Nov. 10, 1959 A. S. JENKINS 2,912,042

CLOSURE-LINER ASSEMBLING MACHINE

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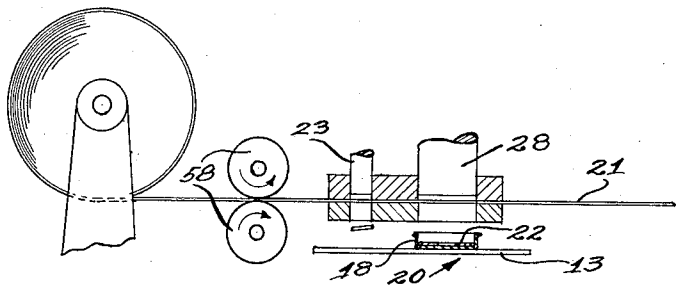


FIG. 2.

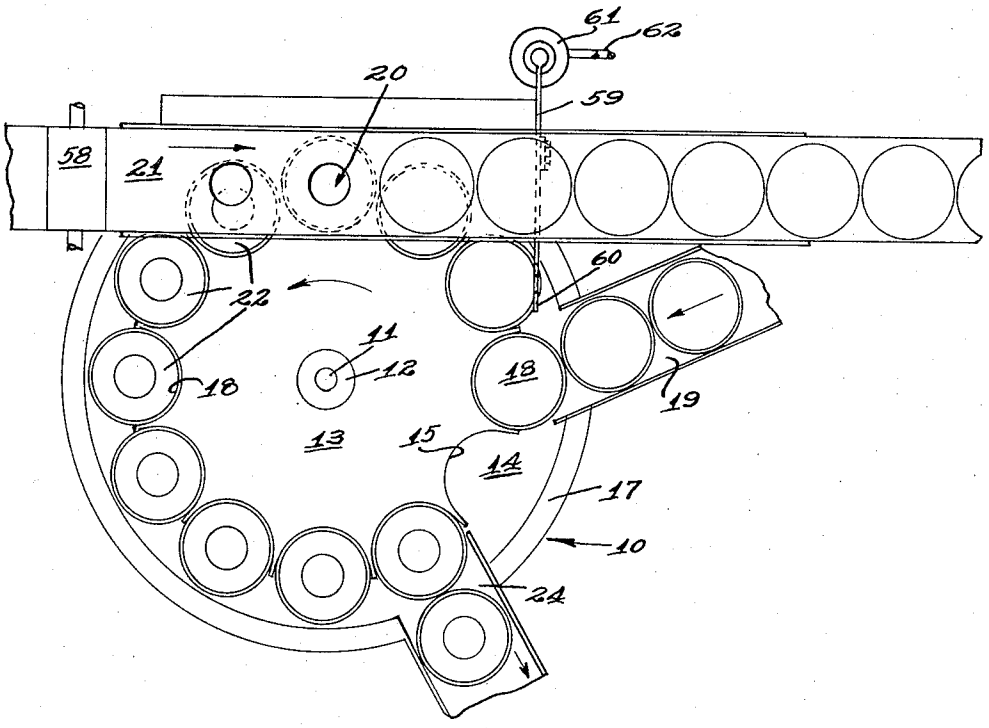


FIG. 1.

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Fig. 5.

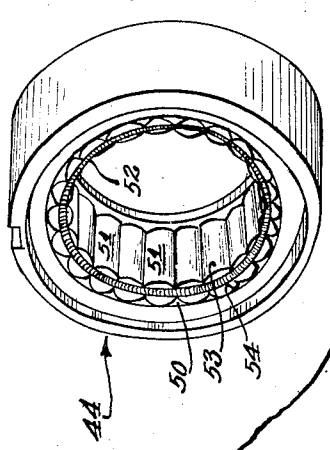


Fig. 3.

Fig. 4.

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CLOSURE-LINER ASSEMBLING MACHINE

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Application February 21, 1956, Serial No. 567,022

5 Claims. (Cl. 154—1.5)

This invention relates to an improvement in a driving mechanism for synchronizing the feed and operation of an automatic closure-liner insertion machine, and more particularly to an improved driving mechanism for synchronizing the feed of liner material with the feed of closures in a closure-liner insertion machine.

