

June 10, 1947.

G. C. MILLER

2,421,801

APPARATUS FOR FUSING THE COATING ON TABLETS

Filed Sept. 22, 1941

2 Sheets-Sheet 1

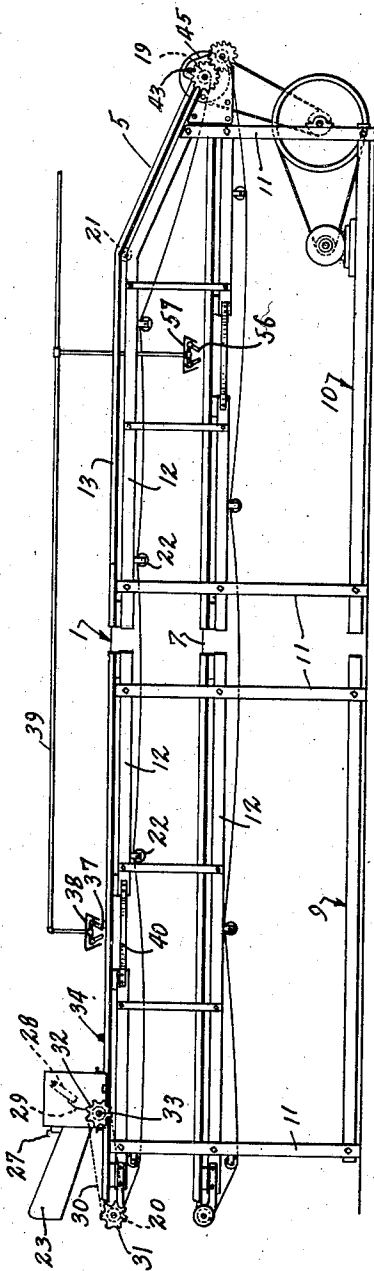


Fig. 1.

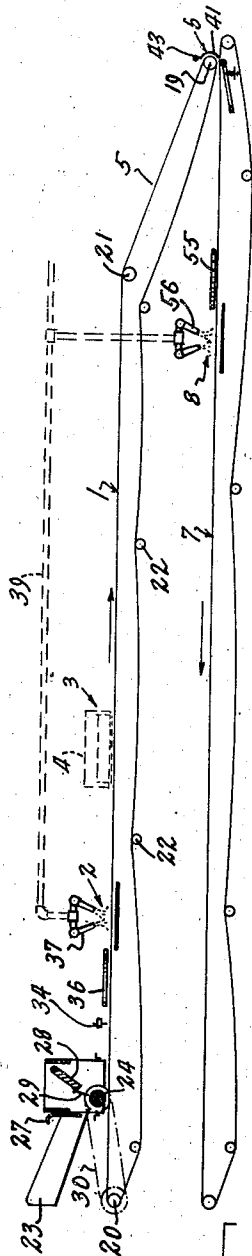


Fig. 2.

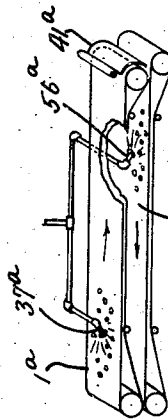
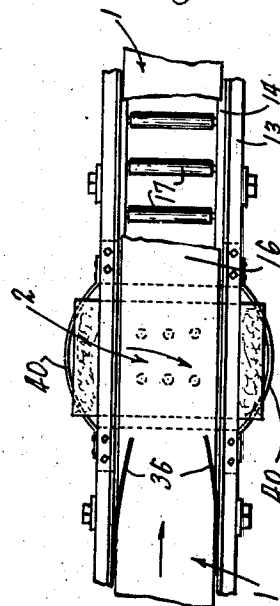


Fig. 3.



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2 Sheets-Sheet 2

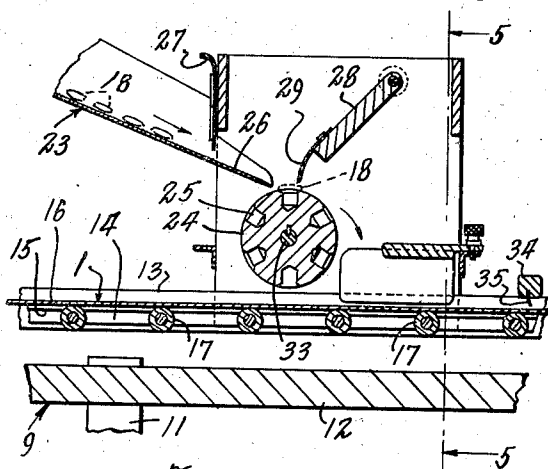


Fig. 4.

