FEEDER AND FOLDER ARRANGEMENT FOR SIGNATURE GATHERING MACHINE

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References Cited

UNITED STATES PATENTS
1,258,720 3/1918  Story .......................... 270/57
2,279,269 4/1942  Tornberg ...................... 270/57
2,796,255 6/1957  Mitchell ...................... 270/57
3,162,434 12/1964  Hepp ...................... 270/57

3,522,942 8/1970  Hepp .......................... 270/55

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ABSTRACT

A feeder folder unit for use with an inserter of the type having a rotary feed drum, a signature opening mechanism and a conveyor chain and wherein the feeder folder unit includes hopper means for supplying signatures in a horizontal position, rotary extractor drum for extracting these signatures from the hopper, transfer means for transferring extracted signatures from the rotary drum to a folder mechanism and transfer chain means for transferring the folded signatures in timed relation to the feed drum of the inserter. The feeder folder mechanism may be constructed as a separate unit but driven from the inserter drive and used with existing inserter gatherers both to convert such gatherers from a vertical hopper feed to a horizontal hopper feed and to perform a fold operation during feeding of the signatures.

13 Claims, 6 Drawing Figures
FEEDER AND FOLDER ARRANGEMENT FOR SIGNATURE GATHERING MACHINE

This invention relates to signature gathering machines and, more particularly, to a feeder folder unit for feeding signatures from a horizontal hopper, folding the signature and transferring the signatures in timed relation to the feed drum of an inserter.

It is an object of this invention to provide a feeder mechanism for an inserter gather for converting the gatherer from a vertical hopper feed to a horizontal hopper feed and in which feeder means including a rotary extractor drum are used to extract signatures from a horizontal hopper and feed the signatures, fold edge first, to the rotary feed drum of the inserter.

It is a further object of this invention to provide a feeder folder unit for use with an inserter gatherer and wherein a rotary separator drum extracts signatures from a horizontal hopper, conveyor means convey the signatures to a folder wherein the signatures are folded and transfer means transfer the folded signatures in timed relation and fold edge first to the feed drum of the inserter.

It is still another object of the invention to provide a feeder folder unit which is adapted to be used with existing inserters to replace vertical hoppers with horizontal hoppers with the feeder folder unit being adapted to be driven in synchronism with the inserter from the inserter drive shaft.

Other objects and features of the invention will be more apparent from the following description which, together with the attached drawings, discloses but a preferred form of the invention.

Referring now to the drawings wherein like reference numerals indicate like parts in the various views:

FIG. 1 is a schematic illustration in side elevation of the feeder folder unit and its operative relationship with the inserter;
FIG. 2 is a sectional view along line 2—2 of FIG. 1;
FIG. 3 is a sectional view along line 3—3 of FIG. 1;
FIG. 4 is a fragmentary sectional view illustrating the feeding of a signature from the horizontal hopper;
FIG. 5 illustrates a buckle folder which may be used in the unit in lieu of the folder illustrated in FIG. 1;
FIG. 6 is a fragmentary view illustrating the transfer of a signature to the inserter feed drum.

Referring now more in detail to the drawings, there is illustrated in FIG. 1 a feeder folder unit, indicated generally by the reference numeral 10, and which is constructed in accordance with the principles of this invention. The feeder folder unit is adapted to be used in combination with an inserter gatherer which may be of a conventional construction and the details of which form no portion of this invention. However, to facilitate an understanding of the invention, a fragmentary portion of the inserter is schematically indicated at 12. The portions of the inserter 12 illustrated in FIG. 1 include a rotary feed drum 14 having grippers 16 carried thereon. A pair of cylinders comprising a transfer cylinder 18 and an opener cylinder 20 comprise a signature opening mechanism which cooperates with the feed drum 14 in a manner well known in the art to open the signatures and deposit them on a saddle conveyor chain 22. As is well understood in the art, the grippers 16 on the feed drum 14 receive and grip a signature by the folded edge and carry the signature around to the position shown in FIG. 1. At this position, the gripper 16 releases the folded edge and the signature abuts a stop schematically illustrated at 24. The transfer cylinder 18 thereafter engages the signature and pulls it away from the drum 14 and carries it to the opener cylinder 20 where the signature is opened and dropped onto the conveyor chain 22.

