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METHOD OF AND APPARATUS FOR PRODUCING INDIVIDUAL TEA BAGS

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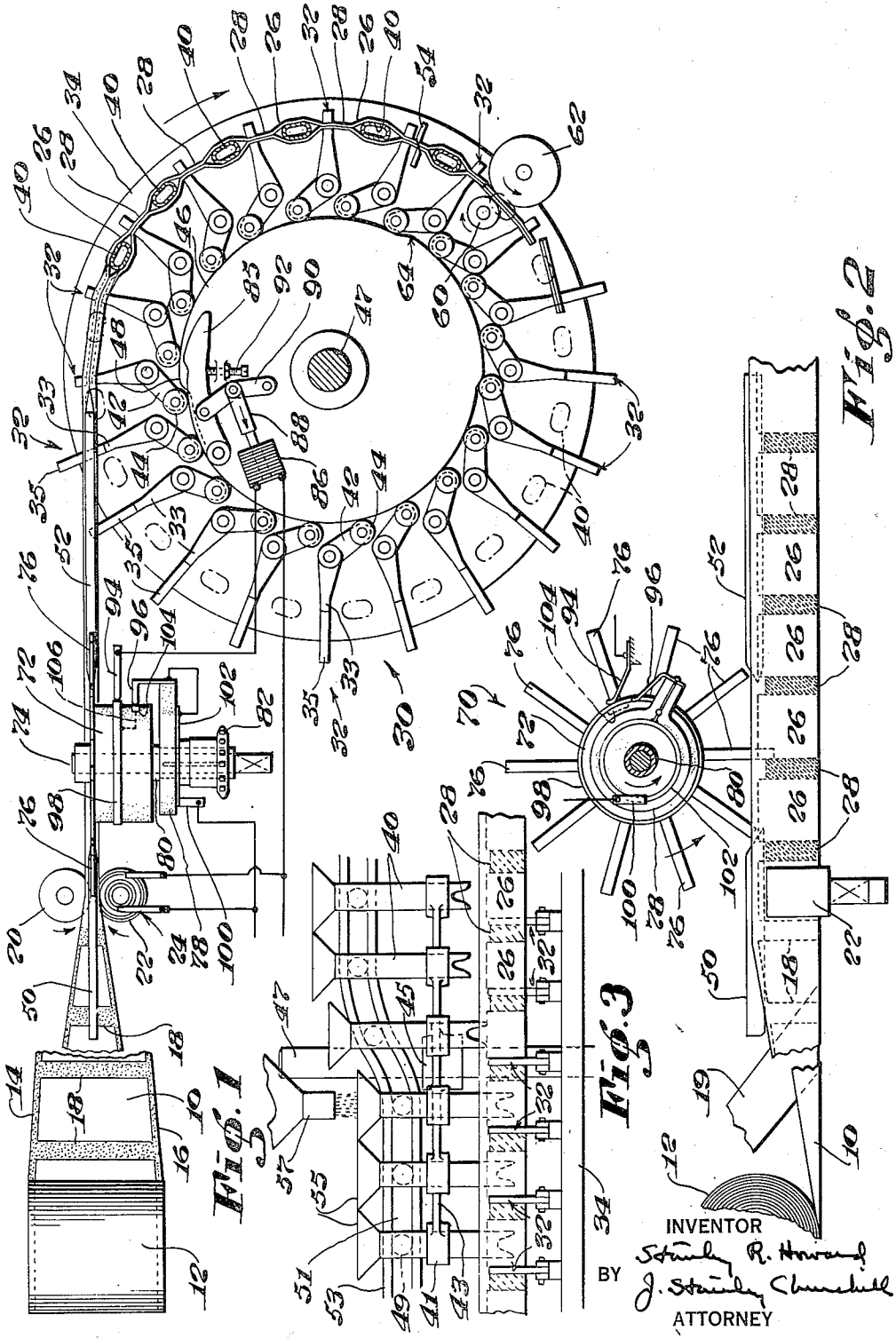


Fig. 1

Fig. 2

Fig. 3

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METHOD OF AND APPARATUS FOR PRODUCING INDIVIDUAL TEA BAGS

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This invention relates to a method of and apparatus for producing individual tea bags.

The object of the invention is to provide a novel method of and apparatus for making individual tea bags from a strip of bag forming material comprising a series of connected bag sections in an economical, rapid and reliable manner.

With this general object in view and such others as may hereinafter appear, the invention consists in the method and apparatus for producing tea bags as hereinafter described and particularly defined in the claims at the end of this specification.

