Jan. 31, 1961 C. H. ABBE ET AL 2,969,753

FEEDING AND PICK-OFF ARRANGEMENT FOR TABLET-FORMING MACHINE

Filed Jan. 30, 1958 3 Sheets-Sheet 1

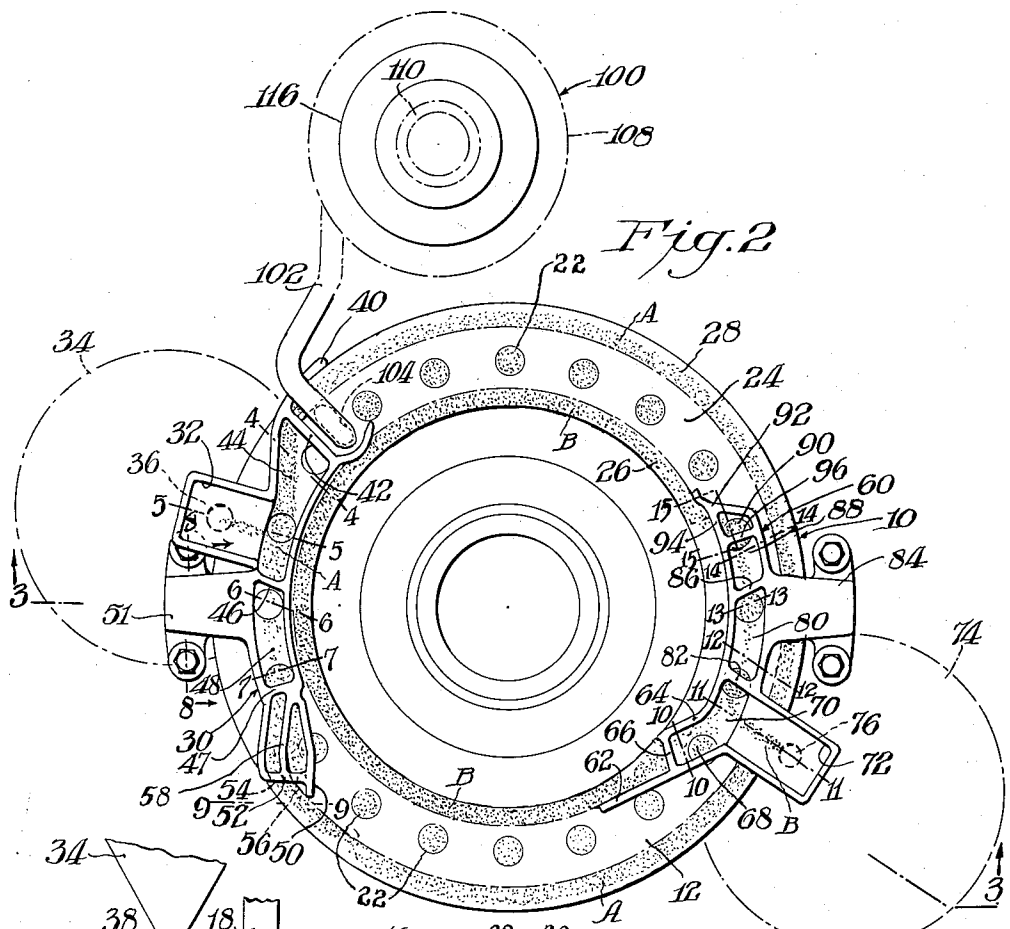


Fig. 2