For a more complete description of an inserter and its operation, reference may be had to U.S. Pat. Nos. 2,251,943 and 2,855,195.

Referring now to the feeder folder unit 10, that unit includes a horizontal hopper, indicated generally by the reference numeral 30, together with feed means for feeding signatures from the hopper 30 and a folder for folding these signatures as they are being fed to the inserter feed drum 14. The feed means includes a rotary separator drum 32 which is rotatably supported adjacent the hopper 30 and which includes suitable grippers 34 for receiving signatures from the hopper 30 and carrying them around the drum 32. The operation of the grippers 34 is controlled by a suitable cam and follower arrangement, not shown, but which operates to open and close the grippers 34 in a predetermined timed sequence.

FIG. 4 illustrates in enlarged detail one form which the hopper feed may take and includes a suction cup extractor 36 which is rockingly supported on a rocker arm 38. The suction extractor 36 is periodically pivoted to a position in engagement with the lower most of the signatures in the hopper 30 and then pivoted back to the position shown in FIG. 4 drawing with it the signature for gripping by the grippers 34 on the drum 32. As is well known in the art, the rocking movement of the suction extractor 36 and the application and release of suction are timed to coincide with the rotation of the drum 32. A suitable cam and follower arrangement, not shown, may be used to control the pivoting movement of the suction extractor 36.

A feed roller 40 is supported for rotation adjacent the periphery of the drum 32 and cooperates with a conveyor 42 which is also positioned adjacent the drum 32. The conveyor may comprise a conveyor belt trained around three pulleys, 43, 44, 45. The feed roll 40 is positioned to contact the conveyor 42 to define a nip therebetween into which the signatures are fed. A roller 40a (FIG. 1) spring loaded against gripper drum 32 will drive the sheet between drum 32 and roller 40a after gripper 34 of drum 32 has opened. Guide 40b, concentric with roller 40, guides the leading edge of the sheet, after gripper 34 has released it, into the pinch point of conveyor belt 42.

Adjacent the horizontal forward end of the conveyor 42, but spaced from it, is a second conveyor 46 which comprises a conveyor belt trained around a pair of pulleys 47, 48.

Cooperating with the conveyor 42, 46 is a folder means which is illustrated as being of the knife or chopper folder type. This folder means includes a reciprocating knife or chopper blade 50 which is adapted to be reciprocated in a vertical direction in the space between the rollers 45, 48 by a suitable cam 52 and follower 54. A pair of rollers 55, 56 are positioned immediately above the conveyors 42, 46 with the nip of the rolls 55, 56 being aligned with the line of reciprocation of the blade 50. As will be readily understood by those skilled in the art, a sheet to be folded passes along
the conveyor 42 onto the conveyor 46 with the leading edge of the sheet moving into abutment with a fixed stop 58. At the moment the sheet engages the stop 58, the sheet extends across the two conveyors 42,46 and the blade 50 is actuated to reciprocate upwardly thereby making a fold in the sheet and forcing the fold edge into the nip of the two fold rollers 55,56.

Positioned above rollers 55,56 are two additional rollers 59,60 which feed the signature, fold edge first, to a feeder conveyor 62. The conveyor 62 cooperates with a feed roll 64 in the same manner as the conveyor 42 and roll 40, to receive the folded sheet in the nip therebetween and advance the sheet to a transfer chain mechanism, indicated generally by the reference numeral 66.

The transfer chain mechanism 66 comprises a pair of chains 67,68 each of which have spaced projecting driving lugs 69. A pair of spaced guides 70,72 are adapted to receive signatures therebetween with the lugs 69 projecting through slots in the lower guide 72 to advance the signature to the inserter feed drum 14. The operation of the transfer chain mechanism is closely timed to the rotation of the drum 14 so that the signatures advanced by the chain mechanism arrive at the transfer drum as one of the grippers 16 passes by the transfer chain thereby to receive and grip the forward folded edge of the signature.