In the drawing illustrating the present method and a preferred form of apparatus for practicing the same, Fig. 1 is a diagrammatic plan view of apparatus embodying the present invention; Fig. 2 is a side elevation of a portion of the apparatus shown in Fig. 1; and Fig. 3 is a developed view in side elevation of a portion of the apparatus shown in Fig. 1 and illustrating mechanism for raising and lowering the filling tubes.

In general, the present invention contemplates a method and apparatus for making individual tea bags from a strip of bag forming material comprising a series of connected bag sections open at their tops. The strip of connected bag sections may be formed from a web prestencilled with thermoplastic adhesive and folded longitudinally, and the adjacent adhesively coated portions may be heat sealed to form a series of equally spaced bag sections. In the preferred embodiment of the invention, the strip is withdrawn from a roll of bag forming material past suitable shaping and heat sealing mechanism by a plurality of grippers arranged to successively engage the web portions intervening between the bag sections and to convey the strip into registered relation to filling tubes adapted to enter successive bag sections and into registered relation to severing mechanism for cutting off successive endmost bag sections to form individual filled bags. Provision is made for sealing the tops of the bags to complete the production of the bags.

In accordance with the present invention, provision is made for accurately registering the bag sections with their individual filling tubes and also for registering the same with relation to the severing mechanism for cutting off successive endmost bag sections. In the illustrated embodiment of the invention, this is accomplished by mechanism including a rotary member provided with a plurality of radial arms arranged to enter successive bag sections as the strip is advanced by the grippers. The intervening web portions or side seams of the bag sections are arranged to engage and advance the individual radial arms to turn the rotary member in timed relation to the movement of the grippers so that normally successive grippers will engage successive bag sections at predetermined points in the intervening web portions or side seams of the strip.

However, in the event that the intervening side seams are not spaced substantially in accordance with the spacing of the grippers, which may be due to irregularities in the application of the thermoplastic adhesive, stretching of the strip or like causes, such irregularity will be detected by the rotary registering or control member and through mechanism operatively connected to the latter, the last gripper to engage and advance the strip is caused to pull the strip forward through an increased increment whereby the next succeeding gripper will engage the strip in proper registered relation. Furthermore, even though the side seams are spaced substantially in accordance with the predetermined spacing, in the event that the strip should lag behind slightly as when the grippers are slightly out of register with the side seams, this condition will be detected by the control mechanism to effect advancement of the strip into proper registered position.

Referring now to the drawing, 10 represents a strip of bag forming material which is withdrawn from a roll 12 and which may comprise any paper now commonly used in the production of tea bags or similar containers. As herein shown, the bag forming material is preferably provided with a coating of thermoplastic adhesive upon one surface thereof along the longitudinal edges 14, 16 and in equally spaced transverse areas 18 in accordance with the bag sections to be formed.

As herein shown, in the formation of the bag the bag forming material being withdrawn is arranged to pass through suitable shaping mechanism, indicated generally at 19 which is arranged to fold the strip longitudinally to present the adhesively coated portions in contiguous engagement and thereafter, the folded strip is arranged to pass between vertically disposed rollers 20, 22, the latter of which may be heated by any suitable heating means such as the electrical heating element indicated at 24. As herein shown, the rollers 20, 22 are of a height such as to engage and heat seal the transverse portions 18 of

the strip only, whereby to form a series of equally spaced bag sections 26 open at the top and having equally spaced side seams 28.

As illustrated in Fig. 1, the strip of bag forming material is withdrawn from the roll 12 by a rotary conveyer indicated generally at 30 and which may comprise a plurality of gripper members 32 pivotally mounted upon a rotatable disk 34. The gripper members 32 are equally spaced about the disk in accordance with the spacing of the side seams 28 and successive grippers are adapted to be closed upon successive side seams 28 during the rotation of the conveying mechanism. In operation, the last gripper to engage the strip operates to effect the withdrawal and advancement of the strip from the roll and through the shaping mechanism and heat sealing rollers 20, 22 as above described, the preceding portions of the strip being held between and independently supported by the preceding gripper members. As herein shown, each pair of grippers 32 comprises a relatively stationary member 33 and a pivotally mounted member 35 cooperating therewith and which may be arranged to close upon the web through any suitable mechanism, not shown, as the grippers are being rotated with the disk 34.

