

7. A tablet-making machine as claimed in claim 6 wherein the socket of the Allen screw joins with an axial hole through the screw by a frustoconical transition, the shank projecting through the hole and into the transition the frustoconical form of which serves to retain a circular spring clip in position in a groove around the shank.

8. A tablet-making machine as claimed in claim 1 wherein the locking hole and the rib on the plug are disposed, relative to one another such as to urge the die into engagement with a shoulder in the die hole.