The present improvement will be described in connection with a driving mechanism for transmitting incremental rotary motion, but it is to be understood that the improvement is also suitable to a driving mechanism for transmitting continuous rotary motion. For the purposes of clarity and simplicity, however, the present description will be confined to an incremental driving mechanism for conveying a strip of liner material to a closure-liner insertion machine of the type commonly used in inserting liners into closures and more specifically described in U.S. Patent No. 2,537,832 issued to J. C. Johnson et al.

The principal object of this invention is to provide an improvement in a driving mechanism to synchronize the feed of liner material with the presentation of closures for liner insertion in a closure-liner insertion machine.

Another object of this invention is to provide an improved driving mechanism characterized by means for temporarily interrupting the feed of liner material to a closure-liner insertion machine upon response from a signal means indicating that the machine has failed to present a closure for liner insertion.

A still further object of this invention is the provision of an improvement in a driving mechanism which will permit the resumption of synchronous movement between a strip of liner material and a closure-liner insertion machine when a closure is being presented by the machine for liner insertion.

A still further object of this invention is to provide an improved driving mechanism comprising the aforementioned improvements and which is readily adaptable for use with many of the commercial closure-liner insertion machines presently utilized.

The specific nature of this invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description, taken in conjunction with the annexed drawings on which, by way of preferred example only, are illustrated the preferred embodiments of this invention.

Fig. 1 represents a schematic plan view of the principal operable portions of a conventional commercial closure-liner insertion machine and generally indicates its relative position with respect to a strip of liner material.

Fig. 2 represents a schematic elevational view of a liner punching and inserting station.

Fig. 3 represents a driving mechanism embodying the present invention.

Fig. 4 represents an enlarged sectional view of the actuating means for the driving mechanism illustrated in Fig. 3 and represents a section taken substantially along the line 4—4 therein.

Fig. 5 represents a perspective view of a conventional unidirectional roller type cam clutch.

The driving mechanism embodying the present invention, which will be described in detail, subsequently, may be advantageously utilized with a machine requiring a highly synchronized feed of material to the machine, such as the closure-liner insertion machine indicated generally in Fig. 1 by the numeral 10. The machine 10, therein illustrated, is a conventional machine commonly used for inserting individual liners within receptacle closures. The liners generally are formed from material, such as heavy paper, which is capable of forming an effective seal between the closure and receptacle when mutually engaged in relatively snug relationship.

In general, the closure-liner insertion machine 10 has an incrementally rotatable shaft 11 fixedly journalled within a hub 12 located in the center of the generally circular table 13. This table 13 incrementally rotates within a circular basin 14 and defines a scalloped periphery constituting a plurality of closure-receiving pockets 15 proximately adjacent to the rim portion 17 of the basin 14. Closures 18 are deposited open end up within the pockets 15 from a receiving chute 19 traversing the rim 17 of the basin 14. After a closure 18 has been deposited within a pocket 15, the table 13 incrementally rotates the pocket 15 into registration with a liner inserting punch 28 as best shown in Fig. 2. Here, an annular liner 22 is punched out of a strip of liner material 21 overlying the table 13. As schematically shown in Fig. 2, this operation is accomplished by a first punch 23 which punches out a first hole in the liner strip 21, after which the liner strip 21 is advanced to a position in axial alignment with a second punch 28 which punches a larger hole in the liner strip 21 and inserts the annular liner 22, so formed, snugly into the closure 18. Following the insertion of the annular liner 22, the table 13 is incrementally rotated approximately 180° to a position where the lined closure 18 is expelled into a discharge chute 24 traversing the basin rim 17.

The overlying liner strip 21 travels incrementally in a direction generally opposite to that of the rotating table 13 at the liner punching and inserting station 20, and is indexed to advance concurrently with the table 13 by a driving mechanism to be hereinafter described.