From the description thus far, it will be seen that the equally spaced grippers 32 are arranged to successively grasp the web at successive transverse side seams, and to support a bag section of the web between adjacent grippers as they are carried along by the rotary conveyer. In the illustrated embodiment of the invention, provision is made for introducing a charge of tea or other commodity into each bag section as it is thus being carried along by the rotary conveyer, and as herein shown, suitable filling mechanism including a series of equally spaced filling tubes 40 is arranged to be moved around with the rotatable disk 34. The filling tubes 40 are arranged to be lowered into successive bag sections through the top thereof and as they are moved along each tube is provided with a predetermined quantity of the commodity being packaged by any suitable mechanism, to provide each bag section with a charge of the commodity.

As shown in Fig. 3, the filling tubes 40 may be slidably supported in bearings 41 formed on the ends of radial arms 43 extending from a hub 45 rotatably mounted on the central shaft 47 and may be operatively connected to and arranged to rotate with the rotary disk 34. Each filling tube is provided with a cam roll 49 arranged to ride in a cam path 51 provided in a stationary barrel cam 53 mounted upon the central shaft 47. In operation, successive filling tubes 40 are lowered into their respective bag sections after the grippers have engaged the strip and after the grippers have been moved relative to each other to permit the bag section to expand as hereinafter described. The hollow filling tubes 40 may be provided with flared upper edges 55 arranged to abut with adjacent filling tubes, and as the tubes are moved along with their bag sections, each tube is provided with a charge of the commodity by feeding mechanism, including a stationary hopper 57, arranged to feed a continuous and substantially uniform stream of material.

As illustrated in Fig. 1, provision is made for slackening the tension in the bag sections held between successive grippers 32 in order to permit the filling tubes to enter. Each pivotally mounted gripper unit 32 is provided with an arm 42 which carries a roller 44 cooperating with a stationary cam 46. In operation, immediately after a gripper member closes upon the web, the roller 44 passes over the high spot 48 of the cam to rock the gripper unit clockwise thus decreasing the distance between the gripper and the one immediately preceding it, so as to relieve the tautness of the bag section and to permit it to expand when the filling tube is lowered thereinto. This movement of the gripper also effects normal advancement of the strip to permit a succeeding gripper to be closed upon the strip at a predetermined point in the succeeding side seam. Provision is also made for spreading the upper edges of the strip in order to facilitate the insertion of the filling tube, and as herein shown, a pair of stationary V-shaped members 50, 52 supported between the upper edges of the strip is arranged to hold the upper edges of the strip in their spaced condition until the end of a filling tube is inserted into its bag section.

Provision is made for severing successive endmost bag sections from the strip as they are being carried by the rotary conveyer. As illustrated in Fig. 1, the gripper units 32 are arranged to grip the sealed side seams 28 of the strip at a point adjacent the rear edges thereof in order that a sufficient portion of the side seams may be exposed to permit severance substantially through the central portion thereof. Severance of the bag sections from the strip may be effected by a cutter 54 of any usual or preferred construction, capable of moving along with the grippers and operative to cut during the forward movement thereof, and thereafter the cutter is retracted until it coincides with a succeeding sealed side seam to be again brought forward to perform a cutting operation.

Upon severance of a bag section from the strip, the filling tube 40 is withdrawn from the bag, and the bag section supported now by one gripper unit, is passed between heat sealing rollers 60, 62 to seal the top of the bag and to complete the production thereof. As illustrated in Fig. 1, a second high spot 64 of the cam 46 is arranged to advance successive grippers immediately upon severance of a bag section and withdrawal of its filling tube in order to permit the bag section to again stretch out to its normal length before passing between the heat sealing rollers. After the top of a bag section has been sealed, as above described, the gripper unit 32 is opened to permit the bag section to be discharged from the machine.

From the above description it will be seen that proper registration of successive gripper units 32 with the successive side seams 28 of the strip is essential in order to effect proper registration of the individual bag sections with their respective filling tubes, and in order to present the bags in proper registration with the cutter. As long as the successive bag sections are uniformly spaced, the equally spaced gripper units, being arranged to grip the web at fixed spaced portions corresponding to such uniform spacing, the machine will operate normally as above described. However, it will be seen that any irregularities in the spacing between successive bag sections will throw the bag sections out of register with their filling tubes and with the cutter.

As herein shown, provision is made for assuring proper registration of successive grippers with successive side seams 28 and, in effect, to syn-

chronize the feed of the web in accordance with the bag sections formed in the web. For this purpose suitable control mechanism is provided, as indicated generally at 70, arranged to be actuated by the side seams 28 of successive bag sections and which is operative to actuate mechanism for effecting advancement of the strip into proper registered position in the event that the strip lags or in the event that successive side seams are spaced apart a greater distance than the normal predetermined spacing.

