

Aug. 12, 1969

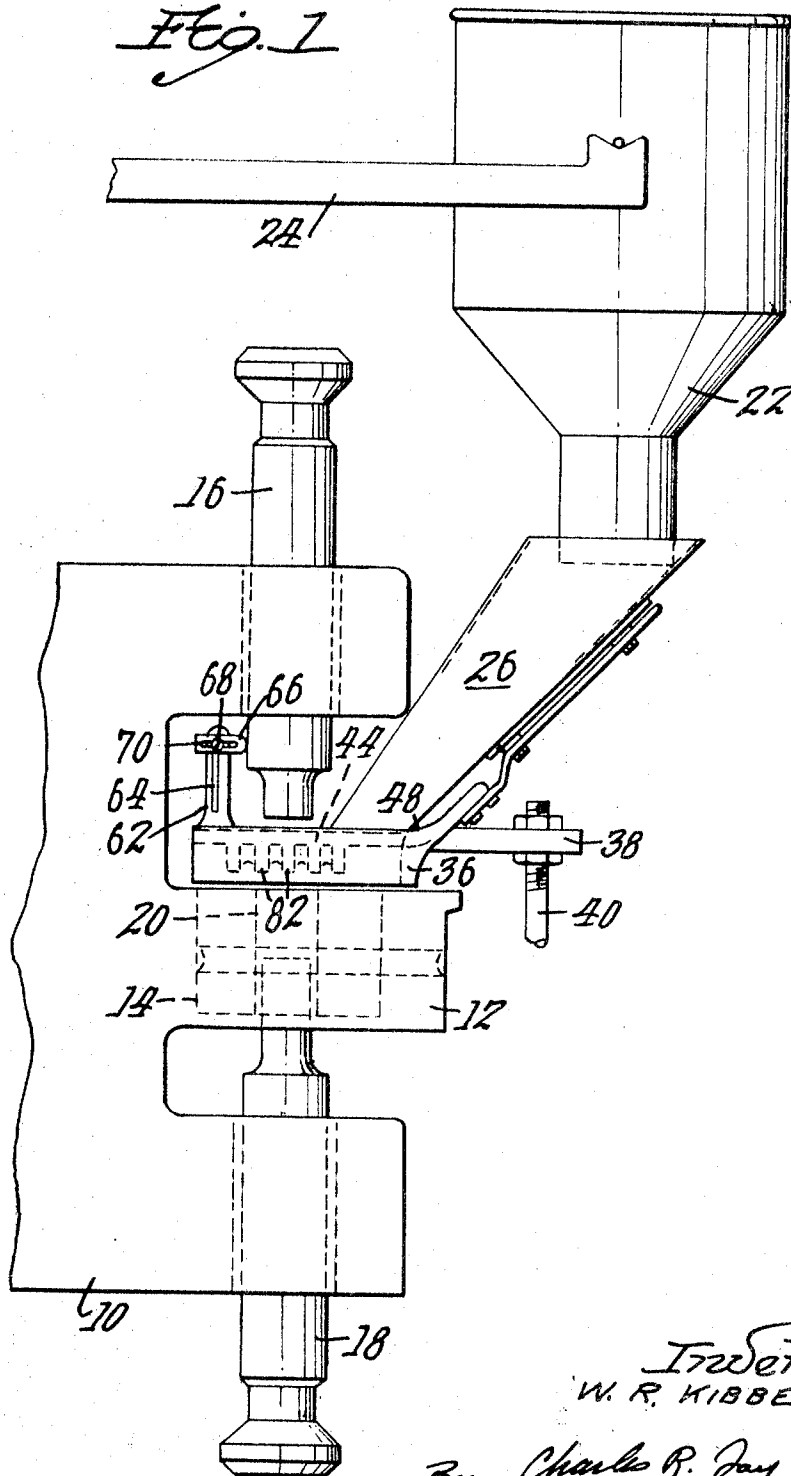
W. R. KIBBE

3,460,487

TABLET FORMING MACHINES

Filed Sept. 22, 1967

2 Sheets-Sheet 1



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Aug. 12, 1969

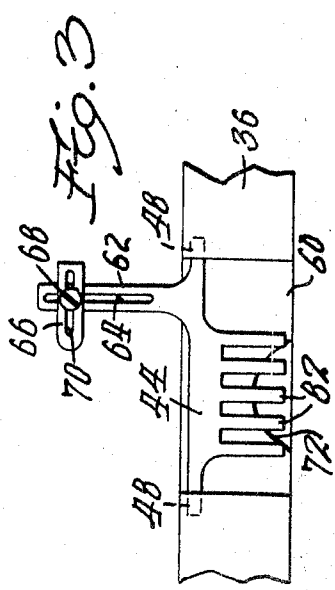
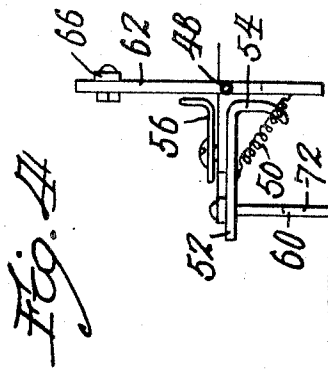
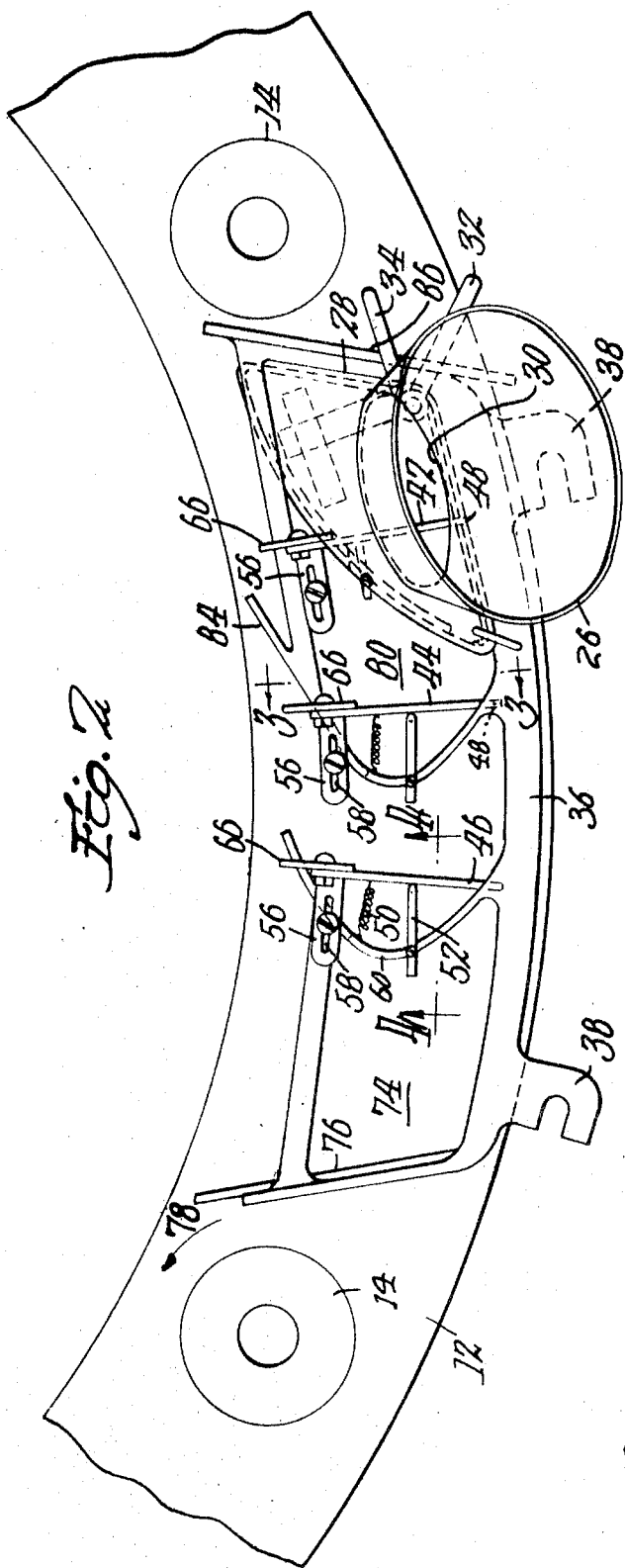
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3,460,487

TABLET FORMING MACHINES

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10 Claims

ABSTRACT OF THE DISCLOSURE

A tablet forming machine utilizing finely comminuted powder-like material through the use of a new and improved agitating mechanism for the powder as it is fed from a hopper to the dies, thus insuring greater uniformity of the powder entering the dies, and better compacting of finer powder than heretofore possible. The agitating is performed by one or more oscillating elements which are mounted in fixed position with relation to a feeding device leading from the hopper to the dies, and having means struck by the upper punches as they pass the feeding station, the present invention providing for improved agitating and compacting of the powder and also providing for recirculation of excess powder around the entire rotary head back to the original position at the feeding device.

Prior art

U.S. Patent 3,016,027, July 9, 1962 (Edgar et al.) which shows a mechanical type feeder requiring separate drives and having some rotary agitation.

