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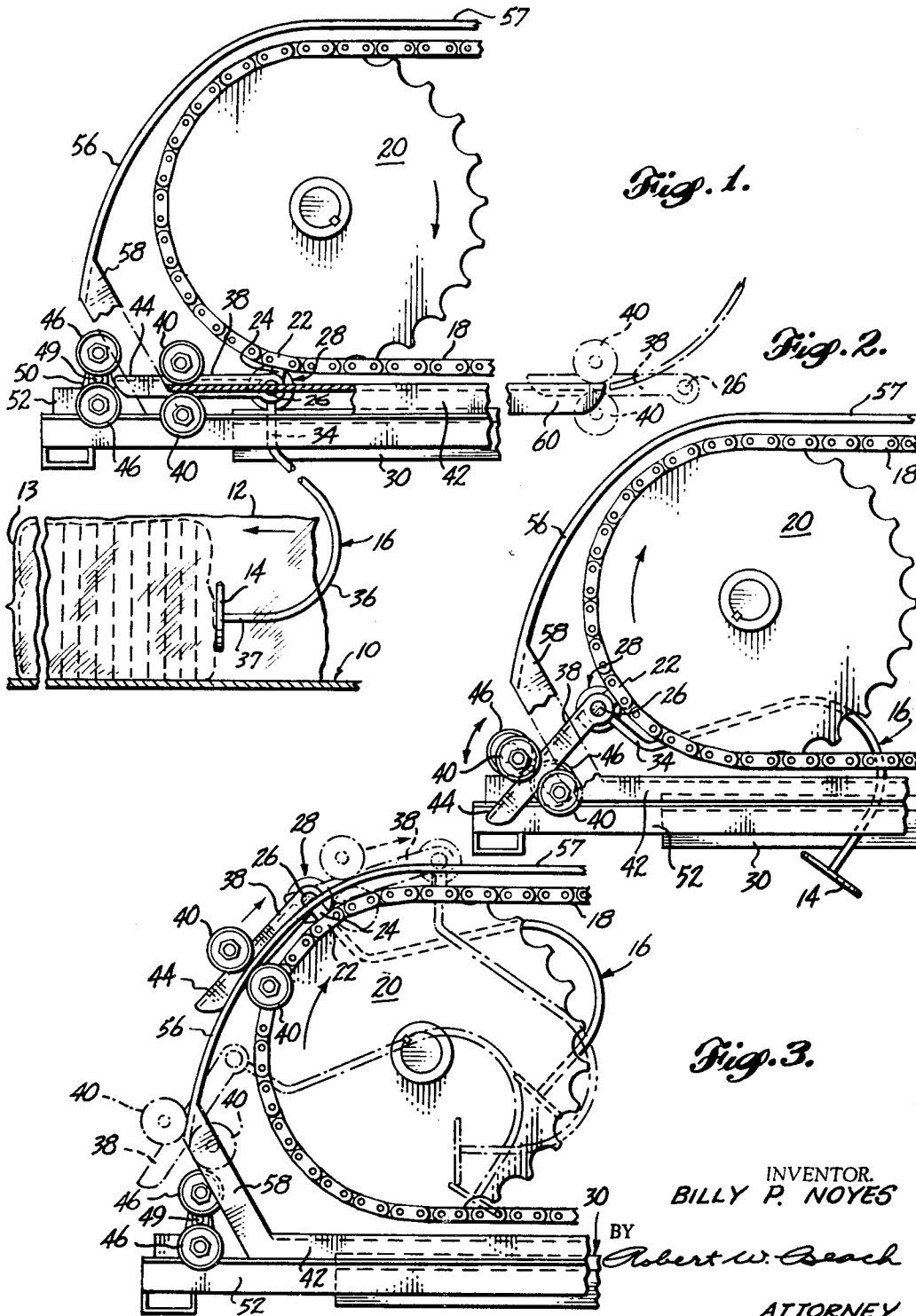
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3,504,784