In the illustrated embodiment of the invention, the control mechanism comprises a rotatable member 72 loosely mounted upon a shaft 74 and provided with a plurality of radially extended feeler or detecting arms 76. The detecting arms 76 are arranged to extend into successive bag sections 26 as the strip is being advanced, and in operation, the engagement of the side seams 28 with successive arms 76 effects rotation of the loosely mounted hub 72 upon the shaft 74. A second rotary member 78 fixed to a collar or bushing 80 is also rotatably mounted upon the shaft 74, and is arranged to be driven in timed relation to the rotation of the rotary conveyer 30 through suitable driving connections including a sprocket 82 keyed to the collar 80. Thus, under normal operating conditions, the rate of rotation of the hub 72 as effected by the engagement of arms 76 with the strip, and the rate of rotation of the member 78 as effected by the driving connections between the rotary conveyer 30 and the member 78, will be equal. That is, as long as the distance between side seams is equal to the predetermined normal spacing and the strip is being advanced by the grippers 32 at a predetermined normal rate without any lag, the rotary detecting member 72 will be rotated in timed relation to the rotation of the driven member 78.

However, in the event that the strip lags so that successive grippers 32 are slightly out of register with the side seams, this condition will be reflected at the detecting station since the detecting arms 76 will be engaged later than usual and the rotation of the hub 72 will be thrown out of timed relation to the driven rotary member 78.

When this condition occurs provision is made for effecting an extra increment of movement of the last gripper to engage the strip in order to advance the strip so that a succeeding gripper will engage the strip at a point relatively further back and thus tend to bring the strip back into accurately registered position. As herein shown, a pivotally mounted cam piece 85, carried by the stationary cam 46, is arranged to be actuated by a solenoid 86 to move the cam piece into a position to cooperate with the rollers 44 of successive gripper units 32. The connections between the armature 88 of the solenoid and the pivotally mounted cam piece comprises a toggle mechanism 90, and the cam piece is adjustably limited in its retracting movement by a stop screw 92 mounted in the stationary cam 46, as illustrated in Fig. 1.

As herein shown, the solenoid 86 is arranged to be energized by a circuit arranged to be closed when the rotation of the detecting hub 72 lags behind the rotation of the driven rotary member 78, as above described. The circuit includes a pair of contacts 94, 96, one of which, 94, is stationary, and in contiguous engagement with a conducting ring 98 provided on the rotary hub 72. The second contact member 96 is carried by the rotary driven member 78 and normally rests against an insulated portion of the hub 72 as shown in Fig. 2. A brush 100 in contact with a conducting ring 102 in the rotary member 78 supplies current to the contact member 96. In operation, when the rotary members are rotated in timed relation, the contact member 96 will remain upon the insulated portion of the hub and the circuit will remain open under such normal operating conditions. However, when the hub 72 lags behind, as will occur when the strip lags, the contact 96 will ride along the insulated hub and engage a contact 104 set in the insulated hub and which is connected to the conducting ring 98 by a lead 106, as clearly shown in Fig. 1. When this occurs, the circuit will be closed to energize the solenoid 86 and to effect advancement of the strip as above described.

From the above description, it will be seen that as long as the rotary hub 72 is driven by the engagement of the detecting arms with the forward edge of successive bag sections, in timed relation to the driven hub 78, the grippers of the rotary conveyer will effect normal advancement of the strip to present successive bag sections into registered position with the filling tubes and the cutter. It will also be observed that any lag in the advancement of the strip will be detected by the detecting arms 76 to effect an abnormal increment of movement of the strip through the connections described whereby to again cause the rotary member 72 to be driven in timed relation to the member 78. It will be seen that the spreader member 50 operates to spread the upper edges of the strip to facilitate entrance of successive feeler arms into successive bag sections as the strip is advanced.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, bag filling means, bag severing means, means for moving said strip comprising a plurality of gripping members arranged to grasp said strip at successive side seams and to present successive bag sections into operative relation to said filling and severing means, and control means for assuring registration of successive grippers with successive side seams.

2. In a machine for making individual filled bags, in combination, means for operatively supporting a strip comprising a plurality of connected bag sections, bag filling means, bag severing means, strip advancing means for presenting successive bag sections into registered relation to said filling and severing means, and control means cooperating with the bag sections for controlling the operation of said strip advancing means.

3. In a machine for making individual filled bags, in combination, means for operatively supporting a strip comprising a plurality of connected bag sections, bag filling means, bag severing means, strip advancing means comprising a plurality of grippers arranged to grasp said strip

at predetermined spaced portions thereof and to present successive bag sections into operative relation to said filling and severing means, and control means cooperating with said bag sections for controlling the operation of said strip advancing means.

4. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections means for moving said strip including a plurality of gripper members arranged to grasp said strip at successive side seams, and to support successive bag sections therebetween, filling means including a plurality of tubes adapted to be inserted into successive bag sections, and means for moving successive grippers relative to one another after they have gripped the strip to decrease the distance therebetween in order to permit expansion of said bag sections to permit said filling tubes to enter.

5. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, means for supporting and moving said strip comprising a rotary conveyor, a plurality of gripper members mounted on said conveyor and arranged to grasp said strip at successive side seams and to support successive bag sections therebetween during subsequent filling and severing operations, detecting means adapted to project into said bag sections and to be engaged by the rear side seam thereof as the strip is advanced, and means operatively connected to said detecting means for advancing said strip an abnormal amount in the event said detecting means detects any lag in the normal advancement of said strip.

6. The combination with apparatus for making and filling bags of means for operatively supporting and moving a strip of bag forming material closed at the bottom and open at the top and provided with transverse sealed side seams forming a series of bag sections, said means comprising a plurality of grippers arranged to successively engage said strip at said side seams and to support successive bag sections therebetween, and control means engageable with said strip for controlling the operation of said grippers to effect an abnormal advancement of said strip in the event said strip should lag whereby to assure accurate registration of said grippers with succeeding side seams.

7. In a method of making individual filled bags, the steps comprising forming bag material into the form of a strip having a closed bottom and open top, sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, and moving the strips by grippers arranged to grasp the strip at successive side seams, and operatively supporting successive bag sections between adjacent grippers during subsequent filling of said bag sections.

8. In a method of making individual filled bags, the steps comprising forming bag forming material into the form of a strip having a closed bottom and open top, sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, moving the strip by grippers adapted to grasp the strip at successive side seam, operatively supporting successive bag sections between adjacent grippers, moving adjacent grippers relative to each other to decrease the distance therebetween, whereby to permit the bag sections to be opened, and subsequently filling said bag sections while they are held in such open position.

9. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, bag filling means, bag severing means, means for moving said strip comprising a plurality of gripping members arranged to grasp said strip at successive side seams and to present successive bag sections into operative relation to said filling and severing means, and control means for detecting abnormal spacing between successive side seams, and means operatively connected to said control means for advancing the strip an abnormal amount sufficient to register succeeding side seams with successive grippers in the event the control means detects such abnormal spacing.

10. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, bag filling means, bag severing means, means for moving said strip comprising a plurality of gripping members arranged to grasp said strip at successive side seams and to present successive bag sections into operative relation to said filling and severing means, and control means comprising a rotary mounted member provided with a plurality of radial arms arranged to enter successive bag sections and to be rotated by engagement with the forward edge of successive side seams, and means operatively connected to said rotary member for effecting movement of a gripper to advance said strip an abnormal amount in the event said control means detects a lag in the movement of the strip whereby to assure proper registration of successive grippers with successive side seams.

11. In a machine for making individual filled bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, bag filling means, bag severing means, means for moving said strip comprising a rotary conveyer, a plurality of gripper members mounted on said conveyer and arranged to grasp said strip at successive side seams and to support successive bag sections therebetween during subsequent filling and severing operations, and means including a stationary cam cooperating with successive grippers to effect movement thereof relative to one another in a direction such as to decrease the distance therebetween after the grippers have engaged such side seams, whereby to permit expansion of said bag during the filling operation.

12. In a machine for making individual filled

bags, in combination, means for forming bag forming material into the form of a strip having a closed bottom and open top, means for sealing the bag forming material of such strip transversely at predetermined spaced intervals to form the side seams of a series of bag sections, means for supporting and moving said strip comprising a rotary conveyer, a plurality of gripper members mounted on said conveyer and arranged to grasp said strip at successive side seams and to support successive bag sections therebetween during subsequent filling and severing operations, and control means operative to effect advancement of said strip an added increment to present successive side seams in register with succeeding grippers in the event that the strip lags out of register with said grippers, said control means comprising a rotary member arranged to be engaged and rotated by successive side seams, a second rotary member driven in timed relation to said rotary conveyer, a cam piece arranged to be actuated to effect added movement of a gripper to advance the strip into registered position, a circuit including a solenoid for moving said cam piece and means for closing said circuit including a contact member carried by said second rotary member and normally in engagement with an insulated portion of said first rotary member, and a second contact member carried by said first rotary member arranged to be engaged by said first contact member to close the circuit in the event that said first rotary member lags behind the second rotary member.

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