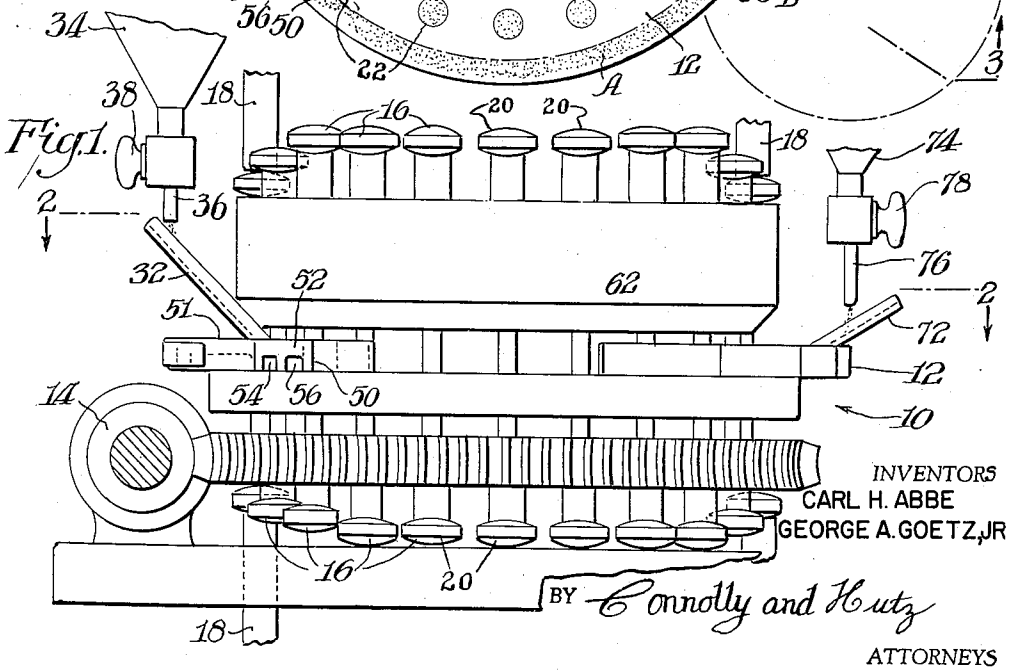


Fig. 1

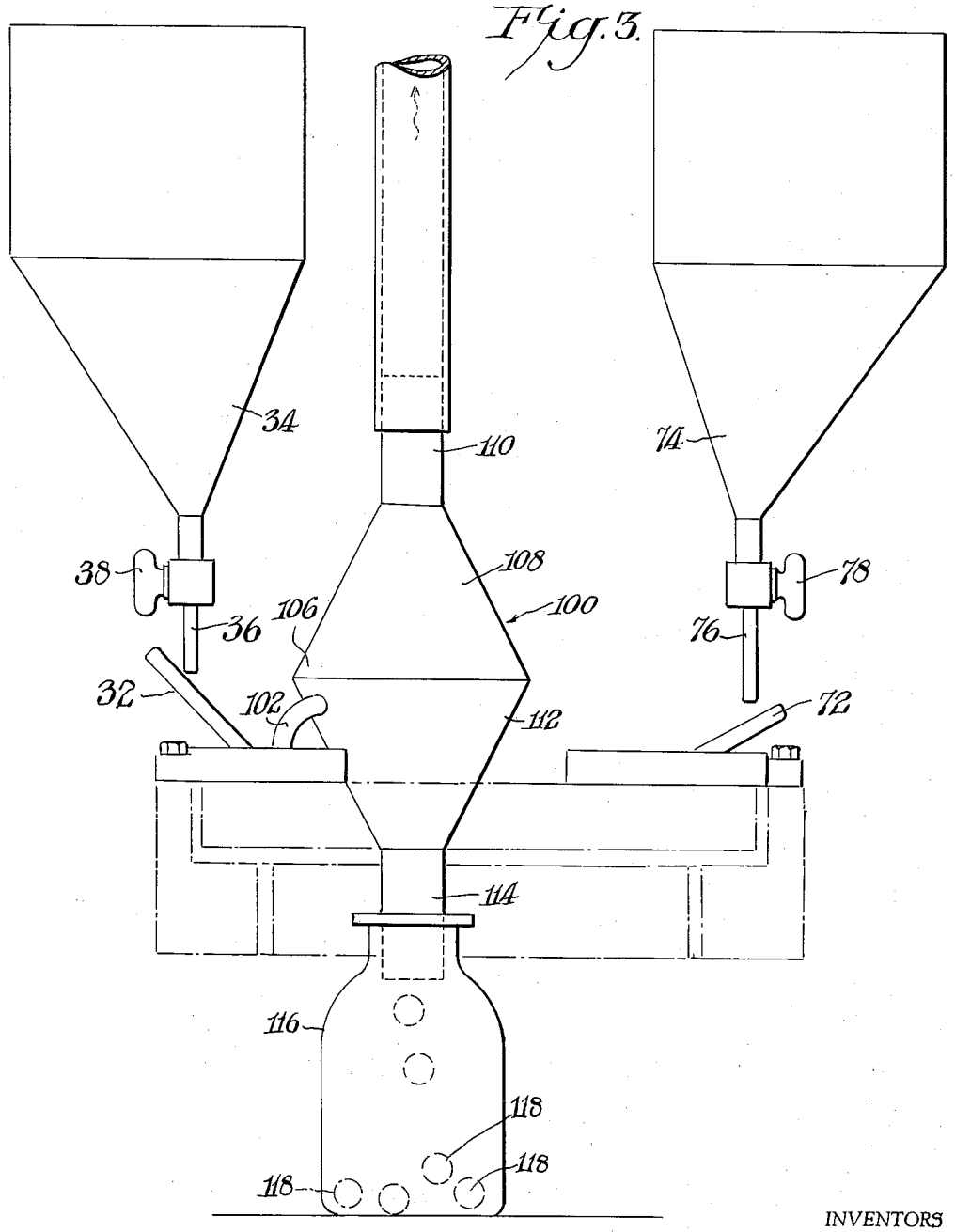
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FEEDING AND PICK-OFF ARRANGEMENT FOR TABLET-FORMING MACHINE

