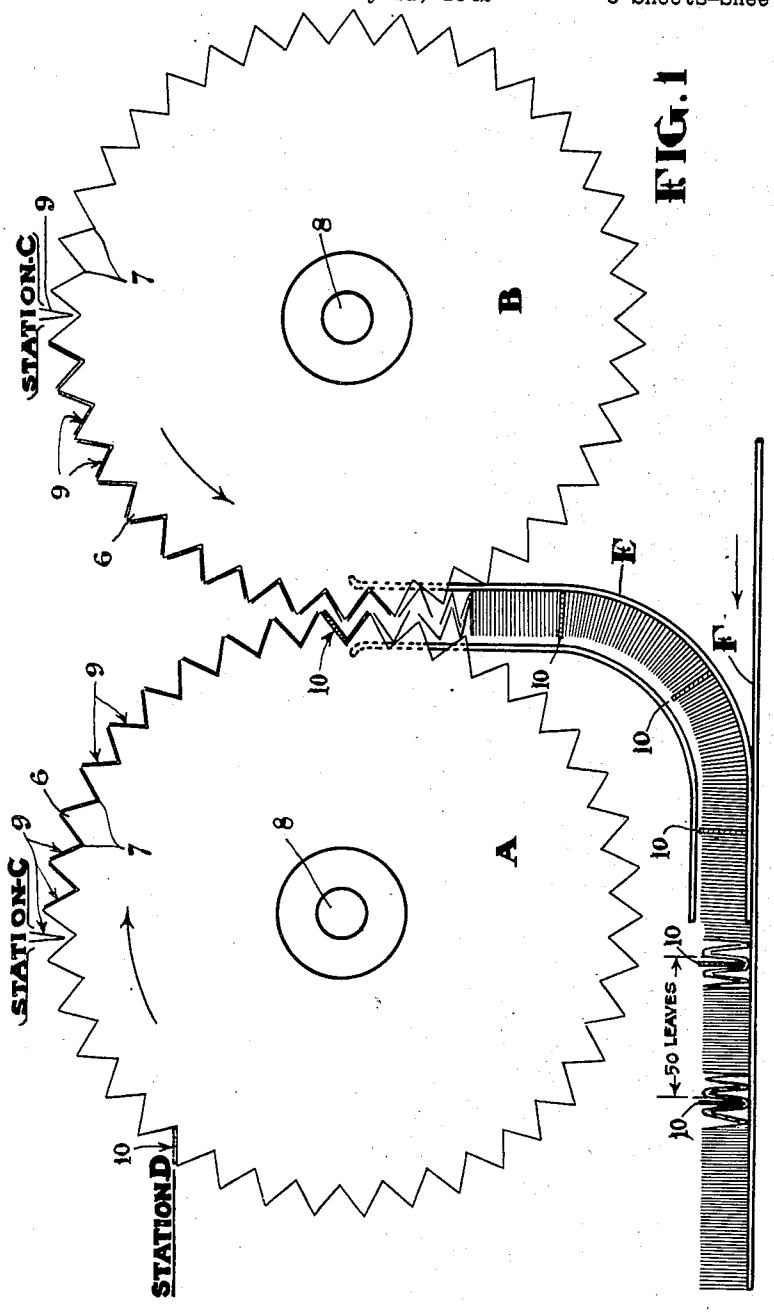
March 14, 1944. H. A. BRAWN 2,344,022

FOLDING AND INTERLEAVING MACHINE

Filed May 11, 1942 5 Sheets-Sheet 1

FIG. 1



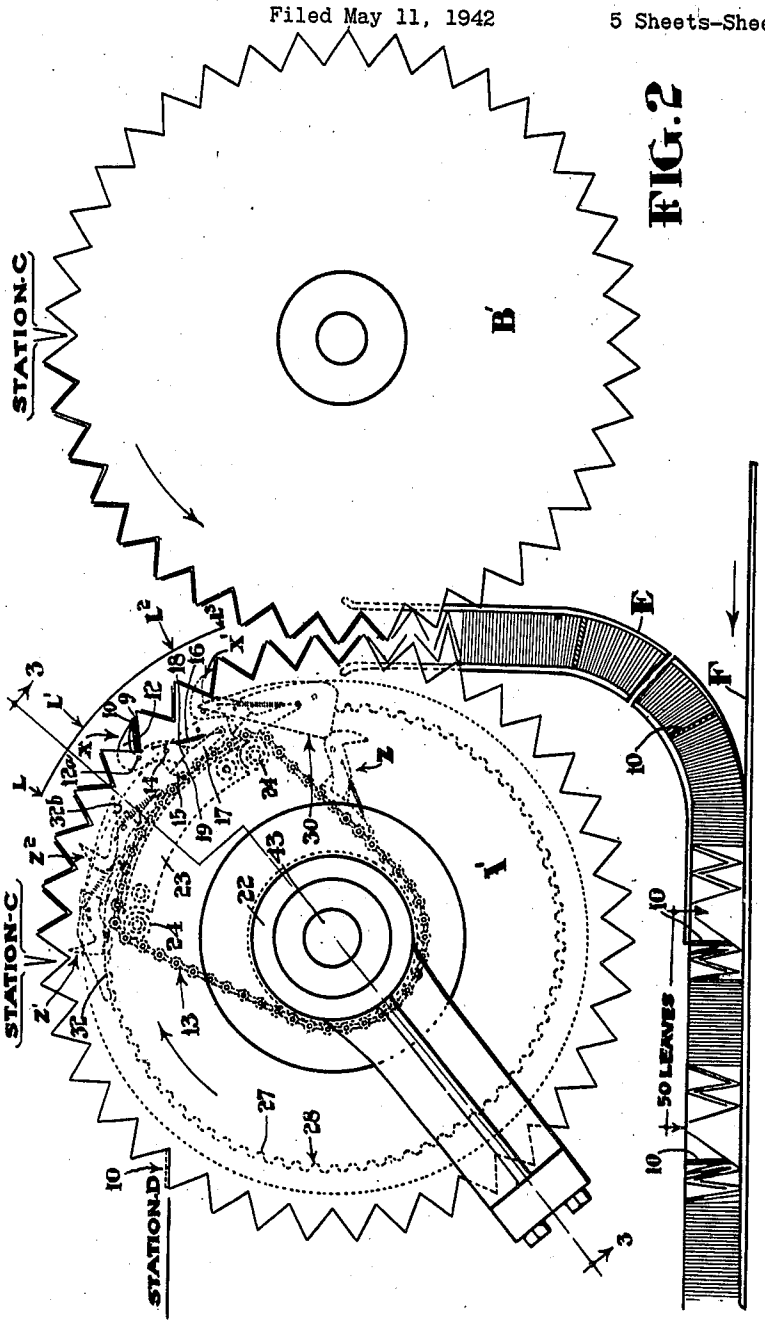
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FOLDING AND INTERLEAVING MACHINE