ARTICLE PUSHER MECHANISM FOR BAG-FILLING MACHINES

Original Filed April 18, 1966

2 Sheets-Sheet 1



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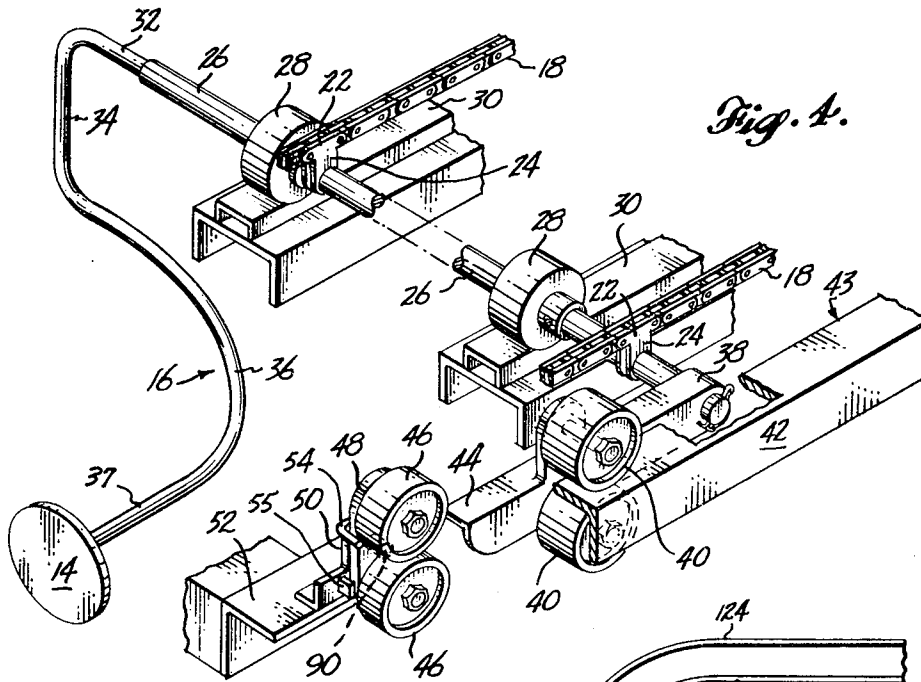


Fig. 1.

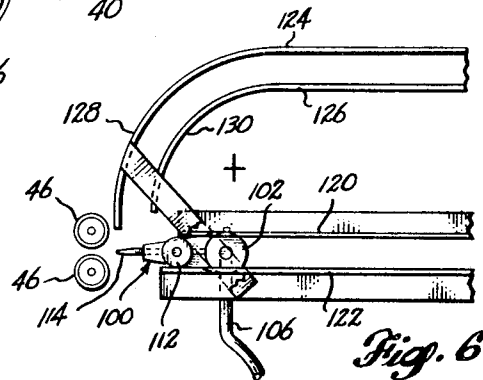


Fig. 6.

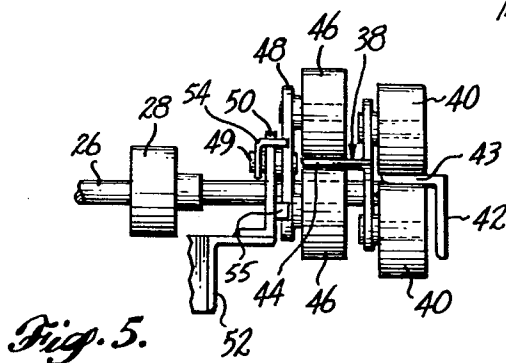


Fig. 5.

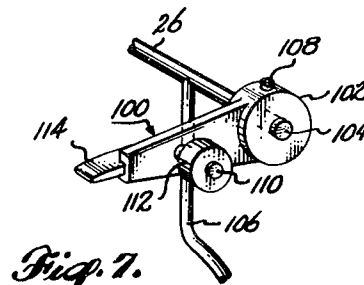


Fig. 7.

