ABSTRACT: An inserting machine for facilitating the assembly of multiple-section newspapers. The main newspapers, for example, are successively fed onto a reciprocating tray provided with a side guide against which the fold of the paper rests. Upon delivery of each main paper to the tray, the latter dwells momentarily, during which time a friction wheel is shifted into engagement with the top face of the paper along an arcuate path of movement extending downwardly and toward the side guide. This causes the uppermost leaf or leaves of the paper to be pulled toward the side guide relative to the remaining leaves of the section to, in turn, raise the forward, hard edge of the paper formed by such leaves. With the paper thus opened, the tray advances forwardly to place the raised edge on a stationary shelf, whereupon the paper is then fed from the tray and continues its advancement in the opened condition. The tray returns to its standby position and the action repeats as the next paper is fed into the tray. One or more feeders along the path of travel of the successively fed papers effect the delivery of additional sections beneath the shelf and into each advancing main paper.
MECHANISM FOR INSERTING A NEWSPAPER SECTION INTO OTHER FOLDED SECTIONS

This invention relates to improvements in inserting machines for newspapers and similar multiple leaf sheet articles and, more particularly, to an improved means of opening the initial section of the paper into which one or more additional sections are to be inserted.

In the newspaper industry, preprinted, multicolor advertising supplements and other preprinted sections are becoming increasingly popular and must be handled by the larger daily papers across the country as a matter of business necessity. Preprinted sections include a variety of supplements, comics, and television guides as well as advertising. The problem of assembling the composite newspaper is particularly acute in the case of large weekday or Sunday editions where the main newspaper itself has either a large number of pages or comprises multiple sections even without the addition of the supplementary sections.

Inserting machines in present use normally employ feeders that utilize a vacuum system to effect the sequential delivery of the paper sections to the assembly apparatus of the inserting machine. This necessarily limits the capability of the machine since vacuum feeders become ineffective when the section to be fed is of substantial thickness. This is often the case with large weekday or Sunday editions, thereby requiring that hand insertion ultimately be employed to assemble the composite newspaper.

The problem outlined above can be overcome, however, through the utilization of mechanical feeders that will handle thick sections, such as a feeder of the bottom delivery type as disclosed in our copending application, Ser. No. 751,011, filed Aug. 7, 1968. This also results in a material cost saving since the high-capacity vacuum system necessary with vacuum feeders is not required. However, to fully benefit from the cost economy resulting by the omission of vacuum equipment, the inserting machine desirably should then not require a vacuum system to effect the opening of the main paper or other section into which the supplemental sections are to be inserted.

It is, therefore, the primary object of the present invention to provide an inserting machine which is capable of opening multifeed newspapers or similar multiple leaf sheet articles without utilizing a vacuum system for the opening operation.

Another important object of the invention is to provide an inserting machine as aforesaid in which reading is effected by pulling one or more leaves adjacent one face of the paper in directions generally in their planes and oriented to cause a hard edge formed by such leaves to separate from adjacent portions of the paper.

Furthermore, it is an important object of this invention to provide an inserting machine as aforesaid wherein, once the hard edge is separated or lifted, the apparatus maintains the paper or other sheet article in an open condition while advancing the same along a predetermined path of travel, thereby permitting other sheet sections to be fed into the open paper as it advances.

Additionally, it is an important object of the invention to provide such an inserting machine which, in the newspaper industry, may be utilized either at a press location or at carrier stations as desired, but with the capability of handling the main newspaper as received from the folder of the press and assembling the same with additional preprinted sections for direct delivery of the assembled papers into a folding and wrapping machine which prepares the papers for residential delivery.