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FIG. 2



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FOLDING AND INTERLEAVING MACHINE

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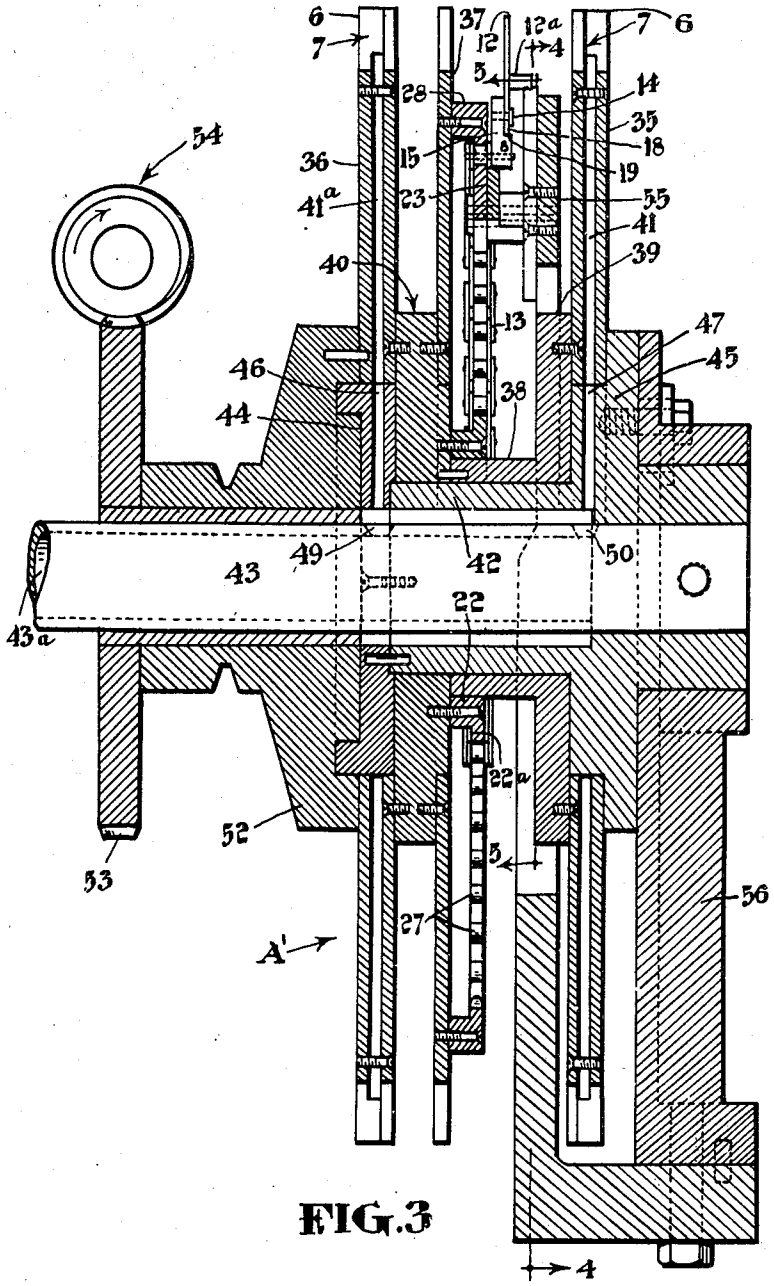


