

April 28, 1970

M. A. MEIER ET AL
CAPSULE REJECTION MEANS

3,508,647

Filed May 27, 1968

2 Sheets-Sheet 1

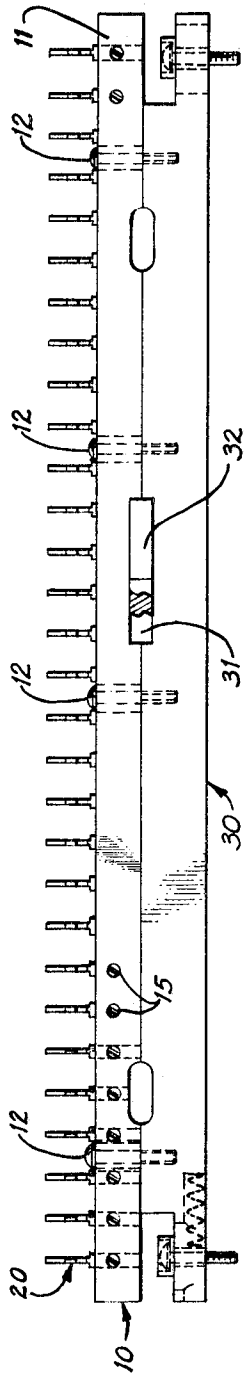


Fig. 1

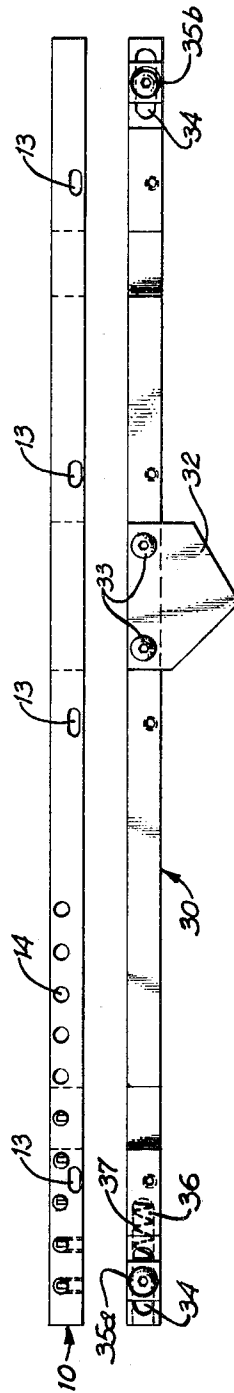


Fig. 2

INVENTOR,
MILTON A. MEIER, &
BY RAYMOND SHAFER
David B. Ehringer
ATTORNEY

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2 Sheets-Sheet 2

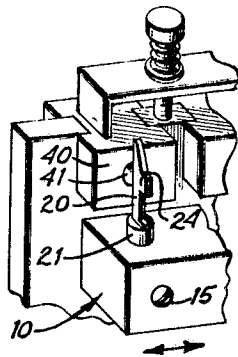


Fig. 3

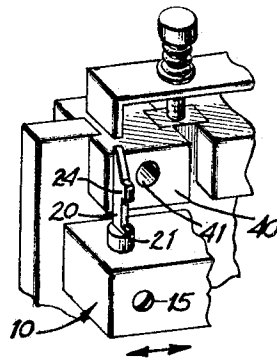


Fig. 4

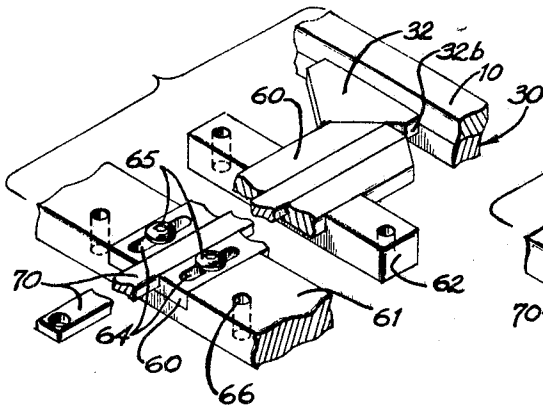


Fig. 5

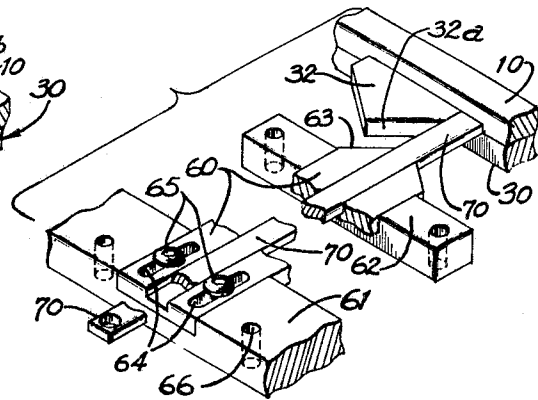


Fig. 6

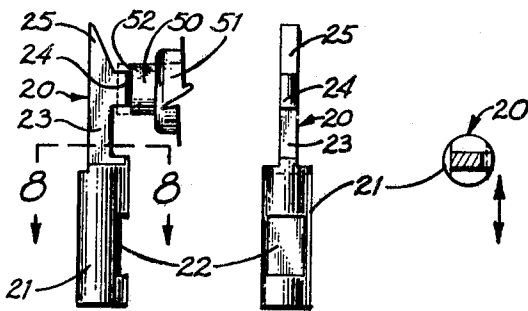


Fig. 7a Fig. 7b Fig. 8

INVENTOR.
MILTON A. MEIER, &
RAYMOND SHAFER
BY David B. Ehrhinger
ATTORNEY

1

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CAPSULE REJECTION MEANS

Milton A. Meier, Detroit, and Raymond Shafer, Lincoln Park, Mich., assignors to Parke, Davis & Company, Detroit, Mich., a corporation of Michigan
 Filed May 27, 1968, Ser. No. 732,219
 Int. Cl. B07c 5/06

U.S. Cl. 209—73

12 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus and means applicable to capsule making machinery of the Colton type are provided for discriminating between standard-length and over-length capsule parts being produced and for rejecting any such over-length parts. Rejection is accomplished prior to final assembly by means of cycle-phase mechanical fingers engaging and destroying over-length capsule parts.

This invention relates to mechanisms and means for producing hard shell capsules for pharmaceuticals and the like and is more particularly an improvement in capsule production apparatus and means described in the patent to Arthur Colton; U.S. 1,787,777 dated Jan. 6, 1931.

In the Colton patent, apparatus is described for forming the cap and body parts of hard shell gelatin capsules, for assembling these cap and body parts as empty joined capsules, and for discharging the assembled capsule from the apparatus. The capsule bodies and caps are separately formed from a gelatinous film or coating which is applied to dip-molding pins supported in a row on a bar, hardened on the pins and then removed. In the process after the capsule bodies and caps are removed from the pins, the bodies and caps are trimmed to accurate length dimension and then assembled together temporarily prior to filling, printing, etc.

Whereas such an apparatus has generally been satisfactory for the production of capsules of the kind described, from time to time it happens that an over-length capsule is produced (whether due to faulty trimming or the like). Any such capsules, especially the so-called "opaque" capsules, are difficult to inspect for quality control purposes since they closely resemble and would easily pass for the acceptable article with the result that the capsule ordinarily goes unnoticed until the printing or filling operations, particularly where the printing or filling equipment employed is of a type that will not accept capsules of greater length than the standard length. In this case the operation must be interrupted long enough to remove the defective capsule by hand or make other similar adjustment. In this way valuable time, materials, etc. are unavoidably lost.

It is therefore an object of the present invention to provide apparatus and means for producing capsules using standard capsule production machinery which apparatus and means will in process selectively reject any capsule parts exceeding standard length.

It is also an object of the invention to provide means, and particularly economical means, for detecting and rejecting overlength capsule parts in a standard production machine prior to the final assembly of the capsule parts.

It is a further object of the invention to provide apparatus and methods for the quality control of capsules being produced to avoid subsequent problems in the printing and filling of the empty capsule parts produced.

It is a still further object of the invention to provide capsule inspection apparatus and means which can be adjusted as desired to inspect and reject capsule parts of varying lengths and sizes.

2

Other features, objects and purposes of the invention will be seen in the following description and the accompanying drawings in which:

FIGURE 1 is a side view of a holder bar assembly with its associated array of rejection fingers according to the invention;

FIGURE 2 is a top view of component parts of the assembly shown in FIGURE 1;

FIGURES 3 and 4 are perspective views of a portion of the guide block assembly of a capsule production machine showing in detail a portion of the associated bar assembly of FIGURE 1;

FIGURES 5 and 6 are perspective views, fragmented in part, illustrating certain phasing elements of a preferred embodiment of the invention including cam pusher means and associated guide means;

FIGURE 7a is a side view of a rejection finger according to the invention;

FIGURE 7b is a front elevation of the rejection finger of FIGURE 7a; and

FIGURE 8 is a sectional view of the rejection finger taken at line 8—8 of FIGURE 7a.

Referring in detail to the drawing, a preferred form of the rejection assembly 10 of FIGURE 1 includes the holder bar 11 on which is mounted a row of rejection fingers or finger means 20. The holder bar is supported by cam bar 30 and is removably attached to the cam bar by the screws 12 fitted into the mounting slots 13. The holder bar 11 contains as shown 30 colinear vertical channels 14. Each channel 14 is adapted to receive a rejection finger 20. The position and orientation of each finger are determined by set screw means 15 or the like cooperating with cutaway flat 22. The finger 20, shown in detail in FIGURES 7a, 7b and 8, includes a generally cylindrical base 21 and the mentioned flat 22. In line with the central axis of the finger is an upstanding shank portion 23 which includes an outwardly flaring boss 24 in a line generally perpendicular to the flat 22. The shank 23 also includes the spike portion 25 extending upwardly from the boss 24. The spike advantageously serves to prevent random seating of capsule parts on shank 23. For mounting in the holder bar 11 the base 21 of the rejection finger 20 is inserted into the vertical channel 14 to the point where flat 22 coincides with the set screw 15. At this position the set screw 15 is locked into the flat to insure that the finger 20 and its boss 24 are in correct alignment. The finger 20 can according to the invention have any of various configurations and is not limited to the preferred embodiment described. In general, any configuration is suitable which includes a capsule contacting surface moving in and out of the path of a capsule in a manner equivalent to the boss 24. For example, one such equivalent is one having the shank portion 23 but, by way of substitution, having a receiving channel (instead of boss 24) adapted to circumscribe the over-length portion of an oncoming capsule.

The cam bar 30 adjustably supports the holder bar 11 and includes with the holder bar a slotted recess 31 to receive cam plate 32. The cam plate is removably mounted on the cam bar by screw means 33 or similar means. The cam bar 30 also includes mounting slots 34 to permit adjustable attachment to the pedestal (not shown) of a standard Colton capsule production machine or similar machine by means of anchoring screws 35a and 35b. Adjacent to screw 35a is a tubular recess 36 adapted to receive tension control spring 37.

The rejection assembly 10 in closed position is illustrated as at FIGURE 3 where the rejection finger stands immediately in front of the guide block means 40 where it intersects the path of travel of the capsule part of the guide block means and blocks entry to guide channel 41. The position of the rejection assembly 10 in the closed

3

position referred to is that represented in FIGURES 1 and 2 where the control spring 37 is in an uncompressed condition. FIGURE 4 shows the rejection finger 20 in the open position. In the latter position the rejection finger has been displaced from the position shown in FIGURE 3 by reciprocation of the holder bar 11 from right to left. Reciprocation of the holder bar is accomplished by the cam pusher mechanism shown in FIGURES 5 and 6. This mechanism includes cam pusher 60 and cam pusher bracket 61 and strap 62. The cam elements preferably are made of tool steel whereas cold rolled steel is suitable for other elements of this and other mechanisms herein described. The cam pusher has camming surfaces 63 for slanting contact (preferably at a 45° angle) with corresponding cam portion 32a of cam plate 32. The opposite end of the cam pusher includes slots 64 for adjustable mounting of the cam pusher 60 with cam pusher bracket 61 by set screw means 65. The cam pusher bracket 61 in turn is attached by screw means 66 to the collet mounting (shown in the Colton patent) so that the cam pusher assembly moves in phase with the collet assembly.

The cam pusher mechanism also includes the catch rod 70 shown in FIGURES 5 and 6. The catch rod is removably fixed to the ejector rod mounting (shown in the Colton patent) for movement in phase with the ejector rod assembly. Also, the catch rod is slidably mounted on the cam pusher 60 as shown to accommodate relative shifting motion to and from the positions shown in FIGURES 5 and 6.

OPERATION

The operation of the apparatus of the invention will be understood in relation to the working of a conventional capsule making machine of the Colton type.

In the normal cycle of a capsule production machine, the capsule part is formed by dipping the mold pin in gelatin and drying the shell formed. The dried shell is then processed by the so-called automatic unit which strips the shell from the pin and trims and joins the capsule parts. The present invention is applicable, as indicated, to either capsule bodies or capsule caps. In the nature of the inspection problem, however, the invention is particularly useful for processing capsule bodies. It will be realized in this connection that the apparatus and operation on the body and cap sides of the machine are in principle equivalent. In this context and in greater detail, referring to operation with a capsule body, the empty capsule body part 50, having been stripped from the capsule pin, is supported by the collet means 51, trimmed, elevated and advanced toward the guide block 40 where it assumes the position shown in FIGURE 7a. In its advance to the latter position, the advancing motion is in phase with the inward motion of the collet and collet mounting (not shown) which mounting serves as a guiding and driving support for the apparatus shown in FIGURES 5 and 6. The latter mounting, which is integral with the collet, moves inward with respect to the cam plate 32 so that, as the collet means 51 advances with its capsule part 50, the camming surface 63 contacts the cam plate 32 and its camming surface 32a thereby causing the rejection assembly 10 with its holder bar 11 and cam bar 30 to move the rejection finger 20 from right to left from the closed position of FIGURE 3 to the open position of FIGURE 4, as indicated by the double arrows.

While the rejection finger is in the open position, the collet 51 freely inserts the capsule part into the guide block 40 and the ejector rod is turned and advances inward to the guide block in conventional fashion to eject the body from the guide block with its matching assembled cap part. Since at this time the collet assembly begins to retract from the guide block in timed relation, the invention includes catch rod 70 which in phase with the inward advance of the ejector rod is caused to correspondingly advance to the position shown in FIGURE 6 where

4

it catches the trailing edge 32b of the cam plate 32 and holds the control spring 37 under compression and prevents the premature return of the rejection assembly 10 from the open position of FIGURE 4 to the closed position of FIGURE 3. In the former position and as seen in FIGURE 6, the cam pusher 60 by virtue of its attachment to the now retracting collet mounting (not shown) is being retracted to its original position away from the cam plate 32. Finally, as the ejector rod in the conventional way is retracted from the guide block means 40, the catch rod 70 is correspondingly drawn back away from the trailing edge 32b of cam plate 32 whereupon the control spring 37 being under compression causes the cam bar 30 and its associated holder bar 11 and rejection fingers 20 to shift from left to right to the closed position as illustrated in FIGURE 3.

Referring in greater detail to FIGURE 7a according to a preferred embodiment of the invention, when the collet means 51 carries the capsule part 50 to the rejection finger 20 in closed position and when the capsule part 50 exceeds the standard length as represented by the extension shown by the dotted line, the boss portion 24 of the rejection finger lies within the open end of the capsule part 50 and is surrounded by the encircling capsule wall. Thus, when the ejection finger is suddenly shifted from the closed position (FIGURE 3) to the open position (FIGURE 4) the boss portion 24 contacts the capsule wall with destructive force and, as is the usual result, breaks open and tears the wall portion and/or results in dislodging the capsule from its collet support means 51 to the extent that the capsule part is prevented from subsequent joining into the channel 41 of the guide block. On the other hand, when the capsule part 50 is of the standard length, so that the capsule end shown as 52 just clears the adjacent surface of boss 24, the sudden reciprocation of holder bar 11 and its rejection fingers does not harm the capsule part. The latter in turn is safely delivered by the collet means 51 in conventional fashion to the guide block means 40 for assembly. In other words, the adjustment of the cooperating parts of the mechanism can be precisely controlled so that the standard capsule parts, i.e., parts having the standard length being produced, will just clear the work surface of the rejection finger during the course of travel of the capsule part in the described area to the guide block 40. The standard capsule parts therefore are allowed to pass for final assembly. On the other hand, capsule parts exceeding standard length by even the slightest dimension are caught by the rejection finger and damaged to the extent that they fail to join in normal fashion, are automatically rejected or are singled out as defective, etc.