In the drawings:

FIG. 1 is an end elevation of the inserting machine with certain parts broken away for clarity, the paper-gripping friction wheels being shown in their raised positions;

FIG. 2 is a rear elevation of the feed end of the machine seen in FIG. 1, the friction wheels in FIGS. 2-8 being in their lowermost positions at the time just prior to commencement of forward movement of the floating tray;

FIG. 3 is a fragmentary, top view showing the feeder section and the receiver line of the inserting apparatus as they would both appear in plan;

FIG. 4 is a vertical sectional view taken along line 4-4 of FIG. 3;

FIG. 5 is a cross-sectional view of the feed end of the machine taken along line 5-5 of FIG. 1;

FIG. 6 is a fragmentary, cross-sectional view of the machine taken along line 6-6 of FIG. 1;

FIG. 7 is a fragmentary, cross-sectional view taken along line 7-7 of FIG. 1;

FIG. 8 is an enlarged, fragmentary, cross-sectional view taken along line 8-8 of FIG. 5;

FIG. 9 is a detail view illustrating the action of the friction wheels;

FIGS. 10-15 are diagrammatic views illustrating the operational sequence of the machine;

FIG. 16 is a diagrammatic, top plan view of the feed end of the machine illustrating the pulling action of a friction wheel; and

FIG. 17 is an elevational view corresponding to FIG. 16.

Referring particularly to FIGS. 1-8, it may be seen that the inserting apparatus of the present invention is an elongated structure having a feeder section 20 disposed at the top rear of the machine and extending longitudinally thereof, and a receiver line 22 at the front of the machine which also extends the length thereof. The function of the receiver line 22 is to receive newspaper sections fed thereto, effecting opening of the first newspaper section and subsequent insertion of other sections into the open section as the latter is advanced toward the delivery end of the machine. The feeder section 20 is illustrated herein as comprising a series of three feeders 24, 24a, and 24b, but additional feeders may be provided depending upon the number of individual sections to be combined to form each composite newspaper. Furthermore, it should be understood that, although the description and operational discussion to follow will make reference to the utilization of the apparatus in the assembly of newspapers, the machine is equally well adapted to other similar applications requiring the handling of single and multiple leaf sheet articles.

The machine has a frame comprising a plurality of upstanding, rear frame members 26, a base framework having a plurality of inclined crossmembers 30, three longitudinal angle members 32 spanning the crossmembers 30, and longitudinal top members 34 carried by the upright frame members 26. The receiver line 22 is supported by the inclined crossmembers 30 and associated longitudinal members 32, the feeders 24, 24a and 24b of the feeder section 20 being supported atop the upright frame members 26 and longitudinal top members 34.

At the feed end of the receiver line 22, a support in the nature of a floating tray 36 is mounted for reciprocal movement through a limited distance longitudinally of the machine. The tray 36 is inclined transversely of its path of travel, the lower edge thereof having an upstanding flange 38 which serves as a side guide for newspapers fed onto the tray 36, as will be explained hereinafter. A pair of right-angle plates 40 depend from tray 36 adjacent respective sides thereof, each plate 40 being received between two pairs of opposed rollers 42, thereby mounting the tray 36 for movement longitudinally of the machine (to the right from the standby position of the tray 36 as viewed in FIG. 5). To prevent lateral displacement of the tray 36, an elongated plate element 44 is attached to the right hand angle plate 40 (as viewed in FIG. 1) and extends downwardly therefrom, the plate element 44 being received between two pairs of opposed rollers 46 arranged for rotation about axes orthogonal to the axes of rotation of the guide rollers 42.

A pair of stationary, elongated fingers 48 are mounted just above the side guide 38 of the tray 36 and project downwardly toward the bottom of the side guide 38 and then outwardly over the tray at an angle with respect to the upper surface thereof, as is clear in FIG. 1. The fingers 48 serve as guides for the papers fed onto the tray 36 from the adjacent feeder 24.
directing each paper toward the corner formed by the tray 36 and its side guide 38. Additionally, a pair of flexible guide fingers 50 have their upper ends secured to a pair of crossbars 52 forming a part of the frame of the feeder 24, the flexible fingers 50 extending downwardly into contact with the upper surface of the tray 36. A third, smaller flexible finger 54 also extends downwardly into contact with the tray 36 adjacent its leading edge. A deflector 56 is vertically spaced from the tray 36 and extends parallel to the plane thereof, the deflector 56 being located above the leading edge of the tray 36 and secured to a panel 58 which is supported by the center longitudinal frame member 32.