FIG. 3

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FOLDING AND INTERLEAVING MACHINE

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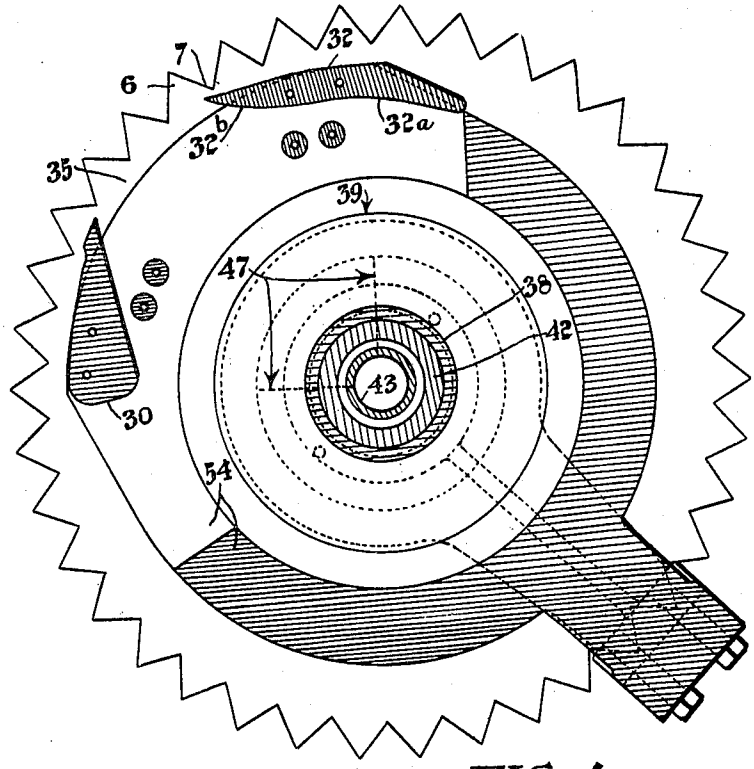


FIG. 4

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FOLDING AND INTERLEAVING MACHINE

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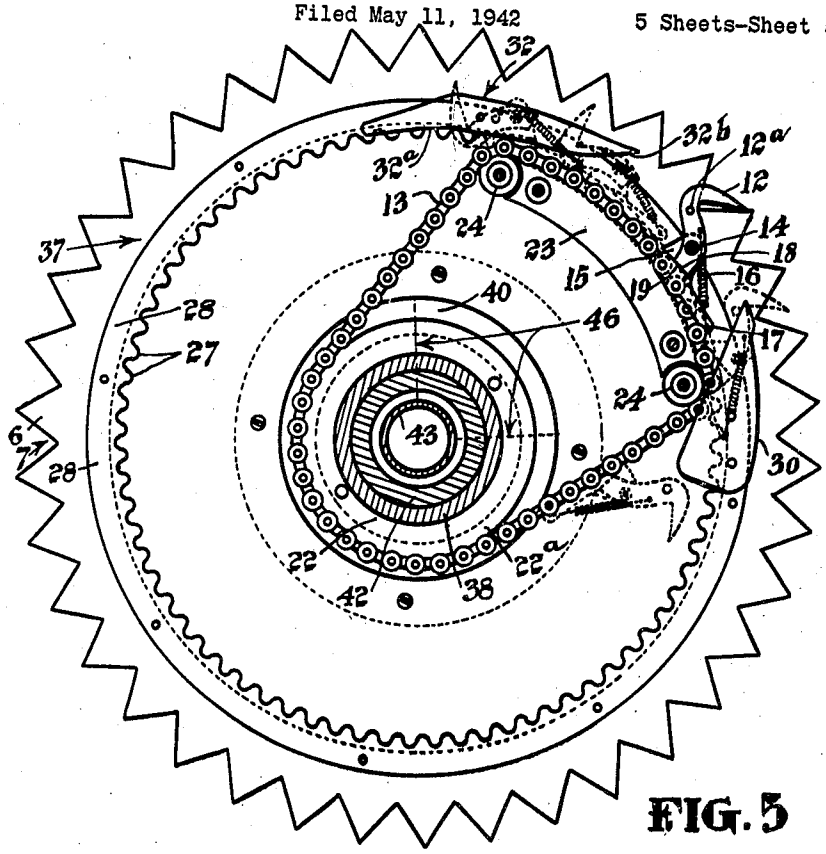