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ARTICLE PUSHER MECHANISM FOR BAG-FILLING MACHINES

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Continuation of application Ser. No. 543,115, Apr. 18, 1966. This application Nov. 14, 1968, Ser. No. 775,849

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4 Claims

ABSTRACT OF THE DISCLOSURE

An endless chain loop carries and moves elevationally a depending curved pusher arm having on its lower end a pusher head engageable with an article to move it into the open mouth of a bag at a bag-filling station. Control mechanism extending around the path of travel of the carrier controls swinging of the pusher arm relative to the carrier to move the pusher head in a linear path during the bag-filling operation and then to swing the arm backward as the portion of the carrier supporting the arm moves upward so as to withdraw the pusher head from the filled bag in a direction opposite to the direction of movement of the carrier despite continued unidirectional movement of the carrier.

This application is a continuation of U.S. patent application Ser. No. 543,115, filed Apr. 18, 1966 for Bag-Filling Machine and now abandoned.

It is a principal object of the present invention to provide simplified mechanism for withdrawing a pusher from a filled bag which will be quick and reliable in operation.

A further object is to provide such mechanism for withdrawing a pusher from a bag while the carrier for the pusher continues to move unidirectionally at uniform speed without interruption.

It is also an object to provide such mechanism which is compact and arranged so as not to interfere with other components of the bagging mechanism.

It is also an object of the invention to provide such apparatus which is simple and easy to construct, reliable in its operation over extended periods of time, and which requires practically no attention in an automatic bag-filling machine, except for minor routine lubrication.

FIGURES 1, 2 and 3 are side elevations of the portion of pusher carrier mechanism at the discharge side of a bag-filling station and the associated pusher control mechanism, a pusher and its control mechanism being shown in different positions in the several figures.

FIGURE 4 is a top perspective of a pusher and a portion of the pusher carrier and pusher control mechanism on an enlarged scale.

FIGURE 5 is a detail end elevation of a portion of the pusher control mechanism at the discharge side of the bag-filling station.

FIGURE 6 is a schematic side elevation of a portion of alternative pusher-guiding mechanism with the carrier mechanism being omitted and FIGURE 7 is a top perspective of a portion of the control mechanism shown in FIGURE 6.

In FIGURE 1 a table 10 is representative of a support for a bag 12, preferably of film material, into which articles are to be inserted at a bag-filling station when the bag mouth is distended. Mechanism adapted for distending such a bag mouth at a bag-filling station is disclosed in the copending patent application Ser. No. 757,513, filed Aug. 5, 1968, in the names of Billy P. Noyes and Howard L. Willard, for Bagging Machine or in U.S. Patent No. 3,217,464, for example. Articles can be pushed into the distended mouth of such a bag by a

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pusher plate 14 on the end of a cantilever arm 16 carried by an endless carrier loop shown in the drawings as chain 18. FIGURE 1 shows that such chain is spaced from the bag-supporting table 10 so as not to interfere with mechanism for supplying bags, opening their mouths and holding the bag mouths open while articles are inserted into the bags. Chain 18 is driven by suitable mechanism to move continuously at a uniform speed in a direction to propel the pusher so that it can move an article into the open mouth of a bag 12 and then move the filled bag from the bag-filling station to a discharge location.

The carrier chain 18 formed as an endless loop is guided to move the pusher arm 16 elevationally by engagement with sprockets 20 at opposite horizontally spaced ends of the loop. Such sprockets are mounted on horizontal shafts at the same elevation and are of substantially equal sizes so that the chain 18 will have substantially parallel and horizontal upper and lower stretches, both of which are located well above the bag support 10 as shown in FIGURE 1. The lower stretch of this chain will be spaced above the bag-filling station a distance with relation to the length of the depending pusher such that the pusher plate 14 will engage an article to be bagged in the proper position as illustrated in FIGURE 1.

The portion of the carrier to which a pusher is attached moves substantially horizontally and linearly parallel to the article-supporting surface and bag-supporting surface as it travels in the bag-filling direction toward and past the bag-filling station. At such station the pusher sweeps the article into the open mouth of the bag 12, presses the article against the bottom 13 of the bag and, as a result of such pressure, then moves the filled bag to the discharge location. Such linear stretch of the pusher-supporting part of the carrier 18 merges into an upward arcuate path defined by the circumference of the sprocket 20 at the discharge end of the pusher travel.