A pair of friction wheels 60 and 62 are rotatably mounted on the lower ends of a pair of threaded support rods 64 and 66, respectively, the rods 64 and 66 being carried by a U-shaped mounting bar 68 whose ends are journaled on a shaft 70 supported by a pair of mounting projections 72. The shaft 70 is horizontally disposed with its axis extending longitudinally of the machine and parallel to the side guide 38 of the tray 36. An arm 74 connected at one end to the center of the mounting bar 68, the opposite end of the arm 74 being coupled with a drive (to be subsequently described) which swings the friction wheels 60 and 62 about the axis of the shaft 70 between the positions best illustrated by a comparison of FIGS. 1 and 8. Each projection 72 supporting shaft 70 is free to pivot about a pivot pin 76 which is secured to the base 22 (as viewed in FIG. 8). The projections 72 are held against clockwise movement by stops 82.

A rib 84 on the upper surface of the tray 36 extends transversely thereof below and in vertical alignment with the path of travel of the friction wheel 60. As best seen in FIG. 9, the rib 84 on the upper surface 86 faced with a frictional material, the concave surface 86 merging with a straight upper surface 88 at a peak 90. The length of the concave surface 86 is short relative to the length of the straight surface 88, the peak 90 being adjacent the left hand of the rib 84 as viewed in FIGS. 1 and 9. The radius of curvature of the concave surface 86 is the same as the radius of the arc traversed by the friction wheels 60 and 62 during movement thereof between standby and operative positions.

An elongated, stationary table 92 is spaced forwardly of the tray 36 and extends longitudinally of the machine in substantially vertical alignment with tray 36, as best seen in FIG. 3. Referring to FIGS. 4 and 5, note that the table 92 is transversely inclined in the same manner as the tray 36, the plane of the table 92 being spaced slightly below the plane of the tray 36. An elongated shelf 94 is nearly coextensive with the table 92 and is mounted thereon in spaced relationship to table 92 and at a slightly greater transverse inclination. The rearward edge of the shelf 94 is provided with a rearwardly projecting extension which presents a lip 96 that overlies the upper portion of the forward edge of the tray 36. Both the table 92 and the shelf 94 extend in front of the two feeders 24a and 24b, paper sections delivered from these feeders being directed onto the table 92 beneath the shelf 94.

A pair of upper and lower pinch rollers 98 and 100 are disposed between the front edge of the tray 36 and the rear edge of the table 92 as is clear in FIG. 5. The upper roller 98 is carried by a bracket 102 swingable on a rotatable shaft 104, the bracket 102 being biased in a clockwise direction (as viewed in FIG. 5) about shaft 104 by a spring 106. The upper roller 98 is thus yieldably held in engagement with the lower roller 100, both rollers being driven via drive connections illustrated in FIG. 7 and discussed hereinbelow. As is clear in FIG. 5, the rollers 98, 100 are located just behind the panel 58, the roller 98 being disposed in slot 108 therein to permit the drive connection to be made to the roller 98 and also permit pivotal movement thereof about shaft 104.

Similarly, at the delivery end of the receiver line 22, a pair of upper and lower pinch rollers 110 and 112 are disposed in substantial longitudinal alignment with the rollers 98 and 100, the upper roller 110 being carried by a bracket 114 pivotal on a shaft 116. A spring 118 is connected to the bracket 114 and biases the latter in a clockwise direction (as viewed in FIG. 6) about the shaft 116, the nip of the engaging rollers 110 and 112 being in horizontal alignment with the proximal leading edge portion of the infeed 110 and 112 being driven via drive connections illustrated in FIG. 7 and discussed hereinabove.