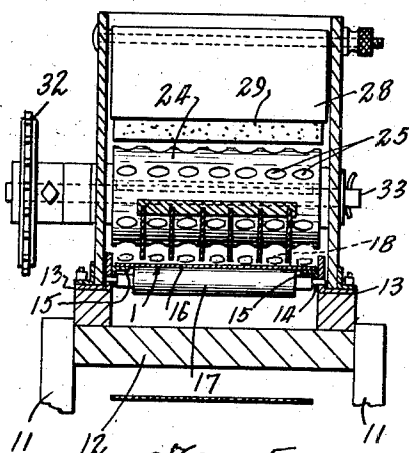


Fig. 5.

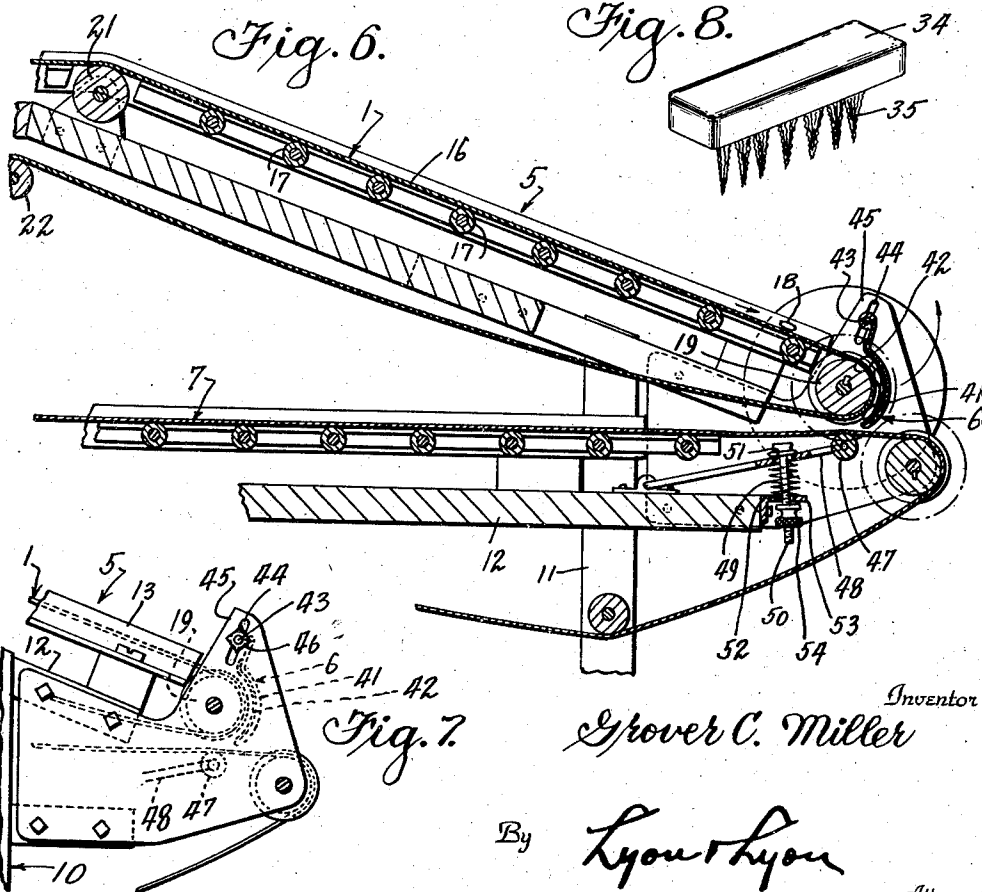


Fig. 6.

Fig. 8.

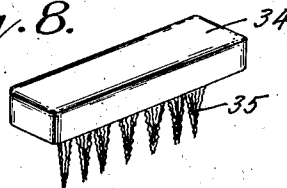


Fig. 7.

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APPARATUS FOR FUSING THE COATING
ON TABLETSGrover C. Miller, San Gabriel, Calif., assignor to
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6 Claims. (Cl. 91—2)

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This invention relates to an apparatus for fusing the coating of tablets or the like and is more particularly related to an apparatus for sealing by fusion a coating upon tablets of relatively small size and through the use of a continuously operating method. This invention is directly related to that invention disclosed in Letters Patent No. 2,011,586 granted August 20, 1935, for Method of applying coating to a medical preparation.