Preferably, the point of transition of the carrier from linear travel to upward arcuate travel is spaced a substantial distance beyond the location of the pusher attachment to the carrier at which the pusher inserts an article into a bag at the bag-filling station. Actually, the shape of the loop around which the endless carrier travels is not particularly important except for the stretch of travel path which extends substantially parallel to the path of movement of an article to and through the bag-filling station. In fact, the path of travel of the carrier could be generally triangular except for the portion of the loop curved upwardly adjacent to the discharge location of the pusher.

The pusher arm 16 is of cantilever type and in order to prevent tilting of its supporting portion it is preferred that the pusher carrier mechanism include two parallel chain loops 18 as shown in FIGURE 4. Corresponding links of these two chains carry pusher-attachment fittings in the form of ears 24 apertured to receive a cross shaft 26 constituting part of the pusher supporting means. Such shaft carries rollers 28 which roll along stationary rails 30 mounted stationarily adjacent to the lower linear stretches of the loops of carrier chains 18. Such rails establish positively the desired shape of the path traveled by each pusher-supporting shaft 26 between the spaced sprockets 20 at opposite ends of the chain loops. Preferably, such rails are straight so that the shaft 26 and pusher plate 14 move along a corresponding linear path.

The pusher arm 16 is shaped so as to locate the pusher plate 14 a substantial distance to one side of the chains 18 and, consequently, overlying the bag-supporting surface 10 a substantial distance below the pusher-supporting cross shaft 26 and a substantial distance ahead of such cross

shaft. To support the pusher plate in such a location, the pusher arm 16 includes the attaching end portion 32 attached to one end of shaft 26 and projecting from such shaft outward generally in horizontal alignment with such shaft. From the outwardly projecting arm portion 32 a portion 34 projects substantially radially of the axis of the pusher-supporting cross-shaft 26 and carries a curved portion 36 from the lower end of which projects the swinging end portion 37 which is disposed substantially perpendicular to a radius extending through the axis of the cross-shaft 26 as shown best in FIGURES 1 and 4. The pusher plate 14 is attached to the forward end of the arm portion 37 in a plane substantially perpendicular to such arm portion and substantially parallel to the radius extending perpendicular to arm portion 37. During movement of the cross-shaft 36 by the carrier along the lower portion of the carrier loop the pusher-supporting arm will extend downward from shaft 26 so that the portion 34 will be upright and will project substantially vertically downward from the shaft 26 while the portion 36 will curve downwardly and forwardly to the swinging end portion 37. Such swinging end portion will project forwardly substantially horizontally, and the pusher plate 14 will be disposed substantially in a vertical plane. The depending portions of the pusher arm, including the vertical portion 34, the downwardly and forwardly curved portion 36, and the horizontal portion 37, are disposed in an upright plane located approximately medially of the bag-supporting surface 10.

As shown in FIGURES 1 to 5, a crank arm 38 is attached rigidly to shaft 26, preferably at its end remote from the pusher arm attaching portion 32. Such crank arm can be keyed, or splined, or pinned to shaft 26 so as to be rotatively integral with it. Such crank arm projects forwardly from shaft 26 substantially parallel to the forwardly projecting pusher arm portion 37. Swinging of such crank arm will effect rotation of cross shaft 26 and corresponding swinging of the pusher arm 16. Rollers 40 are mounted on the swinging end of crank arm 38 for rotation about axes spaced transversely of the crank arm. Such rollers are spaced apart sufficiently to be disposed at opposite sides of a guide rail 42 extending parallel to the rails 30.