A driving mechanism 25, as illustrated in Fig. 3, is also provided which maintains a proper timed indexing correlation between the incremental advancement of the liner strip 21 and the table 13. Constituting one end of this driving mechanism 25, there is a cylinder 26 defining a relatively smooth central bore 29 and having an outwardly projecting welded mounting bracket 27 rigidly bolted to the frame of the machine 10. Within the bore 29 there is a slidable close fitting ram 30 which defines a socketed inner end portion 31 swivelly engaging the T-shaped inner end portion 32 of a driving shaft 33 traversing the cylinder 26 through an aperture 34 positioned in axial alignment with the bore 29. Opposite the socketed end portion 31, the ram 30 also defines a central cavity 67 seating a resilient spring 65 which is compressed against the ram 30 by a cylinder cap 66 marginally bolted to the open end of the cylinder 26. The spring 65 is maintained in this slightly compressed condition to resiliently bias the ram 30 and the driving shaft 33 and prevent same from axially shifting within the bore 29.

Exteriorly of the cylinder 26, the driving shaft 33 defines a centrally located first cylindrical portion 35 and and adjacent diametrically smaller second cylindrical portion 36. Additionally, the outer end of the driving shaft 33 defines a plurality of longitudinal splines 38 which are engageable with complementary splines 40 defined within a hollow output sleeve 39. A miter gear 57 is keyed to sleeve 39 and drives the liner feed rolls 58 through conventional gearing. A driven shaft 37 has a splined inner end portion 41, identical to that of the

driving shaft 33, insertable within the opposite end portion of the sleeve 39, and is rotationally supported at its outer end portion 42 by a stationary bearing block 43.

The first cylindrical portion 35 of the driving shaft 33 is slidably journalled within a conventional roller cam type clutch 44, illustrated in Figs. 4 and 5, which in turn is contained within an oscillatable sectional collar 45, as illustrated in Fig. 4, the sectional portions of which are threadably joined together about the clutch 44 by marginally positioned bolts 49. To prevent relative rotational movement between the collar 45 and the clutch 44, the adjoining surfaces thereof are mutually engaged by a key 46. Projecting radially outward from the collar 45 there is an integral crank arm 47 swivelly connected to a reciprocatory connecting rod 48 suitably interconnected with the table 13 by conventional gearing means, not illustrated, to reciprocate in timed synchronous relationship therewith. Thus, when the table 13 is incrementally rotated, the connecting rod 48 pivotally oscillates the crank arm 47 and the interkeyed collar 45 and clutch 44 about the axis of the driving shaft 33.

As best illustrated in Fig. 5, a resilient annular spring 52 compressibly insertable within the clutch 44 maintains a plurality of roller cams 51 in axially parallel engagement with the outer race 50 of clutch 44. As is well known, the peripheral configuration of these cams 51 is such that they define a partially rounded surface 53 on the side adjacent to the driving shaft 33 and a wedging surface 54 in adjoining relationship to the outer race 50. The wedging surface 54 of the cams 51 is characterized by a small contact angle which is presented to the outer race 50 when the clutch 44 is rotated in one direction, and a relatively larger contact angle which is presented to the outer race 50 when the direction of rotation of the clutch 44 is reversed. When the clutch 44 is rotated in a direction opposing the small contact angle the cams 51 are forcibly rocked into wedged engagement with the first cylindrical portion 35 of the driving shaft 33 and the outer race 50 to force the driving shaft 33 into mutual rotation with the clutch 44. However, when the rotation of the clutch 44 is reversed, the larger contact angle is in opposition to the direction of rotation and permits the outer race 50 to freely overrun the roller cams 51.

To prevent creeping of the driving shaft 33 due to drag or friction while it is being freely overrun by the clutch 44 a second roller cam type clutch 56 is journalled on the driven shaft 37 and fixedly secured to the machine 10 by a bracket 16 bolted to the machine. The clutch 56 however is reversed end for end with the clutch 44 so that the wedging action of the clutch 56 operates rotationally opposite the wedging action of the clutch 44 permitting the clutch 56 to freely overrun the driven shaft 37 when rotated by the sleeve 39 interconnected driving shaft 33, but to wedgingly prohibit both the driving and driven shafts 33 and 37 respectively from rotating backwards when the clutch 44 is overrunning the driving shaft 33. Prevention of drag upon the driving shaft 33 is very important because the miter gear 57 fixedly journalled on the sleeve 39 and conventionally intergeared with the liner strip feed rollers 58, illustrated in Fig. 2, transmits considerable tensional back drag from the liner strip 21 to the miter gear 57, and if this drag were permitted to reverse the rotation of the driving shaft 33, the synchronized advancement of the table 13 and the liner strip 21 would be destroyed. Furthermore, the reverse acting clutch 56 when in wedged engagement with the driven shaft 37, insures that the measured advancement of the liner strip 21 will correspond to the center-to-center distance between the punches 23 and 28.