In the sealing of fusible coatings for medical preparations, a particular problem presents itself in maintaining the tablets, pills, or the like, separated and applying to the coating sufficient heat to fuse the surface of the coating upon all its surfaces without breaking down the coating.

In the handling of large quantities of such tablets or pills carrying such coatings, it is essential in order to obtain a requisite production that a continuously operating method and apparatus be devised which will enable the fusing of such coating to be carried on rapidly, continuously and inexpensively without liability of the coatings of the different tablets or pills fusing together and wherein provision is made that all portions of the coating are fused in order to seal the same.

While this invention is particularly related to that type of coating set forth in the Letters Patent granted to me, No. 2,011,587, August 20, 1935, it obviously is not limited in its applicability to such coating but is usable in connection with any coating where fusing of the surface is desired or required in order to seal the coating. In using the term "seal" in the above connection, I mean fusing the coating together in such manner as to provide a homogeneous coating through which water or moisture penetrates uniformly and as controlled by the constituent characteristics of the coating itself so that voids are voided through which water may pass independently of the constituent components of the coating. The foregoing statement, however, is merely illustrative of the problem as obviously the method and apparatus of the present invention is not limited in its applicability to use in connection with coatings which are dependent upon water penetration for their disruption.

It is therefore an object of this invention to provide an apparatus for fusing the coating upon pills or tablets, which apparatus is of the continuously operating type.

Another object of this invention is to provide an apparatus for the fusing of the coating upon pills or tablets which includes the distribution

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of the tablets in spaced relationship on a conveyor, applying a flame against the exposed surface of the coating upon the tablets to fuse the coating upon the exposed surface, permitting the fused coating to cool, and then inverting the tablets to render available the portion of the surface of the pills or tablets upon which the coating has not been fused, fusing that portion of the coating, and then allowing the tablets to cool so that the coating will set.

Another object of this invention is to provide an apparatus for the handling of small pills or tablets on a conveying means in spaced relationship so that the coating thereon may be fused, means for inverting the tablets while maintained in such spaced relationship so that the remaining portion of the coating may be fused.

Other objects and advantages of this invention it is believed will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is an elevation of the apparatus embodying my invention.

Figure 2 is a diagrammatic view illustrating the method embodying my invention.

Figure 3 is a fragmental plan of a portion of Figure 1 illustrating the fusing section of the apparatus.

Figure 4 is a fragmental sectional elevation of the feed and distribution means embodied in my invention.

Figure 5 is a sectional end view taken substantially on the line 5—5 of Figure 4.

Figure 6 is a fragmental sectional elevation of the inverting portion of the apparatus embodying my invention.

Figure 7 is a fragmental elevation of the inverting portion of my invention.

Figure 8 is a perspective view of a distributing means embodied in my invention.

Figure 9 is a diagrammatic view of a modified form of apparatus utilized for carrying out a modified method embodying my invention.

In carrying out the method embodying my invention, it is essential as illustrated in Figure 2 to distribute the tablets or pills having the coating thereon evenly upon the surface of a continuously operating conveyor 1 so that the tablets as distributed may be conducted under or through a flame zone 2 where a flame is played directly upon the exposed surface of the tablets to fuse the coating upon all portions of the exposed sur-

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face. By "exposed surface" I mean all the surface except that which is directly supported upon the conveyer 1. The exposed surface thus includes the ends and sides, or, if the tablet or pill is of substantially cylindrical or curved shape, the side walls. Before the tablets can be inverted or turned over to expose the portion of the surface not fused, it is necessary to allow the surface to cool and set so that when the now fused portion of the surface is supported upon a surface material, it will not adhere to that material. Either one or two alternatives may be resorted to to effect this rapid cooling, both of which I have indicated in Figure 2. If there is sufficient room for the installation of an apparatus, including a long conveyer 1, the conveyer may be of such length as to permit the cooling before the tablets are inverted. If it is necessary or desirable for any reason to accelerate the cooling, either because of limitations in space or because of the desirability of utilizing a relatively short conveyer 1, the tablets may be conducted through a cooling zone 3 wherein cooling is effected by such a medium as dry ice maintained in position over the conveyer 1 in a suitable container 4.

After the coating upon the pills or tablets has thus cooled to where it is no longer tacky, the tablets pass over a section of the conveyer 1 which may be inclined as indicated at 5, the extent of inclination, however, being insufficient to permit the tablets to slide over the conveyer surface or to bounce therealong as the conveyer is operated. The degree of inclination will of course depend upon the type of coating and the type of surface of the conveyer as well as the size of the tablets and their contour.