Preferably, guide rail 42 is of angle cross section having one flange disposed upright and a horizontal flange 43 extending between the guide rollers 40. Such rollers should be spaced apart sufficiently to receive the horizontal guide rail flange between them, but there should be little, if any, clearance between such guide rollers and the guide rail flange. As long as the flange 43 of guide rail 42 is located between the guide rail follower rollers 40, crank arm 38 will be held in a position parallel to rails 30 and guide rail 42 and, consequently, the portion 37 of pusher arm 16 also will be held in a position parallel to such rails because the crank arm 38 will prevent shaft 26 from rotating relative to the chain ears 24.

It will be evident from FIGURE 1 that it is desired to maintain the forwardly projecting portion 37 of pusher arm 16 in a substantially horizontal attitude while the pusher plate 14 is pushing the article to be bagged toward and into the open mouth of the bag and, further, while the filled bag is being pushed by engagement of the pusher plate with the article in the bag from the bag-filling station to a discharge location. Because the bag is deeper than the article, such as a loaf of bread, inserted into it, it is desirable for the downwardly and forwardly curved portion 36 of the pusher arm and the horizontal pusher arm portion 37 to have a contour and a length as shown in FIGURE 1 such that the concave side of the curved arm portion 36 will still be spaced from the lip of the bag when the article being bagged has been inserted fully into the bag and the pusher plate 14 is still engaged with such article.

When the filled bag has reached the discharge location, it is then desirable to withdraw the pusher plate 14 and the horizontal portion 37 of the pusher arm from the bag

quickly without depending upon further movement of the bag and while the pusher-carrying shaft 26 is still being transported by the carrier chains 18 at a constant speed. Such withdrawal of the pusher plate 14 and pusher arm portion 37 from the bag 12 can be accomplished by rotating cross-shaft 26 in a counterclockwise direction relative to the shaft-mounting ears 24 as seen in FIGURES 1 and 2. When the pusher has reached the position shown in FIGURE 1, therefore, it is desired to effect controlled turning of shaft 26 relative to such ears and such controlled turning can be effected by swinging crank arm 38 relative to rails 30 and guide rail 42.

To enable crank arm 38 to be swung relative to guide rail 42, such rail terminates just beyond the positions of the rollers 40 shown in FIGURE 4 and shortly before these rollers reach the positions shown in FIGURE 1. If the crank arm 38 were then permitted to swing in unrestrained fashion, the weight of the pusher head 14, the horizontal portion 37 of the pusher arm, the crank arm 38 and the rollers 40 would cause the pusher head and crank arm to swing downward so as to rotate shaft 26 in the counter clockwise direction which would initiate withdrawal of the pusher head and the adjacent portion of the pusher arm from the bag 12. It is desired, however, to effect such swinging of the pusher arm in a positively controlled and predictable manner and, also, to an extent greater than would be effected by the action of gravity on the pusher arm and crank arm so as to insure complete retraction of the pusher plate and pusher arm from the bag 12 in every instance.

To effect such positive swinging of the pusher arm to withdraw it from the bag, the crank arm 38 includes a forwardly projecting tongue 44 which will be projected between rollers 46 when the crank arm 38 is substantially horizontal. These rollers are located beyond the end of guide rail 42 sufficiently far so that rollers 40 will have been or will be about to be disengaged from the guide rail 42 and the shaft 26 will be initiating its upward arcuate movement from its linear path parallel to rails 30. Rollers 46 are mounted in spaced relationship on plate 48 which is supported rotatively by pivot 49 on bracket 50 secured to the frame 52 of the bagging machine. A tension spring 54 normally urges the plate 48 to turn in the clockwise direction for engagement with stop 55 so that the rotative axes of the two rollers 46 will be in an upright plane.

The horizontal component of movement of shaft 26 produced by chains 18 will insert the tongue 44 of crank arm 38 between rollers 46. Movement of the tongue toward such rollers will continue until shaft 26 crosses a line joining the rotative axis of bracket pivot 49 and the rotative axis of the adjacent sprocket 20. During movement of shaft 26 by chains 18 toward such line, the speed of insertion of tongue 44 between rollers 46 will be decreasing and the vertical component of the movement of shaft 26 will be turning plate 48 on its pivot 49. As shaft 26 crosses such line, the arcuate movement of the shaft 26 will continue to turn plate 48 because of the engagement of tongue 44 with rollers 46, but such tongue will be withdrawn progressively more rapidly from between the rollers 46.