Various means may be employed to assure control over the signature as it exits from the guides 70,72 and is gripped by the grippers on drum 14. As shown, the lower guide 72 includes a forward delivery portion 74 which extends forwardly of the chain and on which the signature slides down toward the periphery of the drum 14. A pair of cutouts or slots 76 are formed in the forward edge of the delivery portion 74 to accommodate the pivoting movement of the grippers 16 as they close on the forward edge of the signature.

FIG. 6 schematically illustrates the transfer of a signature from the delivery portion 74 of the guide to the feed drum 14. As shown in that Figure, the fold edge of the signature is adjacent to drum 14 and gripper 16 is pivoting to close on the signature and clamp the fold edge against the gripper pad 16a.

To assure that the feeder folder unit operates in synchronism with the inserter, it is contemplated that the feeder folder will be driven from the inserter drive shaft 78. While the drive for the feeder folder unit has only been schematically illustrated in FIG. 1, it will be appreciated that the drive may be accomplished in any convenient manner to achieve the desired synchronism. Of particular importance is the requirement that the transfer chain mechanism be driven in synchronism with the inserter since the transfer chain mechanism not only feeds the signatures to drum 14 but also effects a retiming of the signatures to assure their arrival at the feed drum 14 at the appropriate time. As shown, a drive sprocket 77 on inserter shaft 78 drives a main drive sprocket 79 on a shaft 80. A sprocket 81 on the shaft 80 drives conveyors 42,46, roll 40 and drum 32 by drive means 82,83 while similar means such as shown at 84,85 would be used to drive the fold rolls, feed rolls, conveyor 62, roll 64 and the transfer chain mechanism 66 from the inserter shaft 78.

While the operation of the feeder folder in combination with the inserter is believed apparent from the foregoing description, the operation will be briefly summarized.

With the inserter in operation, the inserter drive shaft 78 will drive the feeder folder unit in synchronism with the inserter. The suction extractor 36 will be actuated to extract the lowermost signature in the horizontal hopper to a position where it can be gripped by the gripper 34. The gripper 34 on the drum 32 will carry the signature around to the roller 40 and conveyor 42 where the forward edge of the signature will be released. The forward edge of the signature then enters the nip between the roller 40 and the conveyor 42 and is carried around the roller 40 onto the horizontal surface of the conveyor 42. The forward edge of the signature is advanced by the conveyor 42 onto the conveyor 46 and into abutment with the stop 58. The blade 50 is then actuated to form the desired fold with the fold rollers 55,56 advancing the folded signature up between the feed rolls 59,60 and into the nip between the roller 64 and the conveyor 62. Thereafter, the signature is advanced around the roller 64 and carried by the conveyor 62 into the guides 70,72. The lower guide 72, in effect, serves as a transfer table on which the signature rests until engaged by one of the lugs 69. The lugs 69 then move the signature along the surface of guide 72 at a controlled rate toward the feed drum 14. As the signature approaches the feed drum 14, the forward edge of the signature moves down onto transfer portion 74 at precisely the time that one of the grippers 16 on the drum 14 is passing by the transfer chain. At this transfer point, the gripper 16 closes on the forward edge of the signature and carries the signature around the drum 14 up to the fixed stop 24 at which point the gripper 16 releases the signature. The transfer cylinder 18 then grasps the signature and moves the signature in a known manner to the opener cylinder 20 which opens the cylinder and deposits it on the saddle conveyor chain 22.

While folded signatures have been illustrated as being supplied form the horizontal hopper 30, it will be appreciated that the described mechanism may be used for feeding single sheets in which the only fold to be made is made by the folder blade 50.

It will be apparent to those skilled in the art that folders other than a knife or chopper folder may be used. For example, there is illustrated in FIG. 5 a buckle folder which is itself conventional and well known in the art. In using a buckle folder, the blade 50 and the conveyor 46 would be replaced with the conveyor 42 advancing the sheet directly into a pair of folding plates 90,92 where the forward edge engages a stop 94 causing the sheet to buckle upward into the nip between a pair of folding rollers 55,56. The folded edge of the signature is then advanced between the feed rolls 59,60 and onto the conveyor 62 in the manner described previously.