The tablets then pass through an inverting means 6 through which the individual tablets are inverted and maintained in spaced relationship and then pass onto a conveyer 7 on the surface of which the tablets are conducted through a second flame zone 8 where the flames are directed against that portion of the surface not previously fused to complete the fusing operation.

In order to permit proper handling of the tablets they are retained upon the conveyer 7 after leaving the flame zone 8 a sufficient period of time to permit the coating to set where it is no longer tacky. Of course as in the case of the conveyer 1, the length of the conveyer 7 would depend upon the cooling means utilized. If the cooling zone 3 is positioned immediately adjacent the flaming zone 8, the conveyer 7 may of course be shortened in length.

It is generally more economical where room permits to utilize the long conveyer rather than to have the additional expense requisite to maintaining the rapid cooling zone 3. The pills or tablets with the coating properly fused thereon are discharged from the conveyer 7 into any suitable form of hopper or may be packaged directly upon the conveyer.

The apparatus embodying my invention is preferably of the following construction:

A pair of frames 9 and 10 are spaced in end to end relationship and in alignment. Each of the frames includes a plurality of uprights 11 supporting spaced apart horizontally disposed side bars 12 upon which angles 13 are secured. Secured to the inner face of the angles 13 are angles 14, the horizontal portions 15 of which are at the top and provide edge supports for the belts 16 of the conveyers 1 and 7. Mounted between the angles 13 are rollers 17 spaced apart throughout the extent of the belt 16 in their

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upper runs to maintain the upper supporting surfaces of the belts horizontal throughout the portion of the travel where they carry the pills or tablets 18. The rollers 17 are closely associated along the said portion of the belt 16 as indicated in Figure 4.

The belts 16 are of the continuous type and are trained over driven belt pulleys 19 at one end and the idler pulleys 20 at their opposed ends. The belt 16 of the upper conveyer 1 is also passed over the idler pulley 21 spaced away from its driven pulley 19 a sufficient distance to determine the angle of inclination of inclined conveyer section 5. Idler pulleys 22 are provided for supporting the lower run of the continuous belts 16. The frames 9 and 10 may be moved apart a sufficient distance to tension the conveyer belts 16. Means are provided for distributing the tablets or pills 18 upon the upper surface of the belt 16 of the conveyer 1 and are herein illustrated as including a hopper 23 into which the previously coated pills or tablets are placed and through which the same are fed onto the distributing roll 24 having a plurality of spaced apart surface indentations 25 spaced both radially around the circumference of the roll 24 and along the length thereof.

The discharge chute 26 of the hopper 23 is closely associated with the surface of the roller 24 so that the pills 18 passing from the hopper 23 slide easily upon the surface of the roll 24. A gate 27 is provided for arresting the flow of pills 18 from the hopper 23.

In order to insure even distribution of the pills 18 in the indentations 25 of the roller 24, a distributor 28 is provided which carries a rubber lip 29 which extends down toward the surface of the roller 24 to be impinged by any tablets 18 tending to ride upon the roller 24 which are not positioned within the indentations 25. The lip 29 thus prevents any tablet or pill 18 from passing with the roller 24 which is not properly positioned in its indentation 25. The roller 24 is driven in timed relationship with the belt 16 of the upper conveyer 1 by means of a chain or belt 30 trained over a sprocket 31 carried by the shaft supporting the idler roller 20 also passing over a sprocket 32 secured to the shaft 33 upon which the roller 24 is supported. As the roller 24 rotates the tablets are deposited upon the upper surface of the belt 16 of the conveyer 1 in spaced apart relationship both longitudinally and laterally of the surface of the said belt 16. Means are provided for insuring that no one tablet overlies another, which means include a brush 34 carrying rather stiff bristles 35 as, for example, wire bristles, which are spaced above the surface of the belt 16 of the conveyer 1 sufficiently to engage any tablet tending to ride one over the other. In the event any tablet is riding upon the surface of the belt 16 of the conveyer 1 too close to the edge thereof to pass properly through the flame zone 2, guides 36 are provided which move the said tablets in toward the center of the belt surface to properly locate the same within the flame zone 2.