When, as oftentimes happens, a table pocket 15 advances to the liner punching and inserting position beneath punch 28 without a closure 18 deposited therein, it is desirable that the liner strip 21 should not be advanced in order to prevent unnecessary waste of liner material. Therefore, to prevent such waste there is provided a means for detecting the absence of a closure 18 from a pocket 15 which cooperates with the described driving mechanism to interrupt the advancement of the liner strip 21. A rocker arm 59, as illustrated in Fig. 1, is pivotally mounted to the frame of the closure-liner machine 10 in a position so located that the rocker arm 59 will contact each closure 18 as it is conveyed by the pockets 15 into registration with the liner inserting punch 28. Failure of a closure 18 to contact the rocker arm 59 will permit the closure contacting end 60 of the rocker arm 59 to shift to a lower position and pivotally raise the opposite end of the rocker arm 59 causing a conventional pressure valve 61 connected thereto to be opened to permit a flow of pressure air through the air line 62.

As illustrated in Fig. 3, the air is discharged from the air line 62 through a cylinder aperture 63 into the cylinder bore 29. The passage of the pressured air into the cylinder bore 29 forces the ram 30 and the swivelly connected driving shaft 33 to shift axially toward the cylinder cap 66, compressing the resilient spring 65 situated therebetween, and exhausting the air compressed by the moving ram 30 out through an outlet 68 extending through the cylinder cap 66. The axial shifting of the driving shaft 33 by the ram 30 causes the first cylindrical portion 35 of shaft 33 to slide out of engagement with the roller cams 51 in the clutch 44 and shifts the smaller diameter second cylindrical portion 36 into the position previously occupied by the first cylindrical portion 35 within the clutch 44. The second cylindrical portion 36 is of sufficiently smaller diameter to permit the clutch 44 to oscillate freely without rotating the driving shaft 33. The failure of the driving shaft 33 to rotate interrupts the advancement of the integeared feed rolls 58 and liner strip 21 until a closure 18 once more contacts the rocker arm 59 causing it to close the pressure valve 61 and release the pressure from the cylinder 26 which permits the spring 65 to slide the first cylindrical portion 35 of the driving shaft 33 back into engagement with the clutch 44 and resume the synchronized advancement between the strip of liner material 21 and the closure-liner machine 10.

One of the outstanding advanges attained through utilization of the driving mechanism 25, is the very closely synchronized relationship available between the feed of the liner strip material 21 and the movement of the rotating table 13. However, any change in the rate of feed of the liner material may be rapidly and accurately made by merely adjusting the stroke of the connecting arm 48. Whereas, in ratchet and pawl devices, as disclosed in the Johnson patent, herein referred to earlier, adjustments in the rate of feed generally necessitate the interchanging of ratchets, since all adjustments are necessarily limited in part to multiples of the circular pitch of the particular ratchet being used. Such interchanging of ratchets causes the machine to be idled for excessively long periods of time and results in increased operating expense.

A further advantage obtained, is the elimination of waste of liner material and a lowered operational cost by preventing the liner strip 21 from advancing when a closure 18 is not in position to receive a liner 22 punched therefrom.

Another outstanding advantage of the present invention resides in its simplicity of design and ease of installation with many of the conventional closure-liner machines presently in commercial use, such as the machine disclosed in the previously mentioned Johnson patent.