The table 92 has a longitudinal opening 120 therein which splits the table into two longitudinal sections as is clear in FIGS. 3 and 4. An endless conveyor 122 is disposed beneath the table 92 and is aligned with the longitudinal opening 120, the conveyor 122 including a drive sprocket 124, an idler sprocket 126, an endless chain 128 trained around the sprockets 124 and 126, and a plurality of spaced pusher fingers 130 attached to the chain 128. The upper stretch of the chain 128 moves parallel to the plane of the table 92 beneath the latter, the pusher fingers 130 of the upper stretch projecting upwardly through the opening 120 and hence above the plane of the table 92.

The feeders 24a, 24a, and 24b are of the bottom delivery type as disclosed in our copending application, Ser. No. 751,011, filed Aug. 7, 1968. Being of identical construction, the same reference numerals are used in the drawings to designate like components of the feeders 24a, 24a, and 24b, with the addition of the "a" or "b" notation. Referring to feeder 24a, a hopper is defined by a pair of upright, rear guides 200, two pairs of side guides 202, and a pair of front guides 204. The bottom of the hopper is defined by an inclined table 206 from which the rear guides 200 extend in an upward direction. The front guides 204 are rigid with the pair of crossbars 52 extending between side plates 208 and 210. A slotted plate 212 extends forwardly from each guide 204 and carries a support finger 214 which cooperates with table 206 to support a stack of newspaper sections A in the hopper, as illustrated diagrammatically in FIG. 10. The front guides 204, therefore, are fixed, a bolt through the slot in each plate 212 rendering each finger 214 adjustable toward and away from the table 206. Several of the other guides 200 and 202 are adjustable as is clear in Figs. 1—3.

The newspapers sections are also supported by two irregularly shaped plate elements 216 carried by a rocker shaft 218 and a cross-shaft 220 spaced therefrom, both of the shafts 218 and 220 extending horizontally between the two sideplates 208 and 210. The lowermost paper of the stack A overlies the upper edges presented by the elements 216 and 218. A cam 246, keyed thereon which, during a portion of each revolution, is in engagement with a follower 248 on the cross-shaft 220 and is aligned with the sprocket 24a of the feeder 24a in FIG. 4) has a cam 246 keyed thereon which, during a portion of each revolution, is in engagement with a follower 248
carried by the rocker arm 250 which oscillates about the axis of a pivot shaft 252. The rocker arm 250 is pivotally coupled with a link 254 which, in turn, is connected to an L-shaped crank 256 that is freely rotatable on cross-shaft 220 and carries the adjacent end of roller shaft 230. The L-crank 256 is biased in a clockwise direction, viewing crank 256a in FIG. 4, by a spring (not shown). In FIG. 3, it may be seen that the opposite end of roller shaft 230 is also carried by a crank 258 swingable on shaft 220, the crank 258 being pivotally connected to a link 260 which is, in turn, pivotally joined to an idler arm 262 swingable about the axis of pivot shaft 252.

The rocker shaft 251 is operated by a crank arm 264 (FIG. 1) rigid with shaft 244 and pivotally connected to a link 266 which is, in turn, pivotally joined to a crank arm 268 rigid with the rocker shaft 218. During one complete revolution of crank arm 264, the crank arm 268 is oscillated through a displacement of less than 180°.

Six paper grippers 270 are rigid with shaft 218 and are spaced therealong, each gripper having a pair of side-by-side continuous bands 272 of rubber or similar material radically spaced from shaft 218 and presenting a serrated, outer surface constituting a continuous, generally oval-shaped tread. The oval configuration is particularly clear in FIG. 4 where one of the grippers 270b of feeder 24a is shown viewed axially of shaft 218a.

A motor 300 is coupled by a belt and pulley drive 302 to a speed reducer 304, the output thereof being coupled to a common feeder drive shaft 306 by a chain and sprocket assembly 308. As is clear in FIG. 2, the drive chains 222 and 222a of the respective feeders 24 and 24a are trained around sprockets on the common drive shaft 306. The feeder 24b is likewise driven, the drive connection thereto from shaft 306 not being visible in the drawings.