FIG. 5

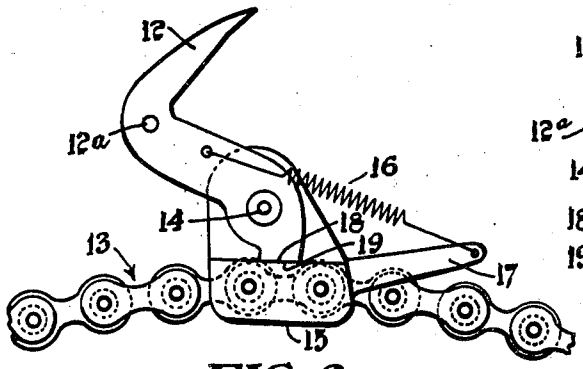


FIG. 6

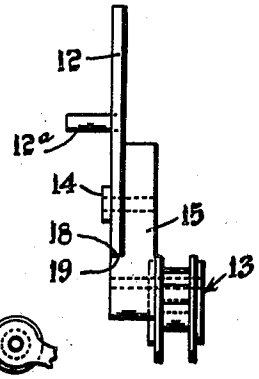


FIG. 7

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UNITED STATES PATENT OFFICE

2,344,022

FOLDING AND INTERLEAVING MACHINE

Herbert A. Brawn, Beauharnois, Quebec, Canada, assignor to Howard Smith Paper Mills Limited, Montreal, Quebec, Canada

Application May 11, 1942, Serial No. 442,559

4 Claims. (Cl. 270—39)

This invention relates to machines for folding and interleaving sheets of paper such, for example, as cigarette paper intended for individual rolling of cigarettes.

More specifically, the invention relates to improvements in folding and interleaving machines equipped with interleaving apparatus of the so-called intermeshing "star wheel" type. In the present instance the invention will be described as embodied in the "star wheel" interleaving apparatus of a conventional type of cigarette paper folding and interleaving machine which is well known to the trade as the "Lerner" machine.

The "star wheel" interleaving apparatus of the "Lerner" machine comprises two wheel members, each presenting a circular series of triangular teeth separated by intervening V-shaped notches. The two wheel members are continuously rotated in opposite directions about parallel horizontal shafts which are spaced apart so that the teeth of one wheel member meshes with the teeth of the companion wheel member while travelling in a downward direction. A loading station is located above each wheel member. At this station mechanism is provided for feeding a continuous strip of cigarette paper from a supply reel; cutting the strip transversely to provide individual cigarette papers of conventional length and width and folding each individual cigarette paper along a fold line located centrally of its width. After being folded, each individual cigarette paper is dropped into a passing notch of the underlying wheel member and opens up so that the folds or sides of the paper lie substantially flat against the sloping side walls of the notch. This results in the sides of the paper deposited in each notch of one wheel being interleaved in the conventional zig-zag interleaving fashion with the sides of two papers deposited in two adjacent notches of the companion wheel as the teeth of the two wheels are brought into interfitting or meshing relation. In order to prevent accidental displacement of the papers deposited therein the cigarette carrying notches of the two wheels are connected with a source of suction from the time they reach the loading station until they arrive at the point where the interleaving occurs.

The "Lerner" interleaving apparatus, operating as described herein, produces an uninterrupted stream of interleaved cigarette papers which, for packaging purposes, must be subsequently divided into separate packets each containing the same number of interleaved cigarette papers. One or more of these packets is then enclosed, by hand or by machinery, within a dispensing cover or package so that the first sheet of each enclosed packet protrudes through a dispensing slot of the enclosing cover or package. Due to the interleaving of the sheets the removal of the first or protruding sheet causes a portion of the next succeeding sheet to be projected through the dispensing slot to facilitate subsequent removal thereof.