U.S. Patent 3,016,572, Jan. 16, 1962 (Stoot) showing a mechanical type feeder with a built-in drive and showing rotary agitation, and

U.S. Patent 3,029,470, Apr. 17, 1962 (Frank) showing a vibratory type feeder having no agitation.

This invention relates to a tablet making machine, and the principal object of the invention resides in the provision of new and improved agitating means for the powder which is directed from a hopper therefor to a series of pockets containing dies in a rotary head, the powder then being compacted as for instance by punches in increasing pressure arrangement as the head rotates, the finished tablets being ejected prior to a complete revolution to repeat the cycle.

In the past it has been found impossible to satisfactorily form tablets from powders under a certain degree of fineness. This invention, by providing an improved agitating means for the powder prior to entry into the dies, provides for the successful manufacture of tablets from fine powders to the end that the speed of dissolution of these tablets in fluid is increased.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings in which:

FIG. 1 is a view in side elevation illustrating the invention;

FIG. 2 is a plan view thereof with parts omitted;

FIG. 3 is a section on line 3—3 of FIG. 2, and

FIG. 4 is a section on line 4—4 of FIG. 2.

In illustrating the present invention, it is pointed out that the basis of the machine in which it is used is of more or less conventional design embodying certain drives, motors, etc. as are conventional and well known in the art and as exemplified by the United States patents cited, i.e., U.S. Patents 3,016,027; 3,016,572; 3,029,470. In the present case a rotary head 10 is provided, this head being of course properly mounted and driven. The head is provided with a die table generally indicated at 12, this die

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table having a horizontal surface provided with vertical pockets in which die bores are provided, preferably with inserted die members as indicated at 14. There is an annular series of upper punches generally indicated at 16 and an annular series of similar lower punches generally indicated at 18. These punches rotate with the head and dies. Powder enters for instance in the area at 20, see FIG. 1, at a feeding station, fills the dies, and thereafter cam means (not shown) move the punches toward each other to compress tablets in the dies. Usually a tablet is completely compressed to the degree desired in just less than a single revolution of the rotary head, whereupon it is ejected and the punches retracted to open position once more for the feeding station. Some machines of the prior art are designed to produce two or more tablets during a single rotation but the present invention is applicable to such a machine as well as to a single revolution type.

The punches are vertically arranged in opposite pairs to operate on a vertical axis in the die bores, which receive their powder as for instance from a hopper 22 of any known description mounted in any desired way as for instance on a support 24, see FIG. 1, the powder descending into a feed chute spout 26 and descending by gravity through a feed shoe conventionally shown at 28 for instance in FIG. 2. This feed shoe is provided with an opening which receives the powder from the lower end of the feed shoe spout 26 and it is provided with means for adjusting the flow, this being a plate variably closing the opening which is indicated at 30 by means of a lever 32, the same usually being provided with a lock at 34.

This feed shoe and feed spout may be conveniently mounted on the feeder frame as at 36 so that it can be removed for cleaning, etc. The feeder device, feeder frame, feed shoe, etc. are mounted in fixed relation so that the powder will be received on the die table in the area of the dies as it rotates thereunder.

The powder agitating means forming the present invention to be described is conveniently mounted in fixed relation on the supporting feeder frame 36, the latter being conveniently mounted in fixed position on arms 38 mounted on studs 40, the latter finding a support where desired on the framework of the machine in fixed relation with respect thereto. The supporting frame 36 is generally open as clearly shown in FIG. 2 where it is provided with a series of oscillating agitator elements generally indicated at 42, 44, 46. These are journaled as for instance at 48, 48 in the side walls of the frame 36 transverse to the path of travel of the dies, and are generally held in upright position as shown for instance in FIG. 4 by a retracting spring 50 having an end secured to a part of frame 36. This also mounts an adjustable stop 52 which has an operative end at 54, this stop being conveniently mounted for axial adjustment by any desired means. There is also a stroke adjustment member 56 having a slot 58 for adjustment thereof, see FIG. 3. The spring, stop, and stroke adjustment can all be mounted on member 60 which is a part of frame 36.

Each agitating element has an upright arm 62 rising well above the frame 36 and each upright arm 62 has a slot 64 therein adjustably mounting an adjustable striker bar 66 by means of a nut 68 located in a slot 70. By means of the two slots 62 and 70 the striker bar can be adjusted up and down and in and out so as to vary the degree with which it is struck by the passing of punch 16, see particularly FIG. 1. The agitating elements may be made in finger or comb shape as shown best in FIG. 3 at 82.

Each frame member 60 is provided with an opening 72 in its lower edge for the passage of excess powder as for instance from right to left in FIG. 2, this excess

powder then moving into the area at 74 against scraper bar 76 which moves it inwardly into the areas 78 on the rotating die table where it is recirculated 360° back to the agitating mechanism for disposition into the dies as for instance in the area at 80 as the die pockets pass thereunder.