It will, of course, be understood that various details of construction may be modified through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim:

1. In a closure-liner assembling machine having an incrementally rotating table provided with a plurality of closure receiving pockets, means for successively feeding closures to said pockets, and liner punching and inserting means; the improvement comprising a driving mechanism for successively advancing said liner relative to said liner punching and inserting means in timed relation to the incremental rotation of said table, including an oscillatable overrunning clutch of the cam roller type, said clutch including a shaft-like axially shiftable power transmitting element having a first cylindrical portion cooperable with the roller cams of said clutch and a second cylindrical portion axially adjacent said first cylindrical portion and of sufficiently smaller diameter to clear said roller cams, said cam rollers being adapted to engage said first cylindrical portion in fixed driving engagement when said clutch is rotated in one direction, and to overrun said first cylindrical portion when said clutch is rotated in the reverse direction, power means for oscillating said clutch in timed relation to rotation of said table, a second power means for axially shifting said shaft-like element to move said first cylindrical portion out of cooperative relation with said roller cams, a second overrunning clutch opposing reverse motion of said shaft-like element when the other overrunning clutch is disengaged from fixed driving engagement with said first cylindrical portion, and means operable in response to the absence of a closure in a pocket of said table at a particular position for actuating said second power means to interrupt the advancement of said liner relative to said punching and inserting means.

2. The combination defined in claim 1, wherein said second power means comprises a pressure-actuated ram for deactivating said cam roller clutch, said ram being coaxially secured to said shaft-like element, and resilient means urging said shaft-like element axially toward its actuating position relative to said cam roller clutch.

3. In a closure-liner assembly machine having an incrementally rotating table with a plurality of closure receiving pockets, means for successively feeding closures to said pockets, and liner punching and inserting means; the improvement comprising a driving mechanism for successively advancing said liner relative to said liner punching and inserting means in timed relation to the incremental rotation of said table, including a first overrunning clutch of the cam roller type, said clutch including an axially shiftable power transmitting shaft-like element having a first cylindrical portion cooperable with the roller cams of said clutch and a second cylindrical portion axially adjacent said first cylindrical portion and of sufficiently smaller diameter to clear said roller cams, power means for axially shifting said shaft-like element to move said first cylindrical portion out of cooperative relation with said roller cams, braking means for preventing reverse motion of said shaft-like element when the latter is moved axially so that said first cylindrical portion is out of cooperative relation with said roller cams, said braking means comprising a second overrunning clutch of the cam roller type cooperating with said shaft-like element in reverse manner from said first overrunning clutch so that said second overrunning clutch is in overrunning relationship in response to rotational movement in a direction effecting engagement of said first overrunning clutch with said shaft-like element and is in engaging relationship in response to rotational movement effecting overrunning of said first overrunning clutch with said shaft-like element, and means responsive to the absense of a closure in a pocket of said table at a particular position for actuating said power means to interrupt the operation of said liner punching and inserting means.

4. In a closure-liner assembly machine having an incrementally rotating table with a plurality of closure receiving pockets, means for successively feeding closures to said pockets, and liner punching and inserting means; the improvement comprising a driving mechanism for successively advancing said liner relative to said liner punching and inserting means in timed relation to the incremental rotation of said table, including an overrunning clutch of the cam roller type, said clutch including an axially shiftable power transmitting first shaft-like element having a first cylindrical portion cooperable with the roller cams of said clutch and a second cylindrical portion axially adjacent said first cylindrical portion and of sufficiently smaller diameter to clear said roller cams, power means for axially shifting said shaft-like element to move said first cylindrical portion out of cooperative relation with said roller cams, braking means for preventing reverse motion of said first shaft-like element when the latter is clear of said roller cams, said braking means comprising a second shaft-like element interconnected with said first shaft-like element for rotation therewith, a second overrunning clutch of the cam rollers type carried by said second shaft-like element and operable in similar manner as said first overrunning clutch but in response to reverse rotation so that said second overrunning clutch will overrun said second shaft-like element when said first overrunning clutch is engaged with said first shaft-like element and will engage said second shaft-like element when said first overrunning clutch is disengaged from said first shaft-like element, and means responsive to the absence of a closure in a pocket of said table at a particular position for actuating said power means to interrupt the operation of said liner punching and inserting means.

5. The combination defined in claim 4, wherein the interconnection between said first and said second shaft-like elements includes an axially splined coupling connecting adjacent end portions of said first and second shaft-like elements for transmitting rotational movements between said shaft-like elements, the splined portion of said coupling being of sufficient length to permit axial splined movements of said first shaft-like element relative to said coupling for movement of said first and second cylindrical portions into and out of engagement with said first overrunning clutch while retaining a connection between said first and second shaft-like elements.

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