The "Lerner" interleaving apparatus is provided with means whereby cardboard divider strips are included in the stream of continuously interleaved cigarette papers to facilitate the subsequent division of the stream into separate and equal packets for packaging purposes. For example, when it is desired that each separate packet contain fifty interleaved cigarette papers the divider strip inserting means is caused to deposit a divider strip in each twenty-fifth notch of one of the wheel members as such notch travels upwardly past a predetermined point located in advance of its loading station. When the notch carrying the divider strip reaches the loading station a cigarette paper is deposited therein so that the divider strip lies between the trailing side of the notch and the adjacent side of the cigarette paper. At the point where the interleaving occurs each divider strip is included in the stream of interleaved papers so that it serves as a marker to facilitate the subsequent division of the stream into separate packets, each containing fifty interleaved cigarette papers. In addition to marking the count of the papers, the divider strips also serve as bearers in the later handling of the packets of cigarette papers so marked. This conventional method of inserting the divider strips does not in any way interrupt the continuity of the interleaving operation. In other words, the divider strips merely facilitate the division of the stream into separate packets containing the same number of cigarette papers by indicating the points at which the interleaving of the stream of papers must be interrupted to accomplish this purpose. The actual division of the stream into separate packets is done by hand and is very expensive since it is a time consuming operation which requires the service of a large number of employees in mills or factories where a considerable number of the folding and interleaving machines are in operation.

With the foregoing in mind the object of the present invention is to provide means whereby the divider strips are utilized to periodically interrupt the continuity of the interleaving operation so that the interleaving apparatus, instead of producing a stream of continuously interleaved cigarette papers, will produce a stream of successive packets each containing the required number of papers which are interleaved with each other but are free of interleaving engagement with the papers of the preceding and succeeding packets. This is accomplished by the provision of a divider strip tipping mechanism whereby each divider strip, as it approaches the interleaving zone, is tipped from its normal posi-

tion against the trailing side of the divider strip carrying notch to an interleaving interrupting position close to and substantially parallel with the leading side of said notch. This tipping of the divider strip causes the two sides of the folded cigarette paper occupying the same notch to be folded together and pressed tightly against the leading side of the notch. This prevents the sides of the paper in the divider strip carrying notch being interleaved with other papers in the usual manner and thus causes a definite interruption of the continuity of the interleaving operation as each divider strip carrying notch passes through the interleaving zone. This modification of the interleaving operation to produce separate packets of interleaved papers, instead of a single stream of continuously interleaved papers, enables a considerable saving to be realized since it eliminates the time and manual labor heretofore required for separating into separate packets the continuous stream output of the conventional "Lerner" and other similar interleaving apparatus to which my invention is applicable.

Another object is the provision of a divider strip tipping mechanism which is designed so that the cost of embodying same in the "Lerner" and similar types of interleaving apparatus is relatively small compared with the savings resulting from the use of such mechanism.

Other objects, advantages and characteristic features of the invention will be more readily understood from the following detailed description and drawings, in which—

Fig. 1 is a diagrammatic representation of the conventional "Lerner" interleaving apparatus as it appears in front elevation. For the sake of clearness the spacing of the interleaving wheels shown in this figure has been exaggerated and a clearance which does not exist in actual practice is shown between the cigarette papers and the walls of the wheel notches in which these papers are carried.

Fig. 2 is a similar view of a "Lerner" interleaving apparatus which has been modified to incorporate the divider strip tipping mechanism constituting my invention.

Fig. 3 is a transverse sectional view taken substantially along the line 3—3 of Fig. 2.

Fig. 4 is a sectional view substantially along the line 4—4 of Fig. 3.

Fig. 5 is a sectional view substantially along the line 5—5 of Fig. 3.

Fig. 6 is a front elevational view of a tipping finger and a tipping finger carrying chain which form part of the divider strip tipping mechanism shown in the preceding figures.

Fig. 7 is a side elevation of the assembly shown in Fig. 6.

The conventional "Lerner" interleaving apparatus is diagrammatically represented in Fig. 1 by the wheel members A and B, the stations designated C and D, the channel member E and the conveyor belt F. Each wheel member presents a circular series of triangular teeth 6 separated by intervening V-shaped notches 7. These wheel members are rotated in opposite directions about parallel stationary axes 8 which are spaced apart so that the teeth of one wheel member are brought into interleaving or intermeshing relation with the teeth of the companion wheel member while travelling in a downward direction.