Beneath the feeder 24, a right-angle gearbox 310 is located and is driven by a chain and sprocket assembly 312 coupled with the drive shaft 306. The gearbox 310 has an output shaft 314 visible in cross section in FIG. 5, a chain 316 being trained around sprockets keyed to the shaft 318, a shaft 320, plus an idler sprocket 322.

Referring to FIG. 7, it may be seen that a drive chain 324 is trained around a sprocket on the opposite end of the shaft 318 and is also trained around a sprocket on shaft 326 to transfer drive to the latter. This shaft 326 is also visible in FIG. 6 and has the drive sprocket 124 of the endless conveyor 122 mounted thereon. In this manner, the conveyor 122 is continuously driven.

One detail in FIG. 36 is best illustrated in FIGS. 3, 8, and 6. A cam 328 is rigid with shaft 320 and has an internal cam track which receives a follower 330 carried by an upright rocker arm 332, the lower end thereof being secured to a rocker shaft 334. The upper end of the rocker arm 332 is joined to the trailing edge portion of the tray 36 by a link 336. As is clear in FIG. 6, the cam 328 has a generally oval-shaped track in which the follower 330 rides, half of the track being concentric with the axis of the shaft 320 while the other half of the track describes an arc having a center spaced below the shaft 320. The direction of rotation of the cam 328 is counterclockwise in FIG. 6 as indicated by the arrow, the thus relationship of the parts is shown at the end of the half revolution dwell period, during which time the follower 330 was traversing the concenetric portion of the cam track.

In FIG. 7 an analogous arrangement is illustrated for driving the friction wheels 60 and 62. A cam 338 of the same configuration as cam 328 rotates with shaft 320 in the direction indicated by the arrow, the cam 338 being 180° out of phase with respect to the cam 328. The cam 338 engages a follower 340 carried by a rocker arm 342, one end of the rocker arm 342 being mounted on a rocker shaft 344. The opposite end of the rocker arm 342 is pivotally joined to the lower end of an upwardly extending connecting rod 346, the upper end of the rod 346 being pivotally joined to the end of the arm 74, the latter extending from the mounting bar 68 that carries the friction wheels 60 and 62 as described above. It should be noted that the cam follower 340 is displaced 90° relative to the follower 330 associated with the tray drive, thus (together with the 180° out-of-phase relationship between cams 328 and 338) the connecting rod 346 is at its maximum raised position at the time of termination of the dwell of the tray drive. This results in the friction wheels 60 and 62 being disposed in their lower operating positions at this time.

A drive chain 348 is trained around a sprocket on the shaft 320 (FIG. 7) and is also trained around a sprocket on the shaft 350 to transmit power thereto. Power is then taken from a second sprocket rotatable with shaft 350 via a chain 352 which is in mesh with the teeth of a sprocket on a shaft 354 and is also trained around a sprocket on the shaft 104. Another chain 358 then transmits the drive to a shaft 360, the latter having the upper pinch roller 98 mounted thereon for rotation therewith (FIG. 6). The shaft 354 carries the lower pinch roller 100 for rotation therewith, the directions of rotation of the various shafts and sprockets of the drive configuration being indicated by the arrows in FIG. 7.

The drive is transmitted onto the pinch rollers 110 and 112 by a drive chain 362 trained around a sprocket keyed to the shaft 354. The chain 362 engages an idler sprocket 364 and is then trained around sprockets on the shaft 116 and a shaft 368, the latter shaft 368 having the lower pinch roller 112 mounted thereon for rotation therewith. The upper pinch roller 110 is on a shaft 370, drive thereto being effected by a chain 372 and associated sprockets on shafts 370 and 116.

OPERATION

As an aid in understanding the operation of the machine of the present invention, particular reference is made to the diagrammatic views of FIGS. 10-15, together with the detail and the diagrammatic illustrations of FIGS. 16 and 17. As one of example of use of the machine, the papers of stack A in the hopper of the first feeder 24 is assumed to be the main newspaper sections into which other sections, such as preprinted supplements, are to be inserted. The other sections or supplements are loaded into the hoppers of the feeders 24a and 24b, a stack B thereof in feeder 270 being diagrammatically illustrated in FIGS. 13 and 14.

An understanding of the basic manner of operation of each of the feeders 24, 24a, and 24b may be obtained with reference to FIGS. 1 and 4. Although two different feeders 24 and 24a are illustrated, their parts are in the same relative positions. As the shaft 224 is driven in a counterclockwise direction (as viewed in FIGS. 1 and 4) by the drive chain 222, the cam 244 (or 244a) rotates as indicated by the arrows in FIG. 4. When the cam 244 engages the follower 248, the rollers 232, 236 are open. Movement of the lower rollers 232 upwardly toward the upper rollers 236 to engage a paper fed therewith is effected by spring action during the time that the lobe of the cam 246 is out of engagement with the follower 248. In synchronism with this operation, the feeder grippers 270 are oscillated about the axis of shaft 218 by the crank mechanism 264, 266, 268. Rearward movement of the feeder grippers 270 toward table 206 causes the treads 272 to engage the lowermost paper of the stack to effect buckling of the paper between the feeder grippers and the table 206, causing the leading edge of such paper to be withdrawn from between the fingers 214 and the remaining papers of the stack thereabove. As the feeder grippers 270 are then rocked forwardly away from the table 206, the withdrawn leading edge of the paper is introduced between the rollers 232 and 236 to deliver the paper from the feeder, the trailing edge portion of the paper being withdrawn from between the remaining papers thereabove and the table 206 by the frictional engagement of the rollers 232, 236 therewith. Additional details concerning the operation of bottom delivery feeders of this type may be obtained from our aforesaid patent application.

In FIG. 10 a paper from the stack A is shown received by the tray 36 and resting against the side guide 38. The friction wheels 60 and 62 have not as yet commenced downward movement. FIG. 9 shows the friction wheel 60 after downward
movement commences under the action of the cam 338, follower 340, rocker arm 342, and connecting rod 346 shown in FIG. 7. FIG. 9 clearly reveals that the paper in the tray 36 is a typical newspaper section having a fold 372 along its bottom (in relation to the copy on the upper half of the front page). This fold 372 divides the newspaper section into two segments and constitutes a side edge of the newspaper section for purposes of discussion herein, the fold 372 being flush against the side guide 38. Note that the friction wheel 60 begins to grip the upper face of the top segment of the newspaper section as it passes over the hump in the section formed by the peak 90 presented by the upper surface configuration of the rib 84.

The wheel 60 is shown in its lowest, fully operative position in FIGS. 16 and 17. A comparison of FIG. 9 with FIGS. 16 and 17 illustrates the pulling action of the wheel 60 as it grips the upper edge of the top segment of the newspaper section as it completes its arcuate downward path of movement. The typical newspaper section has a pair of hand edges 374 and 376 which will be considered herein as the forward edges of the paper, the hand edges 374 and 376 being formed by the fold that constitutes the left hand edge of the newspaper section when it is opened at the bottom fold 372, and held in the upper position for reading the copy. As the wheel 60 moves from the position thereof shown in FIG. 9 to the position shown in FIGS. 16 and 17, the uppermost page or pages of the top segment of the paper are pulled toward the fold 372 in directions generally in their planes relative to the remaining sheets of the top and bottom segments, thereby causing the upper, hand edge 374 to separate from the lower, hand edge 376. As is clear from a comparison of FIGS. 16 and 17, the hard edge 60 is raised to a position which will place the edge 374 over the lip 96 of the shelf 94 upon forward advancement of the tray 36 (to the right as viewed in FIGS. 16 and 17).