It is to be noted that the feeder folder unit 10 is adapted to be used as an attachment for existing inserters whereby such inserters may be converted from a vertical hopper feed to a horizontal hopper feed and the additional function of performing a final folding operation during the feeding of the signatures may be performed. Thus, all of the elements of the unit 10 are supported in a suitable frame 98 thereby providing a self-supporting unit which can be installed adjacent the
frame 100 of the inserter. Since the unit is adapted to be driven by the inserter itself, synchronism of the feeder folder unit with the inserter is assured.

While the invention has been described with reference to an illustrated preferred embodiment, neither the illustrated embodiment nor the terminology employed in describing it is intended to be limiting; rather, it is intended to be limited only by the scope of the appended claims.

What is claimed is:

1. In a signature gathering machine including a rotary feed drum, rotary signature opening means and conveyor means for receiving opened signatures thereon,

   hopper means for receiving and storing signatures in a generally horizontal arrangement, and

   feeding means for feeding the horizontally arranged signatures from said hopper means to said rotary feed drum,

   said feeding means including a rotary extractor drum for extracting signatures from said hopper means.

2. An inserter gathering machine for gathering signatures and including a gathering chain for receiving signatures thereon, a rotary drum for feeding signatures and signature opening means for opening signatures received from said rotary drum and depositing the opened signatures on said gathering chain,

   hopper means for storing a supply of signatures, rotary drum extractor means for extracting and feeding signatures from said hopper means, and

   feeding means for feeding signatures from said extractor drum to said rotary feed drum,

   said feeding means including folder means for folding the signatures before the signatures reach said rotary feed drum, and
drive means for synchronously driving all of said means.

3. The signature gathering machine of claim 1 and further including drive means for driving said rotary feed drum and said rotary signature opening means, and

   means for driving said feeding means from said drive means whereby said feeding means is driven in synchronism with said rotary feed drum and said signature opening means.

4. The gathering machine of claim 3 wherein said feeding means further includes folder means for folding said signatures before said signatures reach said rotary feed drum.

5. The signature gathering machine of claim 4 wherein said feeding means includes means for receiving the signatures from said folder means and feeding said folded signatures to said rotary feed drum in timed relation thereto.

6. The inserter gathering machine of claim 2 wherein said feeding means includes conveyor means for feeding said signatures from said extractor drum to said folder means, and

   transfer means for receiving said signatures from said folder means and advancing said signatures to said rotary feed drum.

7. The gathering machine of claim 6 wherein said transfer means includes means for advancing said signatures at a rate synchronous with the rotation of said rotary feed drum.

8. The gathering machine of claim 7 and further including additional conveyor means for feeding the signatures from said folder means to said transfer means.

9. The gathering machine of claim 2 wherein said folder means comprises a chopper folder.

10. The gathering machine of claim 2 wherein said folder means comprises a buckle folder.

11. A feeder folder unit for use with an inserter gathering machine and including,

   frame means,

   hopper means supported on said frame means for receiving and storing signatures in a generally horizontal position,

   rotary extractor drum means rotatably supported on said frame means adjacent said hopper means and including means for extracting signatures from said hopper means,

   folder means on said frame means for folding signatures,

   first feed means on said frame means for feeding signatures from said extractor drum to said folder means,

   second feed means on said frame means for feeding signatures from said folder means,

   transfer means for receiving signatures from said second feed means and advancing the signatures along a predetermined path,

   drive means for driving said transfer means, and
drive means connected to said drive means and adapted to be connected to the drive of an inserter gathering machine for driving said transfer means in synchronism with the gathering machine.

12. The feeder folder unit of claim 11 wherein said means connected to said drive means includes means for driving said drum means, folder means and feed means in synchronism with said transfer means.

13. The feeder folder unit of claim 11 wherein said transfer means includes a transfer guide surface supported on said frame means, and

   timing chain means cooperating with said guide surface to move signatures along said guide surface at a predetermined rate.

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