Stations C designate the previously mentioned loading stations where the folded cigarette papers 9 are dropped into the wheel notches 7. As each folded paper 9 drops into its receiving notch it opens out so that the sides thereof rest flatly against the side walls of the notch. Each notch 7 is connected with a source of suction as it travels from its respective loading station C to the interleaving zone where the intermeshing of the teeth of the two wheels causes the sides of the paper carried by each notch of each wheel to be first interleaved in the well known manner with adjacent sides of two papers carried in two adjacent notches of the companion wheel, the papers so interleaved being delivered in a continuous stream through the channel E to the conveyor belt F.

Since the suction system embodied in the conventional "Lerner" interleaving apparatus is well known to the trade, I have not considered it necessary to show this system in Fig. 1. It may be stated, however, that such system includes suction ports extending inwardly from the notches 7 of each wheel toward a hollow portion of the shaft about which the wheel is rotated. The hollow portion of said shaft is connected with a source of suction and is provided with ports whereby communication is established between the source of suction and the suction port of each notch as the latter travels from the loading station to the point of interleaving. As each notch passes beyond the point where the interleaving occurs communication between its suction port and the source of suction is disrupted and is not re-established until the notch has again travelled around to its respective loading station. The object in placing each wheel notch 7 under suction as it passes from its respective loading station to the interleaving zone is to ensure that the papers deposited in the notches of each wheel will be properly held therein until they are interleaved with the papers carried in the notches of the companion wheel.

In the present instance it will be assumed that the continuous stream of uninterrupted interleaved cigarette papers produced by the interleaving apparatus shown in Fig. 1 is intended to be subsequently divided into separate packets each containing fifty interleaved sheets. In this case a cardboard divider strip indicated at 10 is deposited against the trailing side of every twenty fifth notch of the wheel A as such notch travels upwardly beyond station D, which represents the station at which the conventional "Lerner" divider strip feed mechanism is located. When the divider strip carrying notch arrives at its loading station C a cigarette paper 9 is deposited therein so that the divider strip lies between the trailing side of the notch and the adjacent side of the cigarette paper. When the divider strip carrying notch passes through the interleaving zone it is included in the stream of interleaved papers without in any way interrupting the interleaving operation. As will be clearly evident from the showing in Figure 1, the divider strips which are thus successively included in the continuous stream of interleaved papers provide markers indicating where the stream must be interrupted to divide the same into separate packets each containing fifty interleaved sheets.

Each of the previously mentioned wheels A and B, as actually constructed, is composed of four toothed disks rigidly secured together in spaced side by side relation with their teeth 6 and notches 7 in alignment. The two outer disks are relatively thick and are the ones in which the previously mentioned suction ports are provided.

The two inner disks are relatively thin since they merely serve as auxiliary supports for intermediate portions of the cigarette papers whose end portions are held in the notches of the outer disks by suction. In applying my invention to the "Lerner" interleaving apparatus, the right hand wheel B is left in its original form but the left hand wheel is modified, as hereinafter set forth, to include my improved divider strip tipping mechanism.

Referring now to my improved modified interleaving apparatus, as represented in Fig. 2 by the wheel members A' and B', it will be noted that by the time it has reached a position X located between the loading station C and the interleaving zone each divider strip 10 has been tipped over from its normal position resting against the trailing side of its carrying notch 7 to an interleaving interrupting position close to and substantially parallel with the leading side of said notch. It will also be noted that, owing to the tipping of the divider strip, the two sides of the cigarette paper occupying the same notch have been folded together and pressed against the leading side of the notch. The divider strip remains in its tipped over position during passage of the divider strip carrying notch through the interleaving zone and thus prevents the two sides of the cigarette paper carried in said notch being interleaved in the usual fashion with the sides of cigarette papers carried in the notches of wheel B which are passing through the interleaving zone at the same time. This, as clearly indicated in Fig. 2, provides for a definite interruption of the interleaving operation each time one of the divider strips passes through the interleaving zone and results in modifying the interleaving operation so that it produces successive packets of cigarette papers each containing fifty sheets which are interleaved with each other but are free of interleaving engagement with the preceding and succeeding packets.

The divider strips are tipped over by means of a tipping finger 12 forming part of the automatic tipping mechanism hereinafter described. The tipping finger 12 is controlled so that it is projected into tipping engagement with the divider strip as the divider strip carrying notch passes through that portion of its travel which is represented by the line L—L'; remains in full engaging contact with the divider strip as the divider strip carrying notch continues through that portion of its travel represented by the line L'—L^2 and is gradually retracted from engagement with the divider strip as the divider strip carrying notch moves through that portion of its travel represented by the line L^2—L^3.