The tray 36 dwells in its standby position during the pulling action of the gripping wheel 60 just described, by virtue of the configuration of the lower half of the track of the cam 328 as viewed in FIG. 6. Being concentric with the cam shaft 328, the dwell period of the tray 36 is approximately one-half of a revolution of the shaft 320. Following the dwell period, the tray 36 commences advancement toward the table 92 and shelf 94, at which time the gripper wheel 60 begins return movement. However, the raised forward edge 374 of the newspaper section remains under the pulling action of the gripper wheel 60 for a sufficient period of time to assure that the lip 96 of the shelf 94 is effectively inserted into the section beneath the edge 374, thereby supporting the raised edge 374 in vertically spaced relationship to the edge 376 therebeethere. This is depicted in FIGS. 11 and 12 and, finally, the section is completely removed from the tray 36 with the lower half thereof now resting on the table 92 as illustrated in FIG. 13. Feeding of the section from the tray 36 is effected by the pinch rollers 98 and 100, the leading edges 374 and 376 of the section adjacent the fold 372 being introduced into the nip of the rollers 98 and 100 as the tray 36 advances to place the raised edge 374 on the lip 96. The small guide finger 54 (FIG. 3) is advantageously utilized at this time to hold down the loose corner formed by the lower edge 376 and, additionally, slips under the raised edge 374 to prevent the latter from closing against the lower edge 376 before it can be supported by the lip 96. Normally the second friction wheel 62 would be adjusted to a somewhat greater height than the pulling wheel 60 and serves primarily to hold the fold 372 against the side guide 38.

It may be appreciated from FIG. 9 that the frictional facing of the concave upper surface 86 of the rib 84 assists the gripper wheel 60 in separating the hand edges 374 and 376 and continues downward movement to its fully operative position.

In FIGS. 14 and 15, the second feeder 24a is shown delivering a newspaper section from the bottom of stack B, the delivery path extending beneath the shelf 94 and directly into the now opened main section which is supported on both table 92 and shelf 94. Continued advancement of the open main section along the table 92 is effected by the pusher fingers 130 of the conveyor 122, resulting in the main section and an inserted section or sections being advanced in front of the row of feeders along the table 92. Manifestly, the number of feeders utilized in practice of the invention will depend upon the number of sections to be inserted into the main or first newspaper section. Synchronism of the various feeders for successive delivery of respective sections into the open sections advancing along table 92 may be effected by any suitable means, such as by an adjustment (not shown) for each feeder which effectively shortens or lengthens one stretch of the respective drive chain 222, 222a, or 222b, etc.

As long as the hoppers of the various feeders remain loaded, the operation described above is continuous with open sections from the feeder 24 being successively delivered to the tray 92 as the tray 36 reciprocates between its forward and standby positions, shown by a comparison of the broken and solid line illustrations in FIG. 6. At the delivery end of the table 92, the fully assembled newspapers are received in the nip of the pinch rollers 110 and 112 for delivery from the table 92. The assembled papers may simply be collected in stacks as they are discharged from the rollers 110 and 112 or, if desired, the apparatus may directly feed a newspaper folding and wrapping machine of the type disclosed in U.S. Pat. Nos. 3,161,000 and 3,255,569.

Having thus described the invention, what we claim as new and desire to be secured by Letters Patent is:

1. Apparatus for inserting a first sheet section into a second, folded multiple leaf sheet section, the fold dividing the section into two segments and constituting a side edge of said second section with the segments thereof having hard, forward edges extending transversely of the fold, said apparatus comprising: a support for receiving said second section and holding said fold thereof against lateral movement; a slidable gripper disposed to frictionally engage only one face of the outermost leaf of one of the segments of said second section when the latter is received by said support; means coupled with said gripper for shifting the latter into engagement with said face to pull the outermost leaf or leaves of said one segment adjacent said gripper in directions generally in their planes relative to the remaining leaves of said segments to cause the hard forward edge formed by said one segment to separate and move away from the hard forward edge of the other segment of said second section to thereby open the latter; means for advancing said second section forwardly along a predetermined path of travel upon operation of said gripper shifting means and attendant opening of said second section; structure along said path of travel in disposition to support said second section and maintain the latter open as it advances; and means along said path of travel for feeding said first section into the open second section as the latter advances.

2. Apparatus as claimed in claim 1, there being means along said path of travel for feeding at least one additional sheet section into the open second section as the latter continues to advance, whereby said apparatus inserts a plurality of sheet sections into said second section.

3. Apparatus as claimed in claim 1, said gripper shifting means effecting movement of said gripper generally toward said fold, whereby the outermost leaf or leaves of said one segment adjacent said face are pulled toward said fold to open said second section.

4. Apparatus as claimed in claim 1, said support having means disposed to underlie said second section in supporting relationship to the opposite face
thereof, said one face thereby constituting the upper face of said second section, said gripper-shifting means effecting movement of said gripper downwardly into and at an angle to said upper face and generally toward said fold, thereby raising the hard forward edge of said one segment to open said second section.

5. Apparatus as claimed in claim 4, said structure having means disposed to underlie the raised forward edge and hold the latter in spaced relationship to the forward edge therebeneath, as said second section advances along said path of travel.

6. Apparatus as claimed in claim 4, there being means mounting said support for movement a predetermined distance along said path of travel, said advancing means including drive means coupled with said support for shifting the latter said distance to effect initial forward advancement of said second section, said structure having means for receiving the raised forward edge of said second section as said support is shifted, said receiving means being disposed to underlie said raised forward edge and hold the latter in spaced relationship to the forward edge therebeneath as said second section continues to advance along said path of travel.

7. Apparatus as claimed in claim 6, said gripper including a friction wheel rotatable about an axis extending transversely of said path of travel.

8. Apparatus as claimed in claim 7, said support shifting relative to said wheel as the support moves said distance, said gripper shifting means maintaining said wheel in engagement with said upper face of the second section during initial movement of the support, whereby the wheel rotates as the support commences movement to hold the second section open.

9. Apparatus as claimed in claim 6, said advancing means further including means engageable with said second section upon said initial forward advancement thereof for shifting the second section from said support and effecting continued advancement thereof along said path of travel.

10. Apparatus as claimed in claim 6, said drive means effecting said shifting of the support following operation of said gripper-shifting means to open said second section.

11. Apparatus as claimed in claim 4, said support including a tray presenting said means disposed to underlie said second section and provided with an upstanding side guide, said tray having a rib thereon generally aligned with said gripper and extending transversely of said path of travel, there being means for feeding said second section into said tray over said rib with said fold against said guide, whereby a hump is formed in said second section by said rib to augment the pulling action of said gripper.

12. Apparatus as claimed in claim 11, said rib having a concave, frictional upper surface opposing said gripper as the latter moves into engagement with said upper face of the second section.

13. Apparatus as claimed in claim 12, said movement of said gripper being arcuate and directed downwardly over said tray and toward said guide, said concave surface of the rib having a curvature substantially conforming to the arcuate path of movement of said gripper.

14. Apparatus as claimed in claim 4, said support including a tray presenting said means disposed to underlie said second section and provided with an upstanding side guide, there being means for feeding said second section into said tray with said fold against said guide, said movement of said gripper being arcuate and directed downwardly over said tray and toward said guide.

15. Apparatus as claimed in claim 4, said support including a tray presenting said means disposed to underlie said second section and provided with an upstanding side guide, there being means for feeding said second section into said tray with said fold against said guide; and means mounting said tray for forward and return movement a predetermined distance along said path of travel, said advancing means including cyclic drive means coupled with said tray for shifting the latter forwardly said distance to effect initial forward advancement of said second section, and then returning said tray to a standby position thereof for a predetermined dwell period before again shifting the tray forwardly, said gripper-shifting means being synchronized with said drive means and operable to effect downward movement of said gripper into said upper face during said dwell period, said structure having means for receiving the raised forward edge of said second section upon forward movement of said tray following said dwell period, said receiving means being disposed to underlie said raised forward edge and hold the latter in spaced relationship to the forward edge therebeneath as said second section continues to advance along said path of travel.