The foregoing description includes the various details of illustrative embodiments of the invention. It will be realized, however, that considerable variation of such detail can be made.

We claim:

1. Apparatus of the kind described for capsule production operable in a continuous predetermined cycle for selectively passing standard capsule parts and for rejecting long capsule parts, comprising:

guide block means for receiving and joining matching open-ended capsule parts,

collet means for supporting and imparting motion to individual capsule parts in succession and in timed relation along a continuous path from a work station to the guide block means,

finger means between the work station and guide block means operative in a first position to intersect the path of travel of oncoming capsule parts and in a second position to retract out of the path, and

means for advancing the finger means to and from the first and second positions in timed relation to the travel of each capsule part, the advancing means being operative to cause the finger means to assume the first position and intersect the path of travel for

a period at least just prior to the time corresponding to the arrival of the leading edge of each standard capsule part and to cause the finger means to retract thereafter from the first position for a period corresponding at least to the time required for passage of a standard capsule part, the finger means for retraction from the first position being adapted to move clear of standard capsule parts but to contact and destroy long capsule parts whereby the long capsule parts are rejected.

2. Apparatus according to claim 1 adapted for handling capsule body parts.

3. Apparatus of the kind described for capsule production operable in a continuous predetermined cycle for selectively passing standard capsule body parts and for rejecting long capsule body parts, comprising:

guide block means for receiving and joining matching open-ended capsule parts,

collet means for supporting and imparting motion to individual capsule body parts in succession and in timed relation along a continuous path from a work station to the guide block means, the collet means being adapted to bring the parts with open end first to the guide block means,

finger means between the work station and guide block means operative in a first position to intersect the path of travel of oncoming capsule body parts and in a second position to retract out of the path, and means for advancing the finger means to and from the first and second positions in timed relation to the travel of each capsule body part, the advancing means being operative to cause the finger means to assume the first position and intersect the path of travel for a period at least just prior to the time corresponding to the arrival of the leading edge of each standard capsule body part and to cause the finger means to retract thereafter from the first position for a period corresponding at least to the time required for passage of a standard capsule body part, the finger means for retraction from the first position being adapted to move clear of standard capsule body parts but to contact and destroy long capsule body parts whereby the long capsule body parts are rejected.

4. Apparatus according to claim 3 wherein the finger means is supported by a cam-actuated holder bar.

5. Apparatus according to claim 4 wherein the holder bar is adapted for movement to and from the first and second positions by means of a cam pusher.

6. Apparatus according to claim 5 which includes catch rod means for maintaining the holder bar in the second position independent of the cam pusher.

7. Apparatus according to claim 3 wherein the finger means includes an upstanding shank portion.

8. Apparatus according to claim 7 wherein the finger means includes the combination of a shank portion and an outwardly flaring boss.

9. Apparatus according to claim 7 wherein the finger means includes the combination of a shank portion, an outwardly flaring boss and a spike portion extending upwardly from the boss.

10. Process for producing capsules in a continuous predetermined cycle including the steps of selectively passing standard capsule parts and rejecting long capsule parts, comprising:

supporting and imparting motion by collet means to individual capsule parts in succession and in timed relation along a continuous path from a work station to guide block means,

causing finger means in a first position located between the work station and guide block means to intersect the path of travel of oncoming capsule parts and to retract out of the path of the capsule parts into a second position, and

advancing the finger means to and from the second position in timed relation to the travel of each capsule part so as to cause the finger means to assume the first position and intersect the path of travel for a period at least just prior to the time corresponding to the arrival of the leading edge of each standard capsule part and to cause the finger means to retract thereafter from the first position for a period corresponding at least to the time required for passage of a standard capsule part, the finger means for retraction from the first position being adapted to move clear of standard capsule parts but to contact and destroy long capsule parts whereby the long capsule parts are rejected.

11. Process according to claim 10 wherein the capsule parts are capsule body parts.

12. Process according to claim 10 wherein the finger means includes an outwardly flaring boss and the said boss is disposed in the first position within the open-end of long capsule parts and brought into destructive contact with the capsule part while moving from the first position to the second position.

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ALLEN N. KNOWLES, Primary Examiner

U.S. Cl. X.R.

209—74, 90