The powder descends by gravity as explained above in the area at 30 in the feed shoe, being deposited on the rotating die table and entering into the die bores as they pass under the feed shoe. As the powder reaches the die table, it is agitated by the agitating element 42 as the corresponding upper punch 16 strikes the corresponding adjustable striker bar 66. The degree of agitation depends upon the adjustment of the striker bar.

As the punches advance they strike the striker bars one after the other. The agitating element 42 is the first to be moved in a counterclockwise direction as in FIG. 4, giving the powder a kick in the direction opposite to the direction of motion of the die table. Spring 50 then brings the agitating member back to its original position, FIG. 4, and the powder passes through the corresponding opening 72 into the area between the agitating element 42 and the agitating element 44. The latter once more agitates the powder which of course again moves in a clockwise direction, teeth 82 and through opening 72, into an area where it is again acted upon by agitating element 46. After this it passes into the area 74 as described and is recirculated.

A scraper at 84 acts to direct the recirculated powder into the area at 80 and at 86 a table knockoff bar can be provided or this bar can be provided at any point where the tablets become completed and ejected upwardly onto the die table, as usual and well known in the art.

It is believed it will be appreciated that this invention provides for a relatively high degree of agitation of the powder and that this action is adjustable. Each of the three agitating elements shown can be adjusted to a different degree if this should be found to be advantageous. The invention is not limited to three agitator members as in some cases one may be enough or even more than three may be found to be desirable, depending in part upon the nature of the powder and its degree of comminution.

By the use of this agitating device, tablets of a very high degree of fineness may be compacted so that a smaller tablet of the same effectiveness as before in a larger tablet results; the compression may be increased to make a smaller tablet; and the solubility of the tablet is greatly increased because of the increased fineness of the powder.

What is claimed is:

1. A tablet forming machine of the type including a rotary head having circumferentially spaced forming dies therein, a filling device for depositing material to be formed into tablets onto said head in the area of the dies, and means on the head aligned with the dies to compact the material therein as the head rotates relative to the filling device,

means to agitate the material over the dies as the latter receive the same, said agitating means including a movable member having a cyclic motion at least in part generally opposed to the direction of motion of the rotary head and means including an operative part of the machine impinging upon the movable member to move it.

2. The tablet forming machine of claim 1 wherein the operative machine parts comprises a punch for compacting, and including means on the movable member in the

path of the punch for impingement thereby to move the member.

3. The tablet forming machine of claim 1 wherein the operative machine part comprises a punch for compacting, and including means on the movable member in the path of the punch for impingement thereby to move the member in one direction, and means to return the movable member to a normal position.

4. The tablet forming machine of claim 1 wherein the operative machine part comprises a punch for compacting, and including means on the movable member in the path of the punch for impingement thereby to move the member in one direction, and means to return the movable member to a normal position, said member being oscillatable on a generally horizontal axis.

5. The tablet forming machine of claim 1 including means to vary the degree of movement of said member.

6. The tablet forming machine of claim 1 wherein the operative machine part comprises a punch for compacting, and including means on the movable member in the path of the punch for impingement thereby to move the member, the means on the movable member being adjustable to vary the degree of movement of the member.

7. A tablet forming machine of the type including a rotary head having circumferentially spaced forming dies therein, a filling device for depositing material to be formed into tablets onto said head in the area of the dies, means on the head aligned with the dies to compact the material therein as the head rotates relative to the filling device, an oscillatory element to agitate the material, and element being located between the filling device and the rotating head in the path of the dies, and means forming a part of the compacting means constructed and arranged to periodically cause the oscillatory element to be actuated.

8. The tablet forming machine of claim 7 including means pivotally mounting the oscillatory element on an axis generally normal to the motion of the dies, so that a part of the oscillatory motion of the element tends to cause at least some of the material to move temporarily contrary to the motion of the head.

9. The tablet forming machine of claim 1 wherein the compacting means includes a series of said operative machine parts, each including an axial punch cooperating with the dies, and means for actuating the oscillatory element, the last-named means being in the path of the punches, so that agitation takes place as the respective dies pass the filling device.

10. The tablet forming machine of claim 7 including an arm on the oscillatory element and a relatively adjustable striker member on the arm, the striker member being in the path of the compacting means and being impinged upon thereby.

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U.S. Cl. X.R.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,460,487

August 12, 1969

Walter R. Kibbe

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 33, "Stoot" should read -- Stott --. Column 3, line 67, "parts" should read -- part --. Column 4, line 30, "and" should read -- said --.

Signed and sealed this 27th day of October 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents