July 6, 1943. C. L. WECKESSER 2,323,582

METHOD AND APPARATUS FOR CAPSULATING LIQUIDS

Filed May 13, 1941 2 Sheets-Sheet 1

FIG.5.

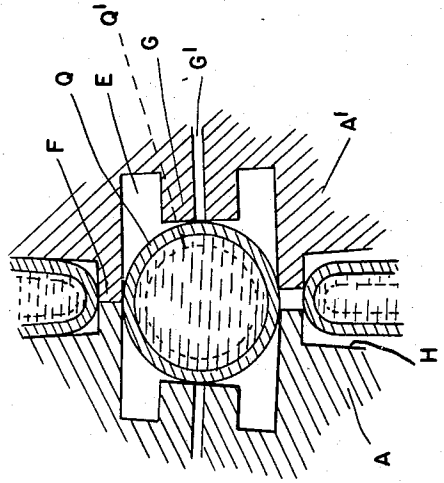


FIG.1.

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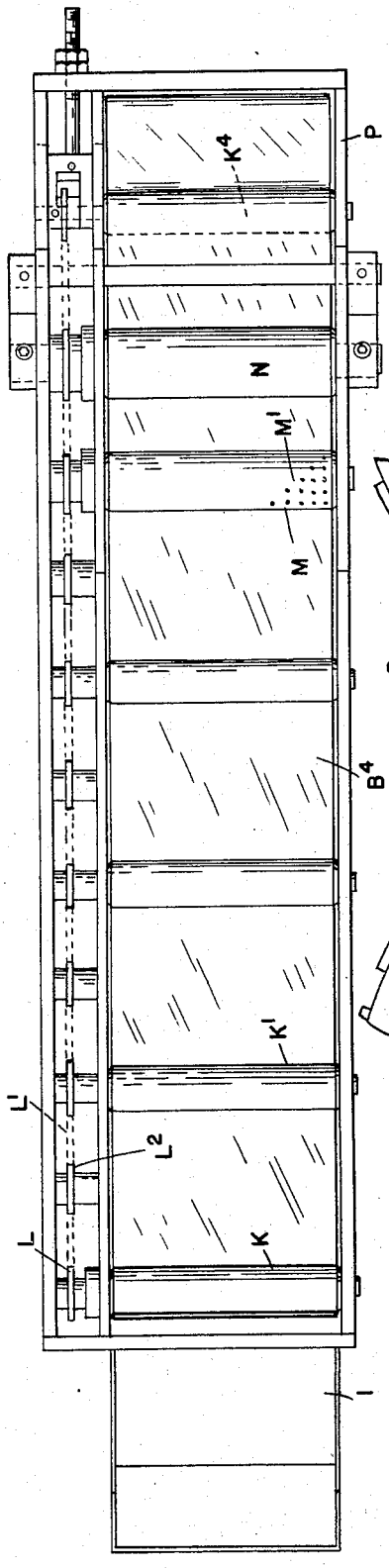


FIG.2.

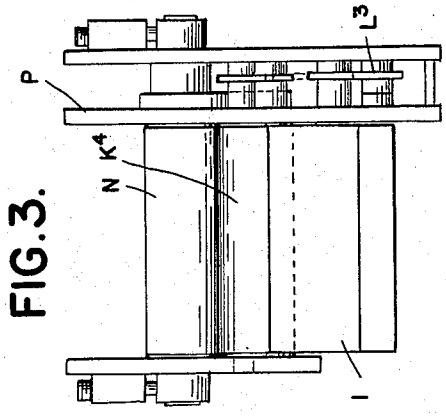


FIG.3.

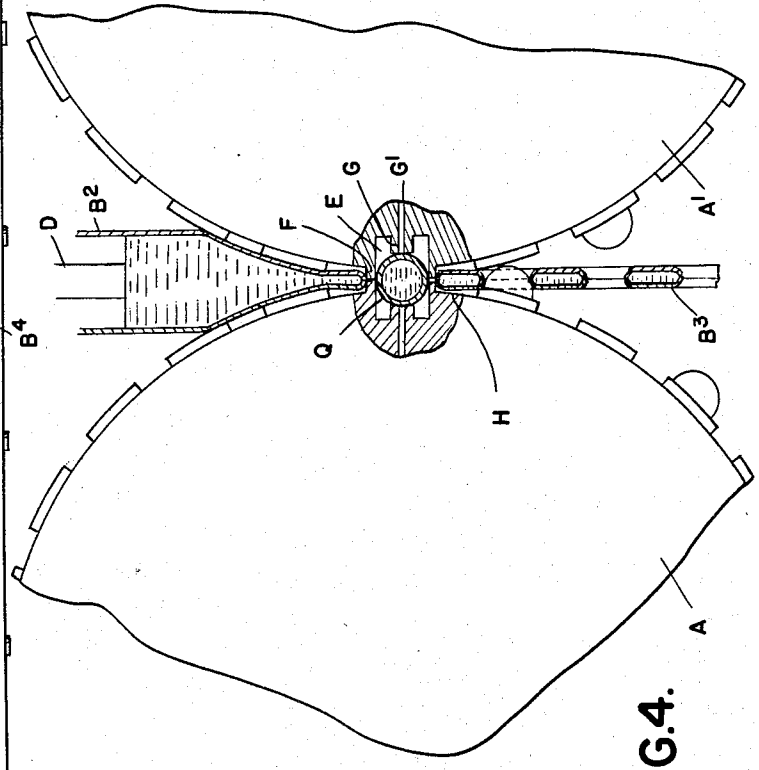


FIG.4.

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UNITED STATES PATENT OFFICE

2,323,582

METHOD AND APPARATUS FOR CAPSULATING LIQUIDS

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Application May 13, 1941, Serial No. 393,293

5 Claims. (Cl. 18—21)

The invention relates to a method and apparatus for capsulating liquids and more particularly to that type in which the capsules are formed from separate strips of gelatin. Heretofore, such separate gelatin strips have been first pressed together along their marginal edge portions to form a tubular section into which the medicament or other liquid content is fed, and this filled tubular portion is then passed between die rolls which fashion and separate the individual capsules. The latter operation includes:

First, forming half capsules by sucking portions of the strip into pockets in the rolls;

Second, pressing the margins of these half capsules together to form a sealing of the same; and

Third, severing the completed capsules from the remainder of the strips.

Usually the gelatin strips are of sufficient width to form transverse rows of capsules, and all of the capsules in each row are simultaneously formed. The portions of the strip intermediate the capsules are fed between the die rolls, which therefore must provide sufficient clearance for this purpose. However, if the clearance is not greater than the thickness of the two strips, the latter will be pressed together so as to force all liquid from between the same into the tubular portion thereabove.

One difficulty experienced in connection with the method and apparatus above described is that the gelatin strips are not always of exactly the same thickness, and if the combined thickness of the two strips is less than the clearance provided by the rolls, they will not be pressed together intermediate the capsules.

A further objection to this method is that it is sometimes desirable to use gelatin strips of different thicknesses, for reasons that will be explained hereinafter. Consequently, this method is not satisfactory for use under all conditions.

It is the object of the present invention to obtain a method and apparatus which dispenses with the necessity for excluding liquid from between the portions of the strips intermediate the capsules, while at the same time avoiding loss of medicament or other liquid to be capsulated.

It is a further object to obtain a method and apparatus through which the quantity of liquid content in the capsules may be varied without changing the capsule forming dies.

With these objects in view, the invention consists in the method and apparatus as hereinafter set forth.

In the drawings:

Fig. 1 is a vertical longitudinal section through a portion of a capsule forming machine to which my improvements are applied and which is capable of carrying out my improved method;

Fig. 2 is a plan view;

Fig. 3 is an end elevation;

Fig. 4 is an enlarged view similar to a portion of Fig. 1; and

Fig. 5 is an enlarged section showing in full and dotted lines capsules having the same external dimensions but different amounts of fluid content.

As illustrated in Fig. 1, A and A' are the cooperating die rolls for forming the capsules. The specific construction of the apparatus for supplying the gelatin strips to these die rolls is not a part of the instant application and may therefore be only generally described as follows:

The separate gelatin strips B and B' may be formed by any suitable means which is adjustable to vary the thickness of these strips within predetermined limits. The strips thus formed are then fed over rollers C and C' which seal the opposite marginal edge portions together to form a tubular portion B^2 which is then fed vertically downward to the rolls A, A'. A tube D feeds the liquid to be capsulated into the portion B^2 to maintain the same at a predetermined level above the rolls A, A'.

The rolls A, A' are provided with registering capsule receiving pockets E arranged in series axially and circumferentially thereof, and each pocket is surrounded by an annular flange F projecting radially outward from the body of the roll to come into rolling contact with the corresponding flange in the registering pocket. The pockets E are further provided with lugs G projecting outward from the inner ends thereof and forming stops which limit the external diameter of the capsule. Air passages G' extend centrally through the lugs G and are connected at certain times to suction means, the arrangement being such that the portions of the gelatin strips which contact with the annular flanges F will be drawn

inward when suction is applied, to form a half capsule. When the gelatin contacts with the lug G, this will seal the passage G', cutting off the suction and preventing further expansion, after which the rotation of the rolls A, A' will bring the flanges F into contact to seal the liquid-filled half capsule sections to each other and to sever the same from the remainder of the strips. The construction and operation as above described has heretofore been used and is not a part of the instant invention.

The peripheral surfaces H of the rolls A and A' between the pocket-surrounding annular flanges F are of smaller radius so as to leave spaces therebetween at the point of closest approach between the rolls, viz., in the common axial plane thereof. This space is of greater radial depth than that of gelatin films of maximum thickness, so that instead of pressing the strips together at such point, there will be left a liquid-filled space. The flanges F, when brought into contact, will seal together the immediately adjacent portions of the strips, both inside and outside said flanges, and will also sever these portions from each other. As a result, the portions of the strips intermediate the capsule portions will form a hollow net B^3 which, as well as the capsule portions, will be filled with the liquid. As this would be very wasteful of the medicament or other liquid, I have provided the following means for recovering the same:

When the pockets E separate from each other on the lower sides of said rolls, the capsules will be retained in one or the other of said pockets and may be subsequently expelled therefrom by positive air pressure entering through the passages G'. The liquid-filled net B^3 passes vertically downward between the rolls and then horizontally over a tank I. This may be accomplished by passing the net around a roller J which may be driven by suitable means such as the belt J', at a peripheral speed substantially equal to that of the net. The horizontal portion is supported on a series of rollers K, K', etc., which also are driven, at substantially the same peripheral speed, by means of pulleys L on one end of each roll, and a driving belt L'. This belt also passes around idler pulleys L^2 between adjacent pulleys L, but at a lower level, thereby giving sufficient wrap about the pulleys to insure proper driving of the same. A tightener pulley L^3 is placed at any convenient point to maintain proper tension on the belt.

At one point in the travel of the horizontal portion B^4 of the net, there is arranged a means for puncturing the walls thereof so as to permit the liquid to drain into the tank I. This, as shown, comprises a roller M provided with a multiplicity of sharp radially projecting points M' and cooperating with a pocketed roller K^2, the net being fed between these rollers. There is also provided a pair of wringer or squeezing rollers N and K^3 which engage the net after it passes the rollers M and K^2 and force out all of the remaining liquid. The net is then passed around a roller K^4 at the end of the tank and into a suitable receptacle O therebeneath. Thus, all of the liquid which was held by the net is recovered in the tank I and may be returned therefrom to the source of supply. The rollers K, K', etc., M and N are mounted on a suitable supporting frame P, and the tank I is also supported on this frame. As the tank extends the full length of the horizontal portion of the net, it will catch any liquid that might escape through an imperfect seal between the strips, as well as that which is positively forced out after the puncturing of the net.

The pockets E in the die rollers A and A', together with the lugs G, determine the outside dimension of the capsule, but the amount of liquid filler in each capsule depends upon the thickness of the gelatin strips. Thus, where it is desired to vary the amount of content, this may be accomplished by changing the thickness of the strips. Fig. 5 illustrates in full lines a capsule Q formed of strips of one thickness and having a predetermined liquid content; also, in dotted lines, a capsule Q' having the same external dimensions but smaller in capacity for liquid content, due to the increased thickness of the gelatin strip. It will thus be understood that it is not necessary to provide as many different sizes of die rolls as have been required in the past, for, by changing the thickness of the strips, the same dies will give capsules of different capacities.

What I claim as my invention is:

1. In an apparatus for forming liquid-filled gelatin capsules, a pair of die rolls having registering pockets therein arranged in transverse and circumferential series, means for feeding a pair of marginally sealed spaced and liquid-filled gelatin strips downward between said rolls, annular portions surrounding each of the pockets in the respective rolls adapted to roll in contact with each other, the peripheral portions of said rolls intermediate said annular portions being spaced from each other at the point of closest approach by a dimension greater than that of the combined thickness of the gelatin strips, means for expanding the portions of said strips registering with said pockets to form liquid-filled capsule portions which are sealed together and severed from the remainder of said strips by said contacting annular portions, thereby leaving a liquid-filled net formed by the remainder of said strips, means for puncturing said net during the continued advancement of the same, and means for squeezing out and recovering the liquid content from said punctured net.

2. In an apparatus for forming liquid-filled gelatin capsules, a pair of die rolls having registering pockets therein arranged in transverse and circumferential series, means for feeding a pair of marginally sealed spaced and liquid-filled gelatin strips downward between said rolls, annular portions surrounding each of the pockets in the respective rolls adapted to roll in contact with each other, the peripheral portions of said rolls intermediate said annular portions being spaced from each other at the point of closest approach by a dimension greater than that of the combined thickness of the gelatin strips, means for expanding the portions of said strips registering with said pockets to form liquid-filled capsule portions which are sealed together and severed from the remainder of said strips by said contacting annular portions, thereby leaving a liquid-filled net formed by the remainder of said strips, means for advancing said net over a liquid-collecting receptacle, means for puncturing said net, and squeeze rolls for forcing a liquid from said punctured net into said receptacle.

3. In a process of forming liquid-filled gelatin capsules of variable content but with the same external dimensions, the steps of expanding at one time into a die pocket of predetermined dimensions a gelatin strip of a selected thickness to obtain a predetermined volume within the

inner surface of the expanded portion of the strip and at another time expanding into said die pocket a strip of a different selected thickness to obtain a different volume within said inner surface of the expanded portion.

4. In a process of forming liquid-filled gelatin capsules of variable content but with the same external dimensions, the steps comprising utilizing a die pocket of predetermined dimensions and in expanding into said pocket gelatin strips of varying thicknesses to correspondingly vary the content of the capsules.

5. In an apparatus for forming liquid-filled gelatin capsules, a pair of die rolls having registering pockets therein arranged in transverse and circumferential series, means for feeding a pair of marginally sealed spaced and liquid-filled gelatin strips between said rolls, annular portions surrounding each of the pockets in the respective rolls adapted to roll in contact with each other, the peripheral portions of said rolls intermediate said annular portions being spaced from each other at the point of closest approach by a dimension greater than that of the combined thickness of the gelatin strips, means for expanding the portions of said strips registering with said pockets to form liquid-filled capsule portions which are sealed together and severed from the remainder of said strips by said contacting annular portions, thereby leaving a liquid-filled net formed by the remainder of said strips and means for recovering the liquid content from the net.

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