The means providing the flame in the flame zone 2 may be ordinary gas burners indicated at 37 mounted within a hood 38 and supplied with gas from a supply conduit 39. Gas burners are set to throw a rather long flame of relatively low velocity so that the flame reaches all surfaces of the pills or tablets 18 which are not directly supported upon the surface of the conveyer. At the flame zone 2 the horizontal bars

12 of the frame are interrupted, particularly if formed of wood, and the spaced bars 12 are connected by connecting strips 46 formed of metal. The tablets thus fused in the flame zone 2 pass along with the belt 16 and are cooled upon the surface of the belt either through the use of a cooling medium as, for example, the dry ice box 4 or by the air, if the conveyor 1 is of a sufficient length, to where they pass down the incline section 5 to the inverting means 6. The inverting means 6 is preferably of the following construction and includes a curved inverting shield 41 curved to substantially conform with the curvature of the driven roller 19 and having upon its inner surface a surface covering 42 formed of felt or other similar material. In order to accommodate for this thickness of the tablets 18, the inverting shield or guide 41 is adjustably supported upon a pin 43 mounted in slots 44 formed in the side plates 45. The guide or shield 41 is pivotally mounted upon the supporting pin 43 and is adapted to be held in adjusted pivoted position by means of a locking nut 46.

The curved shield or guide 41 is positioned away from the surface of the belt 16 of the conveyor 1 sufficiently to permit the tablets 18 to pass through the space provided but sufficiently close, depending upon the thickness of the tablets 18, to prevent the tablets from turning over. Thus as the tablets 18 pass around the driven roller 19 and along the inner surface of the covering 42 of the curved guide 41, they are moved to position where they will drop upon the upper surface of the belt 16 of the conveyor 7 in inverted position.

Means are provided for maintaining definite positioning of the belt 16 of the conveyor 7 with relation to the end of the guide 41 to prevent the pills or tablets 18 from turning over when they are dropped upon the surface of the conveyor 7, which means includes an idler roller 47 which is supported upon an arm 48 pivoted upon the frame bar 12.

A spring 49 normally urges the idler roller 47 into tensioning position against the under surface of the belt 16 of the conveyor 7 and means are provided for determining the extent at which the conveyor is tensioned at this point, thereby determining the extent at which the belt is moved upwardly toward the discharge end of the guide 41.

This means includes a pin or bolt 50 which is passed through a slot 51 formed in the arm 48 and upon which the spring 49 is mounted. The opposite end of the bolt 50 passes through a hole 52 in an angle 53, and a thumb nut 54 is threaded to the bolt 50 to enable proper adjustment of the bolt 50 to determine the limit to which the roller 47 may be thrust against the under surface of the belt 16 of the conveyor 7.

Leaving the inverting mechanism 6, the tablets 18 travel along the upper surface of the belt 16 of the conveyor 7 by an edge guide 55 similar in construction and function to the edge guide 36, and through the flame zone 8 including burners 56 mounted within a hood 57 similar in construction and operation to the burners 37 and hood 38. Leaving the flame zone 8 the tablets pass with the conveyor 7, being properly cooled as hereinabove set forth, to a suitable point of discharge or packaging. The flame created in the flame zone 8 fuses the portion of the surface heretofore covered by the belt 16 of the conveyor 1 and such additional portion of the coating as is required to seal the coating.

In the modified form of my invention as illustrated in Figure 9, I have diagrammatically illustrated the method of carrying out my invention wherein the tablets or pills are coated with, or the coating is sealed with, a sealing material such as one of the cellulose acetate compounds, duco, nitrocellulose, or similar material, as, for example, is specifically set forth in my Patent No. 2,011,586 as one of the modifications thereof. Also a coating similar to that disclosed in my said patent composed of a water-absorbing material, the rate of absorption of which is retarded through the use of waxes and oils, may be sealed further to retard the rate of water absorption by the use of such varnish-like or sealing material.

In carrying out the modification of my invention, the tablets having the coating thereon or to be coated are placed upon the conveyor 1^a through the use of any suitable form of distributing means and are conducted under a spray 37^a of said coating material, i. e., cellulose acetate, duco, nitro-cellulose, or the like. The conveyor 1^a is made of a sufficient length to permit this coating or sealing compound to dry before reaching the inverting guide 41^a at the end of the conveyor 1^a, which guide 41^a may be of a construction similar to the guide 41 and have a similar mode of operation. The tablets or pills are thereby inverted as they fall upon the second conveyor 7^a and are conducted under a second spray nozzle 56^a where the portion of the surface of the pills or tablets, or the coating carried thereon, that was previously in contact with the conveyor 1^a is coated. The conveyor 7^a may also be of a length sufficient to permit the coating to harden before the tablets or pills are discharged therefrom.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In an apparatus of the character described, the combination of a tablet feed means including a spacing roller, a conveyor upon which tablets are delivered in spaced relationship by the spacing roller, a flame producing means, means for driving the conveyor to conduct the spaced tablets through the flame and for conveying the tablets until the fused coating is cooled, means for inverting the tablets, a second conveyor upon which the tablets are deposited by the inverted means in inverted position, and a second flame producing means, and means for driving the conveyor to conduct the tablets through the flame produced by the second flame producing means.