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Fig. 3.



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Fig. 4

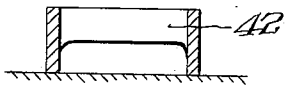


Fig. 5.

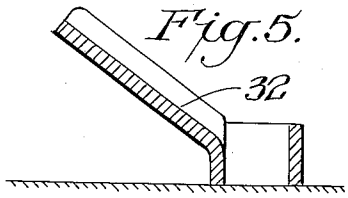


Fig. 6.

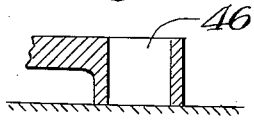


Fig. 7.

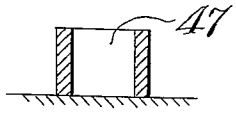


Fig. 8

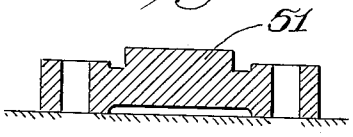


Fig. 9.

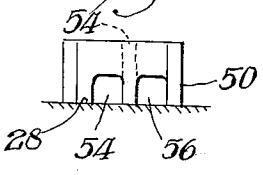


Fig. 10.

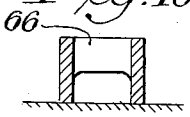


Fig. 11.

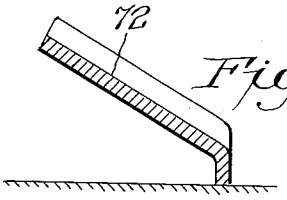


Fig. 12.

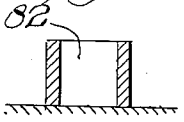


Fig. 13.

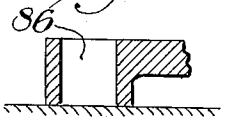


Fig. 14.

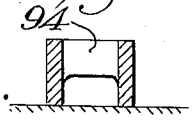
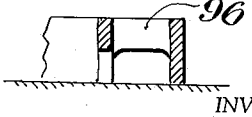


Fig. 15



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2,969,753

FEEDING AND PICK-OFF ARRANGEMENT FOR TABLET-FORMING MACHINE

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5 Claims. (Cl. 107—1)

This invention relates to a powder feeding and tablet pick-off arrangement for a machine which compresses powder deposited upon an annular rotating table into tablets, and more particularly relates to such machines in which dissimilar powders are formed into separate layers of multi-layer tablets.

An early form of a widely utilized type of tablet-forming machine is described in U.S. Letters Patent 1,248,571. This machine and later developments related to it have been used successfully in pressing tablets from powders, particularly in forming tablets containing medicinal powder preparations.

It has been found desirable to compress tablets including a number of layers each containing a dissimilar powder. This permits dissimilar medicinal substances to be confined in a single tablet without intermixing, which is particularly advantageous when these dissimilar powders are incompatible. Furthermore, these dissimilar powders may be differently colored to distinguish the appearance of the tablets and to provide a visual check of the degree of segregation of the powders. This imparts a two-tone finish to the tablet when it is properly formed. However, it has been found highly difficult to prevent powders of each color from being carried over to the wrong layer which mottles the finished tablet.