It may be explained at this point that only one tipping finger 12 is associated with the wheel A' and that the various representations of this finger at X, X', Z, Z' and Z^2 in Fig. 2 indicate merely different positions which the finger is caused to assume as it is moved through a prescribed path by the operating chain 13. In this connection it will be noted that the finger 12 is fastened by a pivot 14 to a block 15 which is secured to the chain 13 so as to travel therewith. A biasing spring 16 is connected between the finger and an arm extension 17 of the block 15 and normally tends to swing the finger in a clockwise direction about the pivot 14 until further swinging movement of the finger in this direction is arrested by engagement of the end portion 18 of the finger with the shoulder 19 of the block 15. In other words, the normal disposition of the finger 12 with relation to the wheel A and the finger carrying block 15 is represented by the showing of the finger at position Z.

The path traversed by the finger 12 and its carrying chain 13 is prescribed by the guiding elements around which the chain is trained, such elements being here shown as comprising a guide disc 22, a guide shoe 23 and guide rollers 24. As hereinafter explained in detail, the disc 22 is fixed to revolve with the wheel A' about the stationary shaft 43; the shoe 23 and the rollers 24 located at opposite ends of said shoe are mounted so that they remain stationary during the rotation of the wheel A'. Those links of the chain 13 which, at any given time, are riding the outer surface of the stationary shoe 23 mesh with and are driven by the teeth 27 of an internally toothed sprocket 28 which is fixed to rotate with the wheel A' and relatively to the shoe 23. From this it will be seen that the finger 12 and the chain 13 travel around the stationary wheel shaft 43 at the same lineal speed as the notches 7 of the wheel A' but follow a shorter path than that traversed by said notches. It is also important to note here that the number of teeth on the internal sprocket and the number of links included in the chain 13 are such that a point on the chain will make one complete cycle and return to the starting point in exactly the same time that twenty five notches of wheel A' pass a given point. Since the wheel A' shown in the present instance is provided with thirty eight notches around the periphery thereof, it is necessary that the sprocket wheel 28 be provided with seventy six teeth and that the chain 13 include fifty links. This relationship is necessary to ensure proper timing of the operation of the tipping finger 12.

In further describing the action of the tipping finger 12 it will be assumed that said finger has already arrived at the position X where it is serving to hold the divider strip in its tipped over position. When the finger 12 has travelled a predetermined distance beyond the position X a laterally extending pin 12*a* of the finger is engaged by a cam 30 which, during continued clockwise movement of the finger relative thereto, causes the finger to be gradually swung in an anti-clockwise direction about its pivot 14 as represented at X' until the point of the finger is moved sufficiently to the left to clear the divider strip carrying notch so that the finger will not interfere with the interleaving operation. When the finger 12 reaches the position Z it is snapped back to its normal position by the spring 16 since the pin 12*a* has passed out of engagement with the control cam 30. The finger 12 retains its normal position until it reaches a position Z' where the pin 12*a* is moved into engagement with the curved surface 32*a* of a second stationary control cam 32 which is positioned adjacent the loading station C. As the pin 12*a* is moved into engagement with this curved cam surface 32 the finger 12 is swung back to a retracted position and is held in such position until the pin 12*a* is advanced into engagement with a reversely curved surface 32*b* of cam 32 (see position Z'). This last mentioned surface permits the finger 12 to be gradually swung in a clockwise direction about the pivot 14 so that the point of the finger swings across the divider strip carrying notch and causes the divider strip to be gradually tipped to its interleaving interrupting position as the divider strip carrying notch passes through that portion of its travel represented by the line L—L'. The

final tipping movement of the finger is accomplished by a snap action since this final tipping movement of the finger is due to a pull exerted by the spring 16 as the pin 12a passes completely out of engagement with the cam 32. A more complete description of the wheel A' and the divider strip tipping mechanism will now be given with particular reference to Figs. 3 to 7, inclusive.