2. In an apparatus of the character described, the combination of a feed means operative to space tablets upon a moving support, a flame means, means for moving the support whereby the tablets are conducted through the flame, a tablet inverting means, and a second coating fusing means.

3. In an apparatus for sealing a fusible coating upon a tablet or pill, the combination of means for supporting and conveying the tablets or pills, means for spacing the tablets or pills apart upon the conveying means, a flame producing means operative to produce a flame through which the tablets are conducted to fuse the unsupported coating of the tablets or pills, means for inverting the tablets after the fused coating has been cooled, and a second flame producing means through the flame of which the tablets or pills are conducted in inverted position to complete the fusing of the

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coating, means for conducting the tablets through the second flame producing means.

4. In an apparatus for sealing a fusible coating upon a tablet or pill, the combination of means for supporting and conveying the tablets or pills, means for spacing the tablets or pills apart upon the conveying means, a flame producing means operative to produce a flame through which the tablets are conducted to fuse the unsupported coating of the tablets or pills, means for inverting the tablets after the fused coating has been cooled, a second flame producing means through the flame of which the tablets or pills are conducted in inverted position to complete the fusing of the coating, said inverting means including a guide member adapted to cooperate with the conveying means to invert the tablets between the heating means, means for conducting the tablets or pills through the second flame producing means.

5. In an apparatus of the character described, the combination of an endless conveyer, means for spacing the tablets or pills apart upon said conveyer both longitudinally and laterally of the conveyer, means for spacing any tablet tending to ride upon another tablet upon the conveyer, a flame producing means positioned over the conveyer to direct a flame against the tablets upon the conveyer, a pulley for supporting the endless conveyer, an inverting means including a curved guide to cooperate with the endless conveyer and pulley in maintaining the tablets upon the conveyer as it passes around the pulley, a second conveyer to which the tablets are delivered from the said guide means and first conveyer in inverted position, and a flame producing means positioned over the second conveyer to direct a flame against the portion of the coating of said tablets previously in contact with the first conveyer.

6. In an apparatus of the character described, the combination of an endless conveyer, means for spacing the tablets or pills apart upon said conveyer both longitudinally and laterally of the conveyer, means for spacing any tablet tending to ride upon another tablet upon the conveyer, a

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flame producing means positioned over the conveyer to direct a flame against the tablets upon the conveyer, a pulley for supporting the endless conveyer, an inverting means including a curved guide to cooperate with the endless conveyer and pulley in maintaining the tablets upon the conveyer as it passes around the pulley, a second conveyer to which the tablets are delivered from the said guide means and first conveyer in inverted position, and a flame producing means positioned over the second conveyer to direct a flame against the portion of the coating of said tablets previously in contact with the first conveyer, and means for adjusting the position of the second conveyer with respect to and adjacent to the said guide means.

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REFERENCES CITED

20 The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
25 1,742,346	Fischer	Jan. 7, 1930
895,856	Harton	Aug. 11, 1908
2,011,586	Miller	Aug. 20, 1935
1,138,356	Conte	May 4, 1915
2,205,317	Studebaker	June 18, 1940
30 2,157,313	Alles	May 9, 1939
1,955,491	Galbreath	Apr. 17, 1934
398,651	Peters	Feb. 26, 1889
458,557	Bennett	Sept. 1, 1891
526,166	Stark	Sept. 18, 1894
35 1,314,606	Powell et al.	Sept. 2, 1919
1,574,178	Sterzing	Feb. 23, 1926
1,672,522	Greer et al.	June 5, 1928
1,761,065	Bausman	June 3, 1930
1,777,276	Kegel	Sept. 30, 1930
40 1,891,908	Bernotow	Dec. 27, 1932
2,260,686	Segrin	Oct. 28, 1941
764,810	Jefferson	July 12, 1904
1,226,824	Steely	May 22, 1917
1,312,815	Taliaferro	Aug. 12, 1919