An arrangement is described in U.S. Letters Patent 2,788,443 which utilizes scraper bar assemblies for diverting separate powders to an inner area and off an outer area of the annular table in an effort to maintain the separate powders discretely separated. However, it has been found extremely difficult to make the operation of these scraper bar assemblies efficient enough to absolutely prevent carry-over of powder from one layer to the other.

An object of this invention is to provide a simple apparatus for feeding powder to a compression type tablet-forming machine and for picking off formed tablets which prevents carry-over of powder from one layer of a multi-layer tablet to the other.

In accordance with this invention, a pair of powder-feeding and scraper assemblies are disposed in intimate sliding contact with central, inner and outer ring-shaped areas of the perforated rotating annular table of a conventional tablet-forming machine. One of these powder-feeding and scraper assemblies is operatively associated with the central and outer areas of the table, and it diverts powder from the annular outer area into the feeding pockets and back onto the outer area as each section of the table passes under it.

The other feeding and scraper bar assembly is operatively associated with the central and inner areas and diverts powder from the inner area to the feeding pocket and back to the inner area as each section of the table passes under it.

Feeding hoppers are associated with each of the scraper bar assemblies for feeding powders at a predetermined rate which maintains the feeding pocket full enough to insure an adequate supply of the discrete powder for each of the respective layers of the tablets. Enough powder is added to make up for the amount being abstracted from the inner and outer areas in forming the tablets.

A vacuum pick-off means is disposed in intimate sliding contact entirely across the central area in front of one of the scraper bar assemblies. This vacuum pick-off means cleans the central area of tablets and excess powder before each section of the table passes under the scraper bar assembly where the first powder layer is deposited and formed. This insures that the two powders are not intermingled in increasing amounts upon the central area and also cleans the tablets of any excess powder as they are collected. The excess powder may be discharged into a particle collecting apparatus which may reclaim the separate constituents for subsequent use.

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

Fig. 1 is a view in elevation of one embodiment of this invention;

Fig. 2 is a plan view of the embodiment shown in Fig. 1;

Fig. 3 is a cross-sectional view taken through Fig. 2 along the line 3—3 and looking in the direction of the arrows; and

Figs. 4–15 are cross-sectional views taken respectively through Fig. 2 along section-cutting lines correspondingly numbered and looking in the direction of the arrows.

In Fig. 1 is shown a tablet-forming machine **10** constructed generally in accordance, for example, with the machines described in U.S. Letters Patent Nos. 901,937, 1,248,571, 1,289,570 or any other of a number of patents devoted to machines of this general classification. Machine **10** includes, for example, a regularly perforated annular table **12**. Drive means **14**, for example, a worm and ring gear drive, rotates table **12** at a constant rate. An array of plungers **16** are disposed above and below table **12** and operatively associated with a plunger driving means **18**, for example a pair of eccentrics, which contact the heads **20** of plungers **16** to reciprocate them relatively toward each other to form a tablet in the well-known manner. Suitable synchronizing means (not shown) is provided for moving the plungers in the proper timed relationship through apertures **22** in annular table **12**.

In Fig. 2 are shown the three principal operating areas of annular table **12**. These are central ring-shaped or annular area **24**, inner ring-shaped area **26** and outer ring-shaped area **28**.

An outer scraper bar and feeding assembly or manifold **30** is operatively associated with outer area **28** and central area **24**. Assembly **30** includes a powder-feeding chute or channel **32** into which a supply means or hopper **34** (see Fig. 3) feeds powder, for example designated A, at a predetermined rate of flow through a tube **36**. Metering means, for example an adjustable valve **38**, is interposed ahead of tube **36** for regulating the rate of powder feed.

Assembly **30** includes a forwardly extending finger **40** whose tip intimately scrapes outer area **28** and whose body is inclined in the direction of rotation of table **12** towards central area **24**. Finger **40**, therefore, scrapes any powder deposited in outer ring **28** under a raised bridging bar **42** (Fig. 4) into feeding pocket **44**. This powder then passes under a leveling bar **46** (Fig. 6) into a compressing pocket **48** within which plunger **16** passes through apertures **22** to compress the first layer

of powder. A second leveling bar 47 (Fig. 7) forms the rear of the pressing pocket 48.