While engagement of the tongue 44 with rollers 46 effects turning of the roller-mounting plate 48 as described, engagement of the tongue 44 between such rollers has the further effect of controlling positively the swinging of crank arm 38 and, consequently, the rotation of shaft 26 in the apertures of chain ears 24 and the swinging of pusher arm 16. The length of crank arm tongue 44 and the location of rollers 46 will therefore be selected with reference to the location and radius of chain sprocket 20 so that the crank arm will be swung through a predetermined angle during the movement of shaft 26 which inserts tongue 44 between rollers 46 and then withdraws such tongue from between such rollers. The angle of swing of crank arm 38 thus selected will be sufficient to

rotate shaft 26 in the apertures of chain ears 24 for the purpose of swinging pusher arm 16 from the pushing position of FIGURE 1 through the retracted position of FIGURE 2. In this position, the pusher plate 14 will have been moved in the direction opposite the horizontal component of movement of shaft 26 to a location rearwardly of bag 12 and will have been raised to a location above bag 12.

Continued movement of shaft 26 upward around an arcuate path of travel of the chain carrier 18 defined by sprocket 20 will effect further swinging of crank arm 38 to raise the pusher still farther through the broken-line positions shown in FIGURE 3. Promptly after the tongue 44 has been withdrawn from between the rollers 46 or even before the tongue is completely free of such rollers, the rollers 40 carried by the crank arm 38 will have moved along opposite sides of a transfer guide rail 56 curved downward around sprocket 20. The tip of tongue 44 will be withdrawn from between rollers 46 when shaft 26 is carried upward far enough, and helical spring 54 will then turn mounting plate 48 in the clockwise direction generally from the position of FIGURE 2 to that of FIGURE 4 where it will engage stop 55, so that such rollers will be prepared to receive between them the tongue 44 of the next pusher attitude-controlling crank arm 38.

The curved transition guide rail 56 is a downward extension of the upper guide rail 57 which extends parallel to the upper stretch of chains 18 and spaced above them a distance equal to the spacing of guide rail 43 below the lower stretches of chain 18 so that the pusher arm will resume a depending attitude during its return movement to a location ahead of the bag-filling station. The lower end of the transfer rail can be connected to the machine frame 52 by a brace 58. As the shaft 26 is carried upward and then horizontally by the carrier chains 18, the rollers 40 straddling the transition rail 56 will effect progressive swinging of the crank arm 38 to rotate shaft 26 and swing the pusher arm downward gradually until pusher plate 14 again is disposed in a substantially upright plane when the rollers 40 have reached a position straddling the upper rail 58.

Consequently, the position of the pusher 16 relative to the carrier links 24 supporting shaft 26 will be positively controlled at all times simply by controlling the swung position of crank arm 38, first, by the lower guide rail 43, then by the swivel-mounted rollers 46, next, by the transition rail 56, and finally by the upper guide rail 57. Thus, even when the crank arm 38 and its tongue are freed from rollers 46, the crank cannot swing back immediately to a substantially horizontal position because of the subsequent guiding engagement of rollers 40 with the guide rails 56 and 57. The position of the pusher arm 16 at all times corresponds, of course, to the swung position of the crank arm 38.

At the end of the loop of carrier chains 18 opposite that shown in FIGURES 1, 2 and 3, further control means are provided to control the swinging of crank arm 38 so that the rollers 40 will be transferred properly from engagement with the upper rail 57 to engagement with the lower guide rail 43 shown in FIGURE 4, so that the pusher will be in the proper attitude to engage another article to be bagged and push it into an open-mouthed bag as discussed above.