As here shown the wheel member A' includes two relatively wide outer disks 35 and 36 and a single relatively narrow inner disk 37, the additional inner disk employed in the conventional "Lerner" wheel assembly having been omitted to make room for the installation of the divider strip tipping mechanism. The three disks 35, 36 and 37 are carried by a revolving hub 38, the disk 35 being fastened to the hub flange 39 and the disks 36 and 37 being fastened to the hub flange 40. The disks 35 and 36 are respectively provided with suction ports 41 and 41a leading from the notches 7 to the inner peripheral edges of the disks. The disks 35, 36 and 37 and the hub 38 are mounted to rotate as a unit about a stationary hub 42 which is mounted on and secured to the stationary wheel shaft 43. The stationary hub 42 is provided with flanges 44 and 45 which are constructed and arranged so that portions thereof are encircled by the inner edges of the disks 35 and 36. Those portions of flanges 44 and 45 which are thus encircled by the disks 35 and 36 are provided with suction ports 46 and 47 which are fan-shaped as shown by dotted lines in Figs. 4 and 5. The inner ends of the ports 46 and 47 communicate with the hollow interior 43a of shaft 43 through the shaft ports 49 and 50. As the notches 7 of the disks 35 and 36 travel from the loading station C (Fig. 2) to the interleaving zone the suction ports 41 and 41a thereof register, respectively, with the ports 47 and 46 of the stationary hub 42 and are thus placed in communication with the hollow interior of the wheel shaft 43. The hollow portion of wheel shaft 43 is in continuous communication with a source of suction.

The suction system described in the foregoing is a slight modification of the previously mentioned suction system of the conventional "Lerner" interleaving apparatus but operates on sustantially the same principle.

The disks 35, 36 and 37 are rotated about the stationary hub 42 and the stationary shaft 43 by means of a driving head 52 equipped with a worm wheel 53 which is driven by a worm 54.

The previously mentioned guide shoe 23, guide rollers 24 and control cams 30 and 32 of the divider strip tipping mechanism are fastened to a stationary bracket 55. As shown to advantage in Figs. 3 and 4, this bracket member 55 is fastened to and carried by a second bracket member 56 which, in turn, is rigidly fastened to the flange 45 of the stationary hub 42. The previously mentioned chain guiding disk 22 is fastened to the flange 40 of the revolvably mounted hub member 38 and is provided with a narrow track portion 22a which fits between the side links of chain 13 and serves to hold the chain against lateral displacement. The chain driving sprocket wheel 28 is fastened to one side of the disk 37 and revolves therewith in driving engagement with that portion of chain 13 which, at any given moment, is passing around the outer portion of the stationary guide shoe 23.

Having thus described what I now consider to be the preferred embodiment of this invention it will be understood that various modifications may be resorted to within the scope and spirit of the appended claims.

Having thus described my invention, what I claim is:

1. In interleaving apparatus of the character described the combination with a toothed wheel member of a divider strip tipping mechanism comprising a disk secured to the central portion of said wheel member to rotate therewith, a stationary shoe arranged between said disk and the periphery of said wheel member, an endless chain trained around said disk and said shoe, a driving connection between the wheel member and the chain whereby said chain is caused to travel with said wheel member, a mounting member carried by said chain, a divider strip tipping member pivotally secured to said mounting member, a biasing spring normally holding said tipping member in a predetermined position, stationary control cams arranged adjacent opposite ends of said shoe and means whereby said tipping member is swung to a retracted position against the resistance of its biasing spring as it passes each of said cam members.

2. Interleaving apparatus as set forth in claim 1, in which the drive connection between the chain and the wheel member comprises an internal sprocket wheel fixed to rotate with said wheel, the teeth of said wheel member being disposed in driving engagement with that portion of the chain which, at any given time, is passing over said shoe.

3. In interleaving apparatus of the character described, the combination with a toothed wheel member of a divider strip tipping mechanism comprising an endless chain driven by said wheel member, a divider strip tipping member, means pivotally mounting said tipping member on said chain so that said tipping member travels with said chain and is also capable of independent pivotal movement, means normally holding said tipping member in a predetermined position and two spaced apart devices arranged to successively swing said tipping member to a retracted position against the resistance of said holding means as the tipping member moves through two relatively spaced portions of its path of travel.

4. In interleaving apparatus of the character described, the combination with a toothed wheel member of a divider strip tipping mechanism comprising an endless chain driven by said wheel member, a divider strip tipping member, means pivotally mounting said tipping member on said chain so that said tipping member travels with said chain and is also capable of independent pivotal movement, means normally holding said tipping member in a predetermined position, a stationary cam arranged so that the tipping member, as it passes through a predetermined portion of its path of travel, is first engaged with a surface portion of said cam which causes the tipping member to be swung to a retracted position against the resistance of said holding means and is then engaged by another surface portion of said cam which permits the tipping member to be returned to its normal position by said holding means, and a further control cam arranged to effect a further swinging movement of the tipping member to a retracted position against the resistance of said holding means when the tipping member has travelled a predetermined distance beyond said first mentioned cam.

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