Feb. 22, 1944. A. WEISENBURG 2,342,504

SPOT APPLYING PROCESS FOR CAPS

Original Filed April 16, 1941 4 Sheets-Sheet 1

Fig. 1.

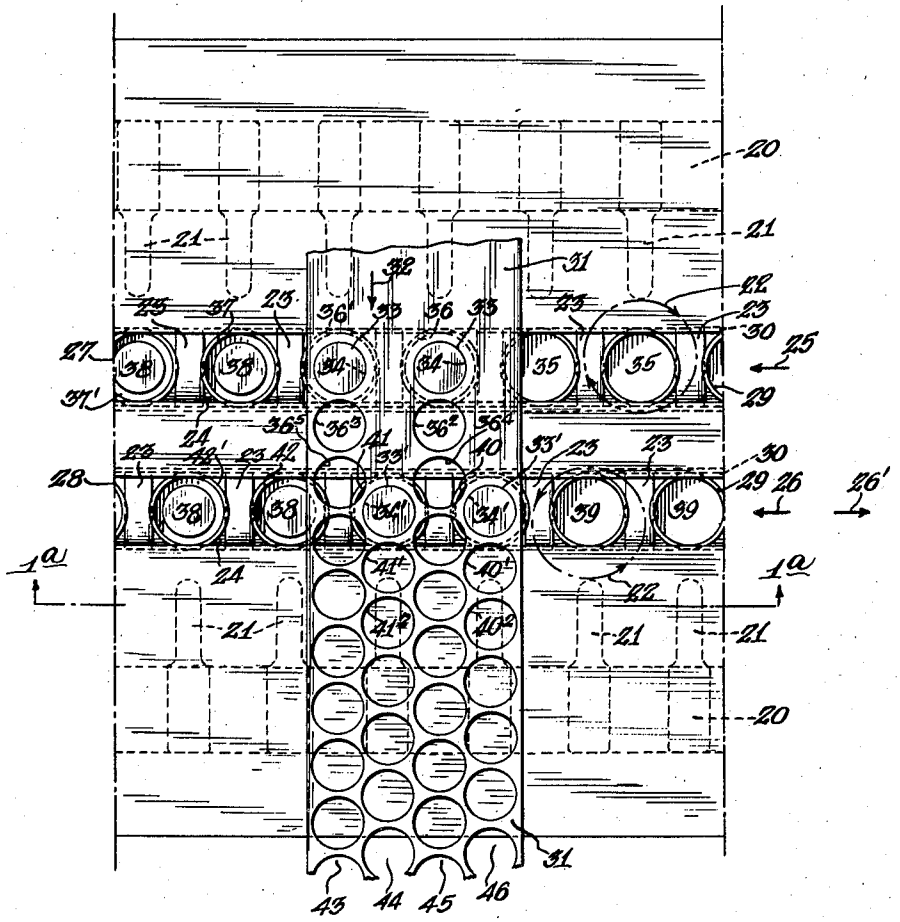
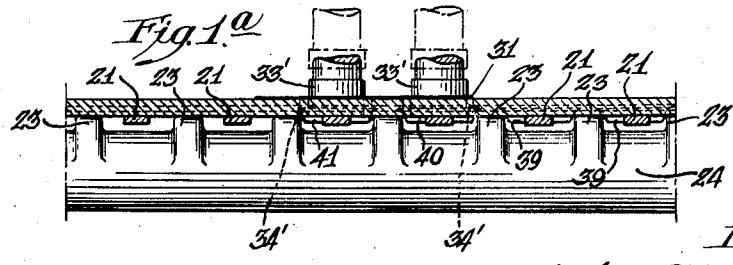


Fig. 1a



Inventor:
Andrew Weisenburg
by Steel Jackson and Son
Attorneys.

Witness:
Walter Chum

Feb. 22, 1944. A. WEISENBURG 2,342,504

SPOT APPLYING PROCESS FOR CAPS

Original Filed April 16, 1941 4 Sheets-Sheet 2

Fig. 2.

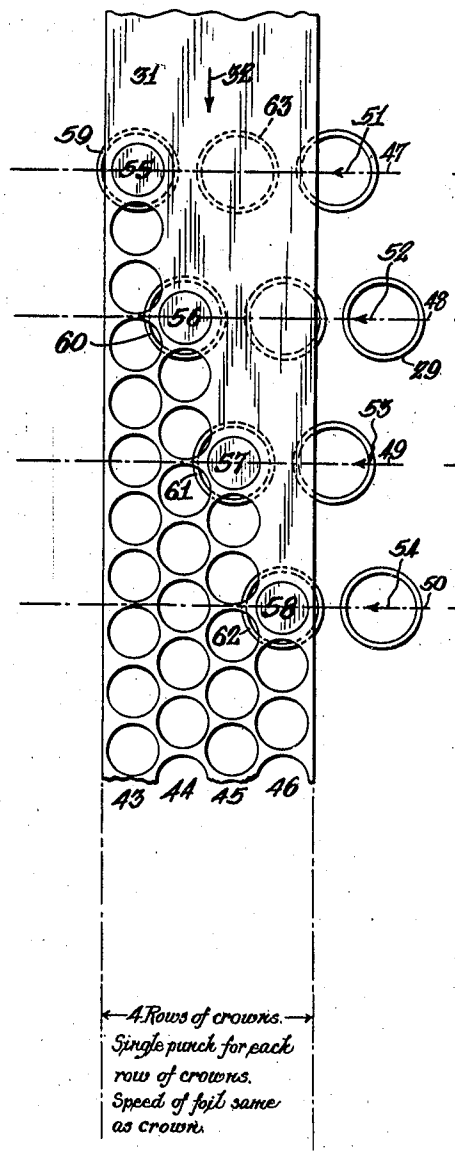
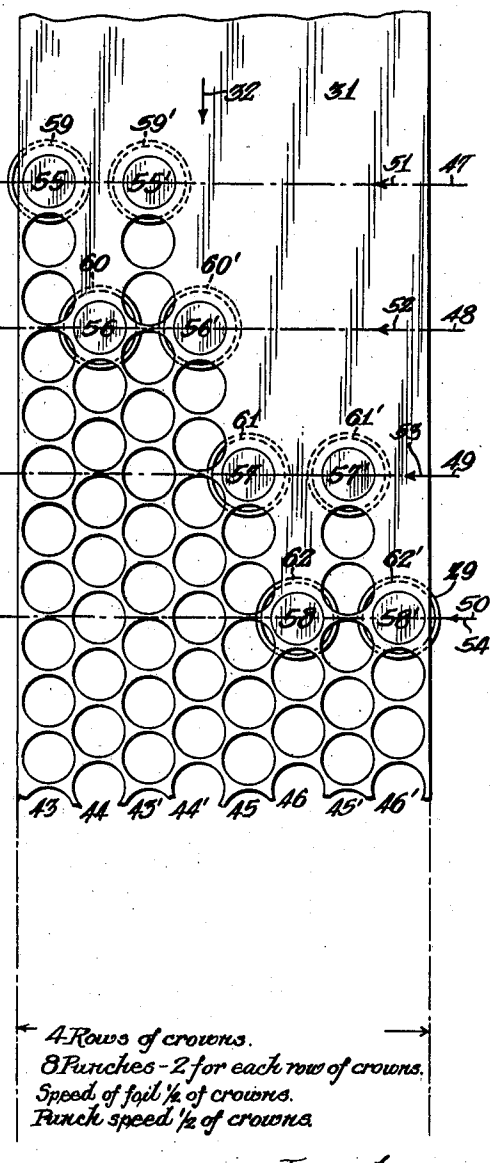


Fig. 3.



Inventor
Andrew Weisenburg
by Stull Jelin and Son
Attorneys.

Witness:
Walter Chism.

Feb. 22, 1944. A. WEISENBURG 2,342,504

SPOT APPLYING PROCESS FOR CAPS

Original Filed April 16, 1941 4 Sheets-Sheet 3

Fig. 4.

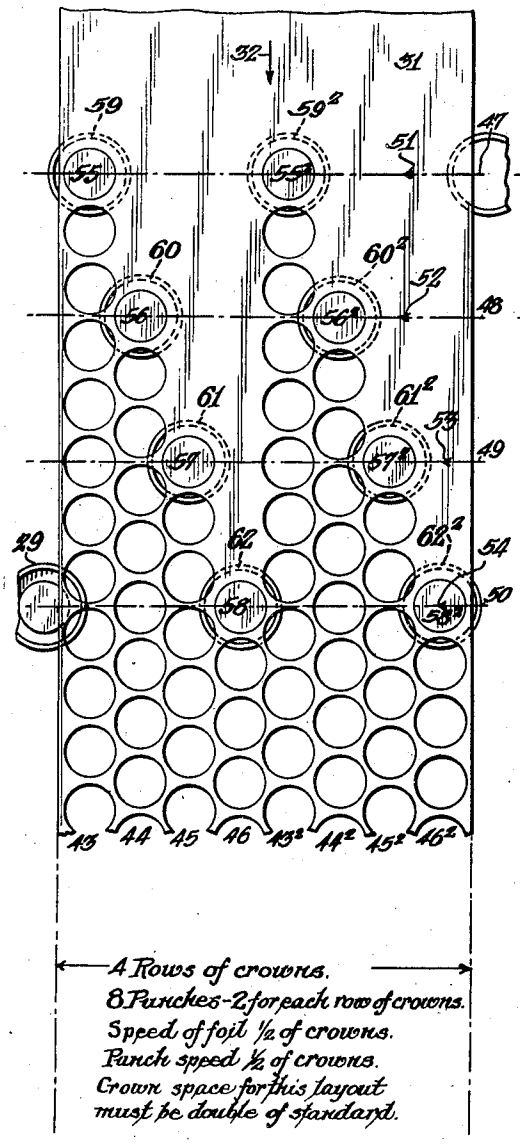
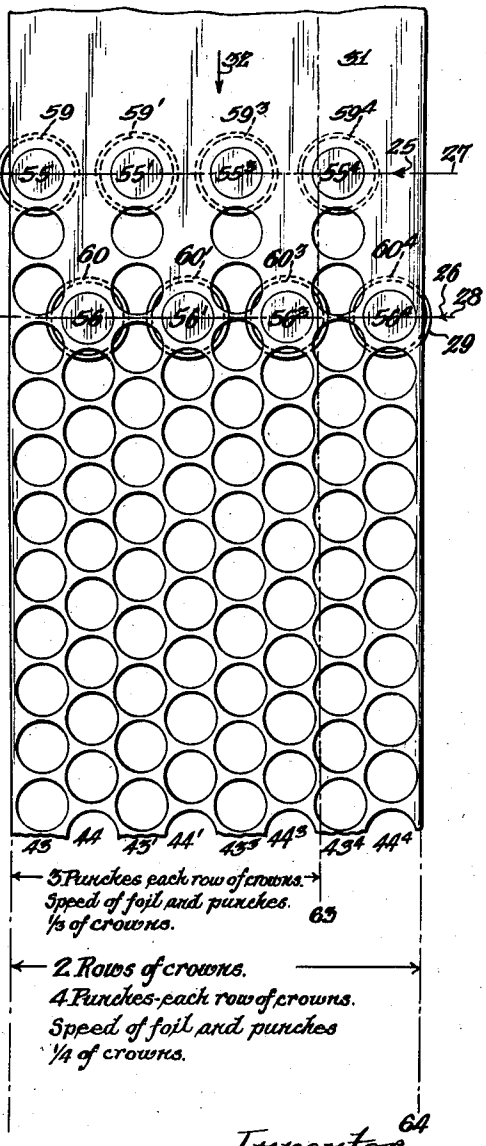


Fig. 6.



Inventor:
Andrew Weisenburg
by C. O. Steel Jackson and Son
Attorneys.

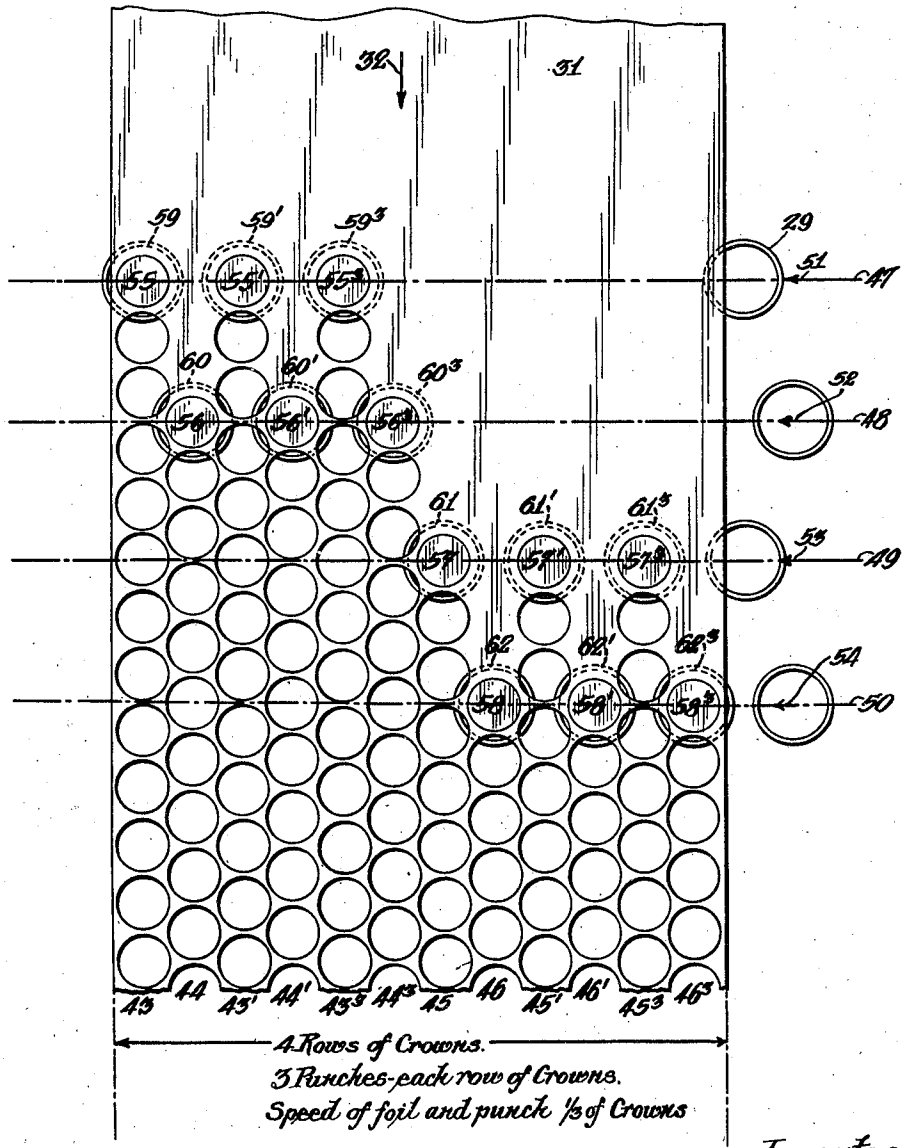
Witness:
Walter Church

Feb. 22, 1944. A. WEISENBURG 2,342,504

SPOT APPLYING PROCESS FOR CAPS

Original Filed April 16, 1941 4 Sheets-Sheet 4

Fig. 5.



Inventor:
Andrew Weisenburg
by Stell Jackson and Son
Attorneys.

Witness:
Walter Chinn

Patented Feb. 22, 1944 2,342,504

UNITED STATES PATENT OFFICE

2,342,504

SPOT APPLYING PROCESS FOR CAPS

Andrew Weisenburg, Overbrook Hills, Pa.

Continuation of application Serial No. 388,828, April 16, 1941. This application October 19, 1943, Serial No. 506,826

18 Claims. (Cl. 113—80)

The present invention relates to a process of applying protective spot material to the inner surfaces of caps, particularly crown caps of the type commonly used on bottles.

A purpose of the invention is to reduce the percentage of waste or scrap resulting from the process of applying protective spot material to caps.

A further purpose is to obtain greater cap production for a given linear speed and for a given machine in applying protective spot material to caps.

A further purpose is to progress protective spot material at lower speeds with less danger of tearing the material, without reducing the production in the process of applying protective spot material to caps.

A further purpose is to reduce the number of machines, the size of machines, and the financial investment in machines required to obtain a given production in the application of protective spot material to caps.

A further purpose, in a process of applying protective spot material to caps, is to progress a plurality of parallel rows of caps with stop and go motion, to progress a strip of protective spot material transversely of the rows and with stop and go motion having corresponding stop periods, and desirably simultaneously to cut out and affix protective spot material to at least one cap in each row and preferably to a plurality of adjoining caps in each row.

A further purpose, in a process of applying protective spot material to caps, is to progress a plurality of parallel rows of caps with stop and go motion, the cap centers desirably being spaced by approximately a multiple of the desired spot diameter, to progress a strip of protective spot material transversely of the rows and with stop and go motion having corresponding stop periods, and desirably simultaneously to cut out and affix spot material to at least one cap in each row and preferably to a plurality of caps in each row, the distance from the center of each line of cut-out positions to the center of the next adjoining line of cut-out positions being approximately equal to the diameter of the cut-out.

A further purpose, in a process of applying protective spot material to crown caps, is to progress a plurality of parallel rows of crowns bottom up with stop and go motion, desirably spacing the crown centers in each row approximately twice the desired spot diameter, to progress a strip of protective spot material transversely over the rows with stop and go motion having corresponding stop periods, and desirably simultaneously to punch out and adhesively affix circular protective spots to at least one crown in each row and preferably to a plurality of crowns in each row, each line of punching centers being laterally spaced from the next adjoining line by a distance approximately equal to the punching diameter and each punching being staggered with respect to the next one of an adjoining line.

A further purpose, in a process of applying cut-out protective spot material to caps, is to progress a plurality of parallel rows of caps with stop and go motion, the cap centers being preferably spaced approximately twice the desired spot diameter, and the distance between row centers being an integer-plus-one-half times the sum of the desired spot diameter and the desired spacing between successive cut-outs in the same line, to progress a strip of protective spot material transversely of the rows with stop and go motion having corresponding stop periods, and desirably simultaneously to cut out and affix protective spot material of circular form to at least one cap in each row and preferably to a plurality of caps in each row, the center of each line of cut-out positions being laterally displaced with respect to the center of the next adjoining line by approximately the cut-out diameter.

A further purpose, in applying punched-out protective spot material to crown caps, is to progress a plurality of parallel rows of crowns bottom up with stop and go motion, desirably spacing the crown centers in each row approximately twice the desired spot diameter, the distance between row centers being an integer-plus-one-half times the sum of the desired spot diameter and the desired spacing between successive cut-outs in the same line, to progress a strip of protective spot material transversely over the rows with stop and go motion having corresponding stop periods, and desirably simultaneously to punch out and adhesively affix circular protective spots to at least one crown of each row and desirably to a plurality of crowns in each row, each line of punching centers being laterally spaced from the next adjoining line by a distance approximately equal to the spot diameter and each punching being staggered with respect to the next one of an adjoining row.

A further purpose, in a process of applying punched-out protecting spot material to caps, desirably crown caps, is to progress a plurality of parallel rows of crowns bottom up with stop and go motion, desirably spacing the crown centers in each row approximately twice the diameter of the spot, the distance between row centers

being an integer-plus-one-half-times the sum of the spot diameter and the spacing between successive punch-outs in the same line, to progress a strip of protective spot material transversely over the rows with stop and go motion having corresponding stop periods, and desirably simultaneously to punch out and adhesively affix a plurality of circular protective spots in each row, the number of cycles of progression of the protective spot material being a fraction of the number of cycles of progression of the crowns equal to the reciprocal of the number of crowns simultaneously punched in a single row, and each line of punching centers being laterally spaced by a distance approximately equal to the spot diameter and each punching being staggered with respect to the next one of an adjoining row.

Further purposes appear in the specification and in the claims.

This application is a continuation, for the purpose of putting the claims in better condition, of my application for patent for Process of affixing protective spot material, Serial No. 388,828, filed April 16, 1941.

The drawings are largely diagrammatic, the forms shown being chosen from the standpoint of satisfactory operation and convenient illustration.

Figure 1 is a fragmentary diagrammatic top plan view illustrating one process applying the principles of the invention.

Figure 1*a* is a section of Figure 1 on the line 1*a*—1*a*.

Figure 2 is a variation of Figure 1 in which four rows of caps are provided and one cut-out is made in each row at a given stop period.

Figure 3 is a view corresponding to Figure 2, but showing two cut-outs made simultaneously in each row.

Figure 4 is a view corresponding to Figure 3, but showing a different cap spacing in each row and a different cut-out arrangement.

Figure 5 is a variation of the form of Figures 2, 3, and 4 in which three cut-outs are made simultaneously in each row.

Figure 6 is a variation of the form of Figure 1, in which four cut-outs are made simultaneously in each of two rows of caps.

In the drawings like numerals refer to like parts.

It is quite usual to place protective spots on the insides of caps such as crown caps for closing bottles. The usual crown cap contains a resilient liner usually of cork inserted in the interior. It is desirable, however, to protect the contents from contact with the resilient liner and for this purpose a spot, usually circular, is centrally located on the inner face of the resilient liner.

Any one of a number of protective spot materials may be used. The most common are glassine paper, wax paper, tin foil, aluminum foil, lead foil, and various other papers and foils coated or covered with protective synthetic coatings. Where the process of the invention is being used to apply liners to caps or the like, the sheet material may be paper, cardboard, pulpboard, or any other suitable liner material.

The protective spot material is normally applied to the interior of the cap by adhesive. Adhesive may be coated on the inner surface of the resilient member (cork), or on the surface of the protective spot material which is to contact the resilient member, or on both surfaces. If the adhesive is of the thermoplastic type, heat may be applied to the surface containing the adhesive prior to application of the adhesive surface to the surface to which it is to adhere. Likewise, pressure may be maintained on the spot material after it is affixed to the resilient member to assure that firm union is obtained. The detail of heat application, if heat application is to be applied, and pressure application, if pressure is to be used, is not important in the present connection.

The preferable adhesive materials are guttapercha, latex, or an alkyd resin such as glycerol phthalate or glycerol phthalate-maleate, or drying oil modified glycerol phthalate or glycerol phthalate-maleate. These thermoplastic materials will, of course, be heated as desired to render them thermoplastic.

In the present practice in the art, caps are progressed in a single row with a stop and go motion, and protective spot material is progressed by a cooperating stop and go motion transversely of the row of caps. As each cap is brought to a stop under the protective strip material a single punch operates to cut out and affix a protective spot to the center of the interior of a cap.

There is considerable waste in the protective spot material, at the edges in the triangular portions left between the single line of punch holes.

In the previous process it is necessary to progress the fragile protective spot material at the same linear speed as that at which the caps move, with resultant danger of tearing the protective spot material and particularly the portion from which the spots have already been cut. The production of the prior art spotting machines is relatively low as only a single row of caps can be employed.

The present inventor has discovered that by employing a plurality of rows of caps, by simultaneously cutting out and affixing protective spots to the caps in each row, and by properly arranging the rows and the locations of cutting with respect to one another, very great savings can be made.

One of the most important savings obtained by the present invention is in the reduction of the amount of waste or scrap protective spot material. Using a double row of caps with a single punch per row in accordance with the principles of the present invention, a saving of approximately ten percent of the protective spot material can be effected. Using two rows of caps and three simultaneous punches per row, a saving of seventeen percent of the protective spot material can be made. When four rows of caps and three simultaneous punches per row are used as in Figure 5, the saving in protective spot material is approximately eighteen and one-half percent.

Since the present invention employs a plurality of rows of caps, for a given linear speed of cap the production is greatly increased.

Where a plurality of protective spots are punched out simultaneously above a given row of caps, the number of cycles of travel of the protective spot material need not be as great as the number of cycles of travel of the caps, but will be a fraction of the number of cycles of travel of the caps equal to the reciprocal of the number of protective spots simultaneously punched out above a particular row of caps. Thus, if the number of simultaneous punchings above the particular row of caps is two, the number of cycles of the pro-

tective spot material will be one-half that of the caps. If the number of simultaneous punchings above a given row of caps is three, the number of cycles of progression of the protective spot material will be one-third that of the caps. If the number of simultaneous punchings above a particular row of caps be four, the number of cycles of the protective spot material will only be one-fourth that of the caps. This reduced number of cycles of the protective spot material tends to reduce tearing, failure to feed, and a stoppage of the machine.

A further advantage of the present invention is that the floor space, the number of machines, and the investment in machines is definitely less than with the equipment of the prior art.

In order to practice the present invention it is necessary to relate the positions of punching of the protective spots to the positions of the rows of crowns and the spacings of the crowns so that the cut-outs of protective spot material will be staggered in one line with respect to the adjoining line and will, therefore, inter-nest. Thus, each successive punching uses a portion of the material which would otherwise be wasted in making the punchings of the adjoining line.

The caps move in parallel rows and the caps in each row are preferably spaced so that the distance between the centers of adjoining caps is approximately a multiple of and preferably twice or four times the diameter of the protective spot. The spacing of the caps will be uniform and will preferably closely approximate that used in the prior art.

When I say that the spacing of the cap centers is approximately a multiple of the spot diameter, I recognize that there is desirably a slight internesting of the cut-outs of adjoining lines. Thus the cut-outs in one line desirably slightly cross the line of tangents of the cut-outs of the adjoining line on the adjoining side. The spacing of the cap centers is then accurately a multiple of the spot diameter less the total distance of internesting of cut-outs between one cap center and another (in some forms the cut-outs internest one each side of a given line between the positions of two adjoining cap centers, whereas in other forms the cut-outs internest on each side of two or more lines).

The cap speeds may be as now employed, suitably of the order of five hundred caps per minute in a given row. The manner of progression of the caps may be any usual or accepted manner which will produce an intermittent or stop and go motion.

Mechanism for progressing crowns with a stop and go motion is shown by the following United States patents: Clark No. 1,134,031; Goebel No. 1,469,557; Skov No. 1,628,338; Johnson No. 1,768,605; and Weisenburg No. 1,858,695.

In Figure 1 conventional cap moving and registering mechanism is shown consisting of two cap racks **20** having cap-moving fingers **21** which at one portion of the cycle extend between adjoining caps and progress them forward. The manner and exact path of movement of the racks **20** and fingers **21** is not important to the present invention, but a conventional path is indicated by the circle **22** shown in Figure 1. When the caps are at rest in the tracks and the racks **20** and the fingers **21** are in retracted position as shown, exact registry of the caps may desirably be procured by dwells **23** on continuously rotating cams **24** (Figures 1 and 2). This mechanism is shown in Weisenburg U. S. Patent No. 1,858,695. At such time as the fingers **21** are out of contact with the caps, the dwells **23** are in position between the caps, and when the dwells **23** are out of contact with the caps, the fingers **21** can engage the caps to progress them.

The direction of progression of the caps is not particularly important in the present invention. In Figure 1 the arrows **25** and **26** indicate that the caps in both tracks are moving in the same direction, but this is not critical, and the direction of progression of the caps in the two tracks may be opposite as indicated by the auxiliary arrow **26'**.

It will be evident that the caps in adjoining tracks will desirably be in echelon or out of step with respect to one another so as to stagger the punching positions in different rows. Thus, in row **28** the center of each cap is approximately opposite a point equidistant between the centers of the caps in the adjoining row **27**.

The caps **29** in the respective rows **27** and **28** desirably move bottom up in a track **30** which may be of any suitable type not shown in detail. The resilient material (cork) has already been inserted in the caps in a previous operation.

The protective spot material moves transversely to the parallel rows of caps under the influence of any suitable stop and go motion having stop periods corresponding to the stop periods in the progression of the caps. See the following United States patents: Johnson No. 1,852,578 and Berg No. 1,477,418. The protective spot material **31** may move in either direction, the motion in Figure 1 being as indicated by the arrow **32**.

Cooperating with one or more points at which caps stop in each track are one or more male dies **33** or **33'** cooperating with female dies **34** and **34'** to cut or punch out a desirably circular protective spot and apply this spot to the interior of a cap centrally positioned immediately below the dies at the moment of punching. Dies of the character in question are shown in Johnson United States Patent No. 1,852,578.

In Figure 1 two dies are operating simultaneously above each row of caps. The stamping operation in both tracks is also desirably simultaneous so that at any stopping position of the caps four dies cut out four spots and affix them to four caps, two in each row of caps. In row **27** caps **35** have not yet reached the position for spot application, although their interiors will desirably be heated if a thermoplastic adhesive is to be used. Caps **36** and **36'** are under the dies and in process of receiving spots, and caps **37** and **37'** have passed beyond the dies and bear spots **38**. Likewise in track **28** caps **39** have not yet reached the dies, but have desirably been interiorly heated, whereas caps **40** and **41** are under the dies, and caps **42** and **42'** beyond the dies have spots **38** applied to them.

In Figure 1 there are four lines of cut-out positions **43**, **44**, **45**, and **46**. Lines **43** and **45** are due to the punches operating in row **27** and lines **44** and **46** are due to the punches operating in row **28**. The distance from the center of each line of cut-out positions to the center of the next adjoining line of cut-out positions approximately equals the diameter of the spot. Actually the distance between the centers of adjoining lines of cut-out positions is equal to the spot diameter minus the distance of internesting at one side of a given line of cut-outs.

It will be evident by reference to Figure 1 that each line of punching centers is laterally

spaced by a distance approximately equal to the punching diameter and that each punching is staggered with respect to the next one of an adjoining line.

The spacing between the centers of the respective rows is an integer-plus-one-half times the sum of the diameter of the spot and the desired spacing between cut-outs in a single row. Thus is Figure 1 the spacing between the centers of the rows is two and a half times the sum of the spot diameter plus the desired spacing between cut-outs in the same line.

In Figure 1 is will be noted that the number of cycles of travel of the protective spot material is one-half that of the number of cycles of travel of the caps, although the stop periods in the intermittent movement of the protective spot material coincide with the stop periods in the intermittent movement of the caps. The reason that the protective spot material travels one-half the number of cycles of the caps is that two simultaneous punches are made above each row of caps, and these two spotted caps must be cleared from beneath the protective spot material **31** while the protective spot material moves the desired distance between adjoining punchings.

In Figure 1 the punches operate every time the caps advance two cap distances. The cap centers being spaced approximately twice the spot diameter, the punches operate every time the caps advance approximately four times the spot diameter.

It will be evident that in Figure 1 the spots immediately below the dies **33** are being applied to the caps **36** and **36'** in the row **27**. Likewise in row **28**, the spots immediately below the dies **33'** are being applied to the caps **40** and **41**.

The cut-outs 36^2 and 36^3 are those made in the next previous step when punching out the spots now to be seen affixed to the caps **37** and **37'** to the left of the figure in row **27**. Likewise the cut-out openings **40'** and **41'** are those made in punching out the spots visible in the caps **42** and **42'** on the left hand side of the figure in the row **28**. The cutout openings 36^4 and 36^5 correspond to the spots applied to caps in the line **27** which are beyond the figure at the left. Likewise the spots corresponding to cut-out openings 40^2 and 41^2 were applied to the caps in the track **28** which are beyond the figure at the left except that a small portion of one of these caps is visible at the extreme left of the row **28**.

It will be noted that the cut-outs of line **43** slightly internest with the cut-outs of line **44**, so that if a line of tangents were drawn to the cut-outs on line **44** on the side adjoining line **43**, the cut-outs of line **43** would slightly cross this line of tangents. This distance that the cut-outs of line **43** extend between the cut-outs of line **44** may be called the distance of internesting. In Figure 1 the distance between cap centers in each row **27** or **28** is equal approximately to twice the spot diameter. Stated more accurately, the distance between cap centers equals twice the spot diameter minus the total distance of internesting. In the form of Figure 1 the total distance of internesting is the distance of internesting on two sides of a given line of cut-outs (for example, the line **44**) or twice the distance of internesting on one side.

It is not necessary that the number of rows of caps be restricted to two. Any greater number of rows may be employed as desired.

In Figures 2 to 5 four rows of caps **47**, **48**, **49**, and **50** are shown moving with stop and go motion under the influence of any suitable means such as the rack illustrated in Figure 1 and registered by any suitable means such as the cams of Figure 1. The rows of caps **47**, **48**, **49**, and **50** are parallel to one another and will desirably but not necessarily move in the same direction as indicated by the arrows **51**, **52**, **53**, and **54**. All caps come to rest at the same moment and all caps move when in motion at the same rate.

The protective spot material in Figures 2 to 5 moves transversely of the rows of caps in either direction as desired, preferably in the direction of the arrow **32**, with a stop and go motion having stop periods which correspond with the stop periods in the movement of the caps. The relations of the cycles of motion of the protective spot material in Figures 2 to 5 will not necessarily be the same as the relations of the cycles employed in Figure 1.

In Figure 2 there are four simultaneous punches **55**, **56**, **57**, and **58**, one acting in each row of caps. The punches operate during the stop period when both the caps and the protective spot material are at rest.

It will be noted that the caps in one row are not opposite those in another row but are arranged in echelon. Thus, the center of each cap in row **48** is opposite a point intermediate between the centers of two adjoining caps in row **47**. The same is true of each successive row. The caps **59**, **60**, **61**, and **62** are receiving spots in Figure 2. All caps to the right of them in the respective rows as, for example, the cap **63** in row **47**, have not yet received spots but have desirably been interiorly heated, and all caps to the left of caps **59** to **62** have already received spots cut out from one of the cut-out openings in one of the lines **43**, **44**, **45**, or **46**.

Thus, the cut-out openings in the line **43** correspond to spots applied to caps in the row **47** and cut-out openings in the line **44** correspond to spots applied to caps in the row **48**.

In the form of Figure 2 the protective spot material moves with the same number of cycles as the caps, since only one spot is punched out and affixed to a cap in a given row during a single stop period of the progression. The punches operate every time the caps advance one cap distance.

Figure 3 is similar to Figure 2 except that two punches **55** and **55'**, **56** and **56'**, **57** and **57'**, and **58** and **58'** operate simultaneously above each row of caps. In Figure 3 the punches not only operate simultaneously in each row, but all punches operate simultaneously in all rows. The punches **55** and **55'**, etc., are spaced to punch out and affix spot material to adjoining caps **59** and **59'**, **60** and **60'**, **61** and **61'**, and **62** and **62'** in a given row.

All caps to the right of those shown have not yet received spot material and all those to the left have already had spot material affixed by punching out from one of the punch-out openings in one of the lines **43** or **43'** corresponding to the row of caps **47**, **44** or **44'** corresponding to the row of caps **48**, **45** or **45'** corresponding to the row of caps **49**, or **46** or **46'** corresponding to the row of caps **50**.

In Figure 3 a plurality of spots are punched out simultaneously in each horizontal row and, therefore, the number of cycles of the protective spot material is reduced with respect to that of the caps, being in this case the reciprocal of two, or one-half, the number of cycles of the caps.

Likewise in Figure 3 the punches do not operate every time the caps advance one cap distance, but instead operate every time the caps advance two cap distances.

Figure 4 illustrates an arrangement similar to Figure 3 except that the sequence of cut-out lines more closely follows Figure 2 and is really a doubling of Figure 2. A wider cap spacing is used in Figure 4 than that normally employed, the spacing between cap centers in each row being approximately four times the spot diameter. In Figure 4 the spacing of cap centers in each row is accurately four times the spot diameter minus four times the distance of internesting at one side of a given line of cut-outs. But the cap spacing in any row is uniform here as in all other forms.

In all other forms shown the spacing of the cap centers is accurately twice the spot diameter minus twice the distance of internesting at one side of a given line of cut-outs. If I were to generalize, I could say that the spacing of the cap centers is a multiple of the expression (spot diameter minus distance of internesting at one side of a given line of cut-outs).

The punches **55** and **55²**, **56** and **56²**, **57** and **57²**, and **58** and **58²** are accordingly more widely spaced than in Figure 3, but operate as in Figure 3 with two simultaneous punching impressions in each row to affix spots simultaneously in caps **59** and **59²**, **60** and **60²**, **61** and **61²**, and **62** and **62²**. The lines of punching for spots applied in each row are differently related to one another than in Figure 2. Thus, the spots for the caps in row **47** were cut from the cut-outs in lines **43** and **43²**, while the spots for cap row **48** were cut from lines **44** and **44²**, the spots for cap row **49** were cut from lines **45** and **45²**, and the spots for cap row **50** were cut from lines **46** and **46²**.

The number of cycles of the protective spot material in Figure 4 is one-half the number of cycles of the caps and the punches operate only after each advance of two cap distances.

Figure 5 is similar to Figure 3 except that three spots are simultaneously punched out in each row by punches **55**, **55'**, and **55³**, operating in row **47**; punches **56**, **56'**, and **56³**, operating in row **48**; punches **57**, **57'**, and **57³**, operating in row **49**; and punches **58**, **58'**, and **58³**, operating in row **50**. Punches **55**, **55'**, and **55³** are applying spots to caps **59**, **59'**, and **59³**; punches **56**, **56'**, and **56³** are applying spots to caps **60**, **60'**, and **60³**; punches **57**, **57'**, and **57³** are applying spots to caps **61**, **61'**, and **61³**; and punches **58**, **58'**, and **58³** are applying spots to caps **62**, **62'**, and **62³**. All caps to the right of those mentioned have not yet received spots and all caps to the left have had spots affixed. The spots for the caps in row **47** come from punch lines **43**, **43'**, and **43³**; those for cap row **48** come from punch lines **44**, **44'**, and **44³**; those for cap row **49** come from punch lines **45**, **45'**, and **45³**; and those for cap row **50** come from punch lines **46**, **46'**, and **46³**.

In Figure 5 each punch operator after the caps have moved three cap distances and the number of cycles of the protective spot material is one-third of the number of cycles of the caps (the reciprocal of three, there being three simultaneous punchings per row).

In all of Figures 2 to 5 the spacing of the row centers is the same; namely, two and a half times the sum of the spot diameter plus the desired spacing between successive cut-outs in a given line. The spacing can be any integer plus a half times the sum of the diameter plus the desired spacing between successive cut-outs in a given line of cut-outs, such as two and a half times, three and a half times, four and a half times, five and a half times, etc. It will be evident that in all forms the rows are spaced so widely that a plurality of cut-outs occur in one line before the first internesting cut-out is encountered in the next line.

In all of Figures 2 to 5 it will be noted that the distance between the centers of each adjoining line of cut-outs is approximately equal to the spot diameter, and the caps in each adjoining row are preferably not opposite to one another but in echelon, preferably with the cap centers in one row opposite points intermediate between cap centers in the adjoining row. This assists in staggering the punch-outs in each line with respect to each adjoining line and causing an internesting of the punch-outs.

Figure 6 is a modification of Figure 1 showing clearly how three or four simultaneous punchings may be made in each of the two rows **27** and **28**. If the right hand margin of the protective spot material be at **63** and three simultaneous punches be made in each row, the form of Figure 6 will be similar to the left hand half of Figure 5. Punches **55**, **55'**, and **55³** will operate simultaneously in row **27** to apply spots to caps **59**, **59'**, and **59³**, and punches **56**, **56'**, and **56³** will operate simultaneously in row **28** and simultaneously with the punches in row **27** to apply spots to caps **60**, **60'**, and **60³**.

The spots from punch-out lines **43**, **43'**, and **43³** will be applied to the caps in row **27** and the spots from punch-out lines **44**, **44'**, and **44³** will be applied to the caps in row **28**.

The number of cycles of the protective spot material will be one-third of the number of cycles of the caps and the punches will operate every time the caps move three cap distances.

The above relationships will be somewhat changed if the strip in Figure 6 be widened to make the right hand margin at **64**. In this case there will be four simultaneous punches **55**, **55'**, **55³**, and **55⁴** in row **27** and four simultaneous punches **56**, **56'**, **56³**, and **56⁴** in row **28**. Each punch center is opposite a point intermediate between punch centers in another row to correspond with the relationship of the centers of the caps in the respective rows. In this case an additional line of cut-outs **43⁴** will contribute spots to caps at the position **59⁴** in row **27** and an additional line of cut-outs **44⁴** will contribute spots to caps at the position **60⁴** in row **28**.

The number of cycles of the protective spot material will again be a fraction of the number of cycles of the crowns equal to the reciprocal of the number of punchings made simultaneously in a given row, that is, one-fourth the number of cycles of the crowns. The punches in both rows will operate simultaneously every time the caps come to rest after moving four cap distances.

The above illustrations are sufficient to indicate that any desired width of protective spot material from two caps wide up may be used and any desired number of rows of caps from two up may be employed.

As already explained, for different widths of strip material, different numbers of rows of caps, different numbers of simultaneous punchings in each row, different spacing of caps, different diameters of spot material, and different distances between cut-outs in a given line, there will be different relationships of numbers of cycles required.

The preferred embodiment of the invention is that illustrated in Figure 6, using the full margin width, since this provides a very efficient arrangement with a minimum number of cap rows.

It will be evident that the invention not only greatly increases the economy of producing and affixing protective spots to caps, especially crowns, but also enables the user to increase the cap production of a given machine, to reduce the number of cycles of the protective spot material, thus reducing the danger of stoppage through tearing of the protective spot material, and to reduce the size of each machine, the number of machines, and the financial investment in the machines.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The process of applying protective spot material to crowns, which comprises, placing a plurality of crowns bottom up in parallel rows in echelon in one row with respect to those in another row, in spacing the crown centers in each row approximately a multiple of the spot diameter, in progressing the rows of crowns, so placed and spaced, lengthwise of the rows with stop and go motion, in spacing a row of punches from each other, center to center by a distance equal to the punching diameter minus the distance of internesting at one side of the row of punching, while staggering each punching with respect to the next one of an adjoining row, in progressing a strip of protective spot material transversely over the rows of crowns with stop and go motion having stop periods corresponding to the periods of stopping the motion of the crowns, in simultaneously punching out a plurality of spots from the spot material and adhesively affixing them to the crowns by continuing stroke for each spot and the corresponding crown at positions such that the spots are affixed to at least one crown in each row, the echelon placing of the crowns and the corresponding placing of the punchings to affix spots within them resulting in internesting of the punchings of one row with those of another.

2. The process of applying cut-out protective spot material to caps, which comprises placing a plurality of caps at uniformly spaced intervals, bottom up in parallel rows, in spacing the row centers a distance equal to an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the rows of caps so placed and spaced, lengthwise of the rows with stop and go motion, in locating lines of punches with their lines of centers spaced laterally from each other by approximately the cut-out diameter minus the distance of internesting at one side of a line of punching, while staggering each punching with respect to the next one of an adjoining line, in progressing a strip of protective spot material transversely over the rows of caps with stop and go motion having stop periods corresponding to the periods of stopping the motion of the caps, and in simultaneously punching out a plurality of circular protective spots from the spot material and adhesively affixing them by the same stroke for each spot and cap, at positions such that the spots are affixed to at least one cap in each row.

3. The process of applying punched-out protective spot material to crown caps, which comprises placing a plurality of caps bottom up in parallel rows, in spacing the cap centers in each row approximately a multiple of the spot diameter, while spacing the distance between row centers an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the rows of caps so placed and spaced, lengthwise of the rows with stop and go motion, in locating lines of punches with their lines of centers spaced from each other by a distance approximately equal to the spot diameter, while staggering the punchings in one line with respect to the punchings of an adjoining line, in progressing a strip of protective spot material transversely over the rows of caps with stop and go motion at stop periods corresponding to periods of stopping the motion of the caps, and in simultaneously punching out a plurality of circular protective spots from the spot material, and adhesively affixing the spots by the same strokes that cut them out, in such positions that the spots are affixed to at least one cap in each row.

4. The process of applying protective spot material to caps, which comprises placing the caps in parallel rows and spacing them in the rows approximately a multiple of the spot diameter, in staggering the caps in one row with respect to the caps in the next adjacent row, in progressing a plurality of said parallel rows of the caps lengthwise of the rows with stop and go motion, in progressing a strip of protective spot material transversely of the rows of caps with stop and go motion having corresponding stop periods in the two stop and go progressions, in simultaneously cutting out a plurality of spots from protective spot material and simultaneously affixing them to a plurality of caps in each row and in a plurality of rows and in spacing the centers of adjoining lines of cut-out positions laterally, meantime by approximately the spot diameter.

5. The process of applying cut-out protective spot material to caps, which comprises placing the caps in parallel rows while spacing the cap centers approximately a multiple of the spot diameter and spacing the distance between row centers an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the plurality of parallel rows of caps lengthwise of the rows with stop and go motion, in progressing a strip of protective spot material transversely of the rows with stop and go motion having stop periods corresponding to the stop periods in the progression of the caps, in simultaneously cutting out protective spots in circular form and in simultaneously affixing the protective spot material to a plurality of caps in each row while spacing the centers of adjoining lines of cut-out material laterally by a distance equal to the cut-out diameter minus the distance of internesting at one side of a line of cut-outs.

6. The process of applying punched out protective spot material to crown caps, which comprises placing the caps in a plurality of parallel rows at uniform spacing, bottoms up, the caps in one row being in echelon with respect to those in another row, setting and maintaining the dis-

tance between row centers as an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the caps so placed and spaced with a stop and go motion, in progressing a strip of protective spot material transversely over the rows with a stop and go motion, having stop periods corresponding to the stop periods in the progression of the caps and in simultaneously punching out and simultaneously adhesively affixing to the individual caps by the same punching strokes, circular protective spots applied to a plurality of caps in each row while spacing one line of punching centers from the next line of punching centers laterally by a distance approximately equal to the punching diameter, each punching in one line being staggered with respect to the adjacent punching in the next adjoining line.

7. The process of applying protective spot material to caps which comprises placing the caps in a plurality of rows, bottom up, uniformly spacing the caps at a distance from each other, from center to center in each row, approximately a multiple of the spot diameter, progressing a plurality of adjacent parallel rows of said caps lengthwise of the rows, with a stop and go motion, progressing a strip of protective spot material transversely of the length of the rows of caps with stop and go motion, whose stops correspond with the stops in the progression of the caps, in simultaneously cutting out and simultaneously affixing as part of the same strokes protective spot material applied to a plurality of the caps in each row, while maintaining the number of cycles of the protective spot material as a fraction of the number of cycles of the caps equal to the reciprocal of the number of simultaneous cut-outs per row, meantime placing the adjoining lines of cut-out centers out of line laterally by a distance approximately equal to the spot diameter and staggering the location of each cut-out with respect to the next cut-out of an adjoining line.

8. The process of applying cut-out protective spot material to caps, which comprises placing the caps in a plurality of parallel rows, meantime spacing their centers a multiple of the spot diameter minus the distance of internesting at one side of the line of cut-outs, and locating the caps in echelon in one row with respect to those in another row, the distance between row centers being an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, progressing a plurality of parallel rows of caps so located lengthwise of the rows, with stop and go motion, progressing a strip of protective spot material transversely over the rows of caps with a stop and go motion, having stop periods corresponding with the stop periods for the caps, in simultaneously cutting out and simultaneously affixing protective spot material of circular form to a plurality of caps in each row while maintaining a number of cycles of progression of the protective spot material as a fraction of the number of cycles of projection of the caps, equal to the reciprocal of the number of simultaneous cut-outs in a single row, and in spacing the center of each line of cut-out positions laterally with respect to the center of the next adjoining line by approximately the cut-out diameter.

9. The process of applying punched out protective spot material to caps which comprises, uniformly spacing a plurality of caps placed bottom up in a plurality of parallel rows, at a distance between row centers equal to an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the parallel rows, thus placed and spaced, lengthwise of the rows, with a stop and go motion, in progressing a strip of protective spot material transversely over the rows with a stop and go motion, in stopping the second progression during stops in the first, in punching out and adhesively affixing circular protective spots to a pluraltiy of caps in each row by a single punching and affixing stroke for each cut-out and cap, in making the number of cycles of progression of the protective spot material a fraction of the number of cycles of the progression of the caps, equal to the reciprocal of the number of punch-outs per row, in spacing each line of punching centers from the next line of punching centers laterally by a distance approximately equal to the punching diameter and in staggering each punching with respect to the next one of an adjoining line.

10. The process of applying cut-out protective spot material to caps, which comprises placing and spacing two parallel rows of caps bottom up at a distance from cap center to cap center approximately a multiple of the spot diameter and at a spacing between row centers equal to an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the two parallel rows lengthwise of the rows with a stop and go motion, in progressing a strip of protective spot material transversely over the rows with a stop and go motion while causing the stop periods in the two progressions to overlap, and in punching out and adhesively affixing at one stroke for each cut-out and cap, a plurality of circular protective spots in each row while spacing the line of punching centers laterally from the next by a distance approximately equal to the punching diameter and while staggering each punching with respect to the next one of said adjoining line.

11. The process of applying punched out protective spot material to caps which comprises, placing caps in two parallel rows bottom upward while spacing them in the rows approximately twice the spot diameter and at a distance, one row center from the second row center an integer-and-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the two parallel rows with stop and go motion, in progressing a strip of protective spot material transversely over the rows of caps with stop and go motion while making the stop periods of the two progressions coincide, and in punching out and adhesively affixing by one stroke, for each spot and cap, two circular protective spots in each row while spacing the punching centers laterally, one from the other, by a distance approximately equal to the punching diameter and while staggering the punchings in one line with respect to the punchings in the next line.

12. The process of applying punched-out protective spot material to crowns, which comprises placing two parallel rows of crowns bottom up while spacing the crown centers approximately twice the spot diameter and spacing the distance between row centers an integer-and-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given line, in progressing the two rows with stop and go

motion, in progressing a strip of protective spot material transversely over the rows of caps with stop and go motion while making the stop periods of the two progressions correspond, and in punching out and adhesively affixing by a single stroke, for each spot and cap, four circular spots in each row at a distance laterally between the punching centers approximately equal to the punching diameter and while staggering each punching in one line with respect to the next punching of an adjoining line.

13. The process of applying punched-out protective spot material to crowns, which comprises placing four parallel rows of crowns bottom up while maintaining a spacing between crown centers in each row approximately twice the spot diameter and maintaining a distance between row centers of an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given row, in progressing the rows of crowns by a stop and go motion lengthwise of the rows, in progressing a strip of protective spot material transversely over the rows with a stop and go motion while causing the two progressions to stop at the same time, in punching out and adhesively affixing at a single stroke, for each spot and crown, circular protective spots to at least one crown in each row, while laterally spacing each line of punching centers from the next by a distance approximately equal to the punching diameter and while staggering each punching with respect to the next punching in an adjoining row.

14. The process of applying punched-out protective spot material to crowns which comprises, placing crowns in four parallel rows of crowns, bottom up, while spacing the crowns uniformly at a distance between centers in each row approximately twice the spot diameter and while spacing the successive rows one row center from the other by an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given row, in progressing the four parallel rows of crowns by a stop and go motion, in progressing a strip of protective spot material transversely over the rows with a stop and go motion while causing the two progressions to stop at the same time and in punching out and adhesively affixing circular protective spots from the spot material at a single stroke for each spot and cap, affixing them to a plurality of crowns in each row at the same time, while spacing each line of punching centers laterally from the next by a distance approximately equal to the punching diameter and while staggering the successive punchings, those in one row with respect to those in the next adjoining row.

15. The process of applying punched-out protective spot material to crowns, which comprises placing crowns bottom up in four parallel rows at a spacing in each row between crown centers approximately four times the spot diameter and while spacing the rows between row centers by an integer-plus-one-half times the sum of the spot diameter and the distance between successive cut-outs in a given row, in progressing, with a stop and go motion, the four parallel rows of crowns so placed and spaced, in progressing with a stop and go motion, a strip of protective spot material transversely over the rows while causing the two progressions to stop at the same time, and in punching out and adhesively affixing by a single stroke for each spot and crown, circular protective spots to a plurality of crowns in each row while spacing each line of punching centers laterally from the next by a distance approximately equal to the punching diameter and while staggering each punching with respect to the next punching in an adjoining line.

16. The process of applying protective spot material to caps which comprises, placing the caps bottom up with uniform spacing in a plurality of parallel rows while spacing the caps in one row out of phase with respect to those in an adjoining row and spacing the adjoining cap centers in each row approximately a multiple of the spot diameter, in progressing the plurality of parallel rows of caps with stop and go motion, in progressing a strip of protective spot material transversely across the rows with a stop and go motion while causing the two progressions to be stopped at the same time, and in cutting out and affixing protective spots by a single stroke, for each spot and cap, and to at least one cap in each row during stop periods while spacing each cut-out laterally of the strip differently from each other cut-out.

17. The process of applying protective spot material to caps, which comprises placing a plurality of parallel rows of caps bottom upward while spacing them uniformly but with the caps in one row out of phase with respect to those in an adjoining row and spacing the cap centers in each row approximately a multiple of the spot diameter, in progressing the caps so placed and spaced with stop and go motion lengthwise of the rows, in progressing a strip of protective spot material transversely across the rows of caps with stop and go motion while causing the two progressions to be stopped at the same time, and in cutting out and affixing by a single stroke, for each spot and cap, protective spots to a plurality of caps in each row during the stop periods, and while spacing each cut-out laterally of the strip differently from each other cut-out.

18. The process of applying protective spot material to caps, which comprises placing the caps bottom up in a plurality of parallel rows while spacing the caps uniformly, those of one row out of phase with respect to those in an adjoining row, and at a distance center to center in each row approximately a multiple of the spot diameter, in progressing said plurality of rows of caps lengthwise of the rows with a stop and go motion, in progressing a strip of protective spot material transversely across the rows with stop and go motion while causing the two progressions to stop at the same time and in cutting out and affixing by a single stroke, for each spot and cap, protective spots to at least one cap in each row during stop periods, spacing each cut-out laterally of the strip differently from each other cut-out but close enough to internest and spacing the rows so widely that a plurality of cut-outs occur in one line before the first internesting cut-out is encountered in the next line.

ANDREW WEISENBURG.