In FIGURE 7 an alternative form of crank arm 100 for controlling the attitude of pusher arm 16 is shown. Such crank arm has a large boss 102 fitting over the end 104 of cross shaft 26 from which pusher arm 106 depends. A set screw 108 locks the boss to the cross shaft. In this instance, a single roller 112 is carried by shaft 110 mounted on the crank arm 100 which is received between spaced lower guide rails 120 and 122 as shown in FIGURE 6. The tongue 114 of crank arm 100 corresponds to the tongue 44 of crank arm 38 and can be projected between spaced rollers 46 in the manner previously

described with respect to tongue 44 of crank arm 38. Such engagement of the tongue with rollers 46 will control swinging of crank arm 100 after the crank arm has been moved past the position shown in FIGURE 6 and the roller 112 has been released from the space between guide rails 120 and 122.

As the shaft 26 is raised by upward movement of the ears 24 carried by chains 18 guided by sprocket 20, the crank arm 100 again will be swung to withdraw the pusher plate from the bag in the manner illustrated in FIGURE 2. During continued upward movement of shaft 26, tongue 114 will be withdrawn from between rollers 46 in the manner described above and roller 112 will be engaged between the transition guide rails 128 and 130 curving downwardly from the upper guide rail elements 124 and 126, respectively. Control over swinging of the crank arm 100 and pusher arm 106 is effected by roller 112 running between guide rails 120 and 122 during movement of the pusher along the lower stretch of its loop and by guide rails 128, 130 and 124, 126 as the shaft 26 is raised in the same manner as rollers 40 on opposite sides of guide rails 43, 56 and 57 control swinging of crank 38 and its pusher 16.

I claim:

1. In a bag-filling machine, a carrier moved elevationally in a loop, pusher-supporting means carried by and turnable about an axis relative to the carrier, an arm carried swingably by the pusher-supporting means with its length extending generally radially of the pusher-supporting means axis, a pusher on the swingable end portion of the arm, and pusher-attitude control means including first means supported separately from and independently of the carrier and second means carried by the pusher-supporting means and cooperating with the first means to effect turning of the pusher-supporting means relative to the carrier, the improvement comprising the combination of the swingable end portion of the arm extending substantially perpendicular to a radius passing through the pusher-supporting means axis, the pusher including plate means disposed substantially in a plane perpendicular to the swingable end portion of the arm, the second means of the pusher-attitude control means including a turnable control member connected to the pusher-supporting means, and the first means of the pusher-attitude control means including control member turning means turnable about a stationary axis in one direction by engagement of said turnable control member therewith as the carrier moves forwardly and upwardly, such engagement of said turnable control member with said control member turning means simultaneously turning the pusher-supporting means about its axis relative to the carrier in the same direction as said control member turning means is turned for swinging the arm to displace the pusher plate means rearwardly relative to the carrier.

2. In the bag-filling machine defined in claim 1, the control member turning means of the pusher-attitude control means including closely spaced rollers and means mounting said closely spaced rollers for conjoint turning about a stationary axis located between said rollers, and the turnable control member of the pusher-attitude control means including a crank arm projecting from the pusher-supporting means and insertable between said rollers.

3. In the bag-filling machine defined in claim 1, the arm including a curved portion between the swingable end portion of the arm and the pusher-supporting means, said curved portion extending from the swingable end portion of the arm in the direction generally opposite to the direction in which the carrier is moved along the lower portion of the loop.

4. In a bag-filling machine, a carrier moved elevationally in a loop having a linear lower stretch and a stretch curved upward from the end of the linear lower stretch toward which the carrier is moved, pusher-support-

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ing means carried by and turnable relative to the carrier, an arm carried swingably by the pusher-supporting means, a pusher on the swingable end portion of the arm, and pusher-attitude control means including first means supported separately from and independently of the carrier and second means carried by the pusher-supporting means and cooperating with the first means to effect turning of the pusher-supporting means relative to the carrier, the improvement comprising the first means of the pusher-attitude control means including stationary guide track means and means turnable relative to said guide track means, and the second means of the pusher-attitude control means including crank means engageable selectively with said guide track means and with said turnable means, and means movable by arcuate upward movement of the carrier to turn said turnable means for swinging the arm to move the pusher relative to the carrier in

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the direction generally opposite to the direction of movement of the carrier around its loop.

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