A trailing finger 50 is attached to the rear end of assembly 30 and extends in intimate contact across the surface of central ring 24 to terminate within outer ring 28. A terminal scraping arm 52 which is perforated by a pair of outlets 54 and 56 (shown in Fig. 9) diverts powder A into outer area 28. An auxiliary trailing scraping arm 58 is disposed substantially parallel to trailing arm 50 to cooperate in directing powder A into outer ring 28. This multiplicity of scrapers is required to minimize the carry-over of the first powder before the successive sections of the table pass beneath the second manifold. Assembly 30 is secured to the stationary frame of machine 10 by a bracket 51 (Fig. 8).

In Fig. 2 is shown a second feeding and scraper bar assembly or manifold 60 which is operatively associated with inner ring 26 and central ring 24 of table 12. Assembly 60 includes a forwardly projecting finger 62 extending across central area 24 towards the outer periphery of inner area 26, and a second projecting scraper bar 64 is disposed substantially parallel to arm 62 and disposed in intimate scraping contact across the surface of inner ring 26. Bars 62 and 64 are joined by a raised bridging arm 66 (Fig. 10). Elements 62, 64 and 66 define a throat 68 through which a second powder, for example, designated B, which is originally fed through manifold 60, is diverted from inner area 26 into feeding pocket 70. A feeding channel or chute 72 (Fig. 11) is also connected to feeding pocket 70 for directing powder B from supply means or hopper 74 (see Fig. 3) through a tube 76 in which is installed a metering valve 78.

Powder B then passes into a compressing pocket 80 through which plungers 16 pass in synchronism through successive apertures 22 to form the second layer under a leveling bar 82 (Fig. 12). A bracket 84 connects scraper bar assembly 60 to the fixed frame of machine 10. From pressing pocket 80, excess B powder passes under another leveling bar 86 (Fig. 13) into collecting and diverting pockets 88 and 90, which are defined by a terminal scraper bar 92 and a raised supporting arm 94 (Fig. 14). Raised supporting arm 94 is connected to trailing scraper bar 92 by another raised arm 96 (Fig. 15). The function of the raised arms which do not scrape the surface of table 12 is to provide structural rigidity for the scraping portions of the assembly and to facilitate the passage of the powders in the desired directions.

A vacuum pick-off or pick-up means 100 is positioned between manifolds 60 and 30 in the direction of rotation of table 12. Vacuum means 100 is connected, for example, to suitable air exhausting apparatus (not shown) which provides subatmospheric pressure. A pick-up tube 102 extends downwardly from a portion of vacuum means 100 towards table 12 and terminates in a mouth 104 which rides in intimate contact completely across central area 24. Tube 102 rises to join the main body 106 which includes an upper hood 108 connected to the exhausting equipment through a tube 110 and a lower funnel-shaped member 112 which includes a tube 114 terminating within the mouth of a container or a bottle 116.

Tube 102 is small enough in diameter or cross-sectional area with respect to main body section 106 of vacuum means 100 to provide sufficient air velocity to raise the tablets and all of the powder upon the central section into body 106. However, air velocity within the larger cross-sectional area of body 106 is insufficient to draw the tablets upward along with the excess powder. Clean tablets 118, therefore, drop into container 116 whereas any entrained powder is exhausted and carried away, for example to apparatus for reclaiming and separating the individual constituents, for example, for reuse.

What is claimed is:

1. A powder-feeding and tablet pick-off apparatus for a pressing machine for forming tablets including layers of dissimilar powders, said apparatus comprising a rotating annular table, said table including apertures regularly spaced in a circular array disposed within a central ring-shaped area of said annular table, plunger means and associated synchronizing apparatus disposed above and below said table for passing through said apertures to compress powder deposited within said apertures into tablets, powder-feeding and scraper bar assemblies disposed in sliding contact with the top of said table at separate stations about its periphery, each of said scraper bar assemblies including a feeding pocket for receiving powder and directing it into successive apertures passing beneath it to permit said opposed plungers to compress said powder into tablets within apertures aligned with said plungers, powder storage means associated with said feeding pockets for feeding said dissimilar powders to said respective pockets, one of said scraper bar assemblies being constructed and arranged to divert powder disposed within an inner ring-shaped area of said annular table into its feeding pocket and back onto said inner ring-shaped area as sections of said table pass under it, the other of said scraper bar assemblies being constructed and arranged to divert powder deposited in an outer ring-shaped area of said annular table into its feeding pocket and back onto said outer ring-shaped area as sections of said table pass under it, and a vacuum pick-up means disposed in front of one of said scraper bar assemblies and including a pick-up tube whose mouth covers the entire width of said central ring-shaped area for abstracting said tablets and cleaning said central area of powder before the first of said dissimilar powders is deposited upon said central area to commence the process of formation of the first layer of one of said tablets, said vacuum pick-up means being confined between said inner and outer ring-shaped areas to avoid interference with said powders deposited thereon, and said vacuum pick-up means incorporating separating means for cleaning said tablets of any entrained powder.

2. An apparatus as set forth in claim 1 wherein said vacuum means is disposed in front of said scraper bar assembly which is operatively associated with an outer ring-shaped area of said annular table, said scraper bar assembly associated with said outer scraper bar assembly including a finger disposed in scraping contact with said outer ring-shaped area and inclined towards said feeding pocket for diverting powder from said outer ring-shaped area into said feeding pocket, and the rear end of said outer scraper bar assembly including a trailing finger disposed in sliding contact with the surface of said central area and extending diagonally across said central area towards said outer ring-shaped area and terminating within said ring-shaped area to divert excess power from said central area onto said outer area.

3. An apparatus as set forth in claim 2 wherein an auxiliary finger is disposed substantially parallel to said trailing finger to cooperate therewith in diverting powder to said outer area.

4. An apparatus as set forth in claim 2 wherein another scraper bar assembly is disposed between said outer scraper bar assembly and said pick-off means in the direction of rotation of said annular table and operatively associated with said inner and central ring-shaped areas, said inner scraper bar assembly including a structure defining a throat extending over said inner area and including a scraper bar forming a wall of said throat and extending from the inner circumference of said inner area to said pocket in sliding contact with the surface of said inner area for diverting powder deposited within said inner area into the feeding pocket of said inner scraper bar assembly, and said inner scraper bar assembly including a trailing finger disposed in intimate sliding contact with the surface of said annular table and extending towards and terminating within said inner area for diverting excess amounts of powder from said central ring-shaped area onto said inner ring-shaped area.

5. A powder-feeding and tablet pick-off apparatus for a

pressing machine for forming tablets including layers of dissimilar powders, said apparatus comprising a rotating annular table, said table including apertures regularly spaced in a circular array disposed within a central ring-shaped area of said annular table, plunger means and associated synchronizing apparatus disposed above and below said table for passing through said apertures to compress powder deposited within said apertures into tablets, powder-feeding and scraper bar assemblies disposed in sliding contact with the top of said table at separate stations about its periphery, each of said scraper bar assemblies including a feeding pocket for receiving powder and directing it into successive apertures passing beneath it to permit said opposed plungers to compress said powder into tablets within apertures aligned with said plungers, powder storage means associated with said feeding pockets for feeding said dissimilar powders to said respective pockets, one of said scraper bar assemblies being constructed and arranged to divert powder disposed within an inner ring-shaped area of said annular table into its feeding pocket and back onto said inner ring-shaped area as sections of said table pass under it, the other of said scraper bar assemblies being constructed

and arranged to divert powder deposited in an outer ring-shaped area of said annular table into its feeding pocket and back onto said outer ring-shaped area as sections of said table pass under it, a vacuum pick-up means disposed in front of one of said scraper bar assemblies and including a pick-up tube whose mouth covers the entire width of said central ring-shaped area for abstracting said tablets and cleaning said central area of powder before the first of said dissimilar powders is deposited upon said central area to commence the process of formation of the first layer of one of said tablets, said vacuum pick-up means includes a pick-up tube of relatively small cross-sectional area for providing sufficient air velocity to pick up tablets and powder, and said vacuum pick-up means includes a body of relatively large cross-sectional area for providing sufficient air velocity for carrying off said powder, but insufficient air velocity for carrying off said tablets which are allowed to drop and be collected.

References Cited in the file of this patent

UNITED STATES PATENTS

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2,798,443	Martell	July 9, 1957