

July 6, 1937.

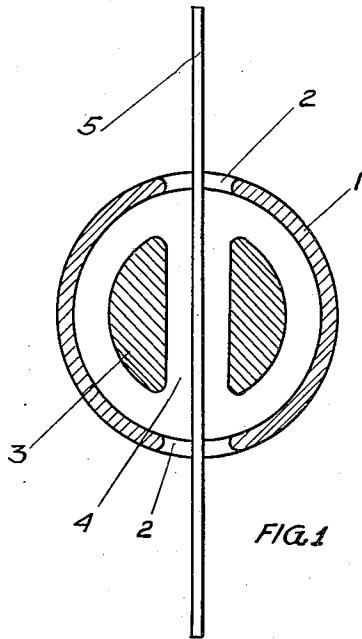
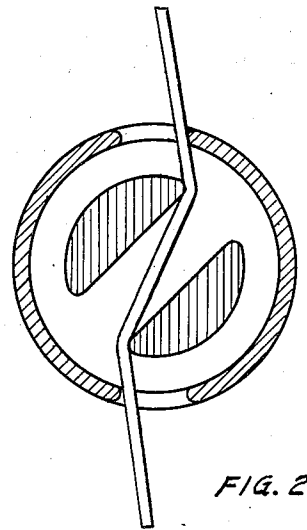
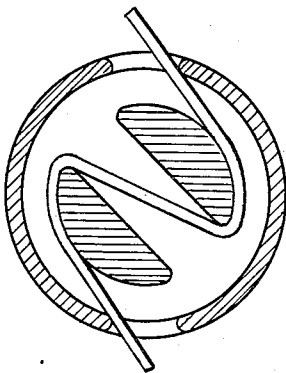
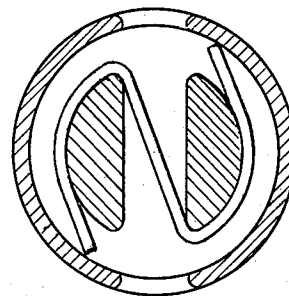
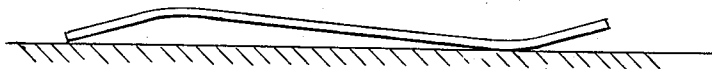
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2,086,375

METHOD OF AND APPARATUS FOR HANDLING SHEETLIKE MATERIAL

Filed June 13, 1936

4 Sheets-Sheet 1



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METHOD OF AND APPARATUS FOR HANDLING SHEETLIKE MATERIAL

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4 Sheets-Sheet 2

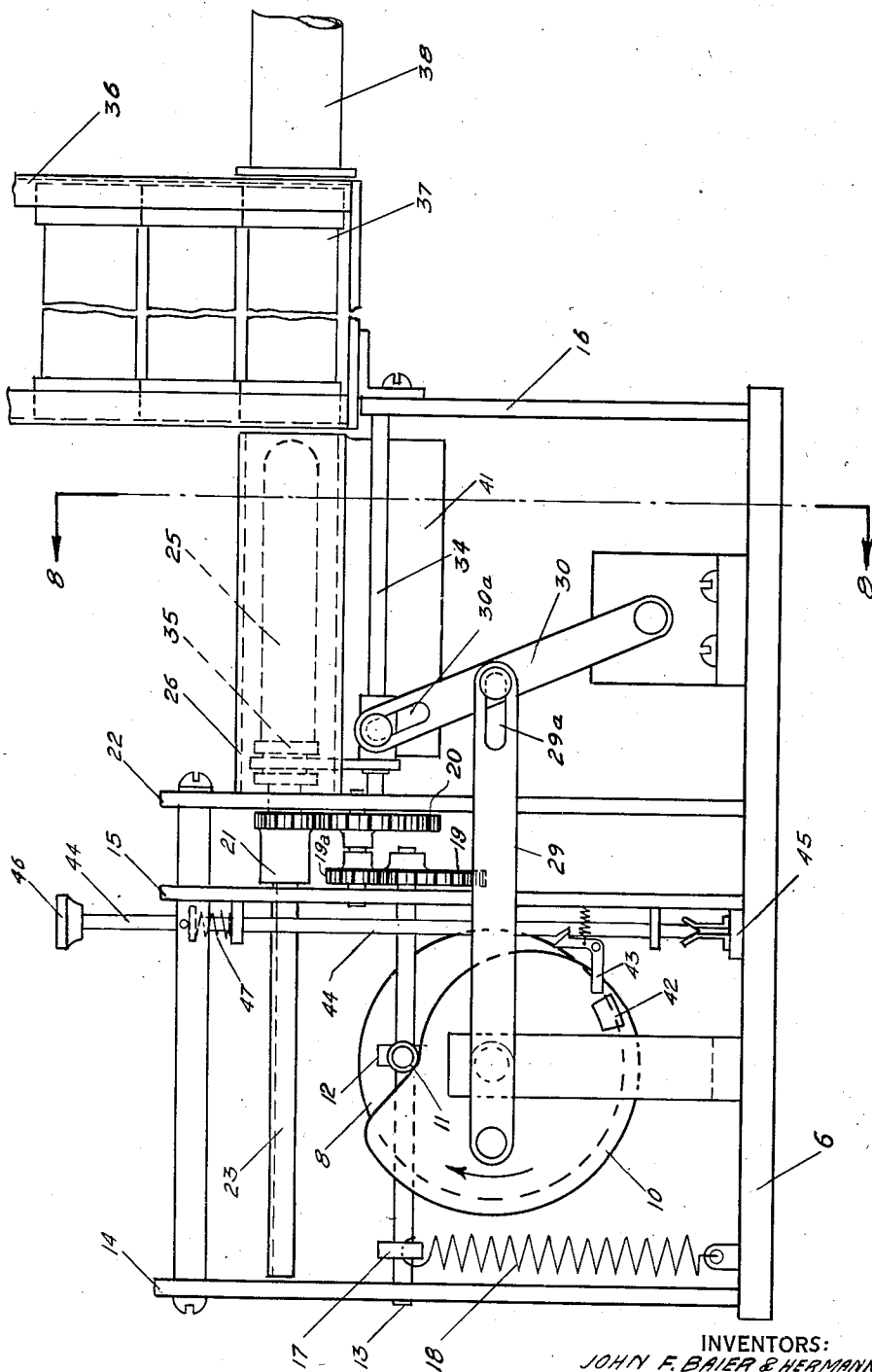


FIG. 6

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METHOD OF AND APPARATUS FOR HANDLING SHEETLIKE MATERIAL

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4 Sheets-Sheet 3

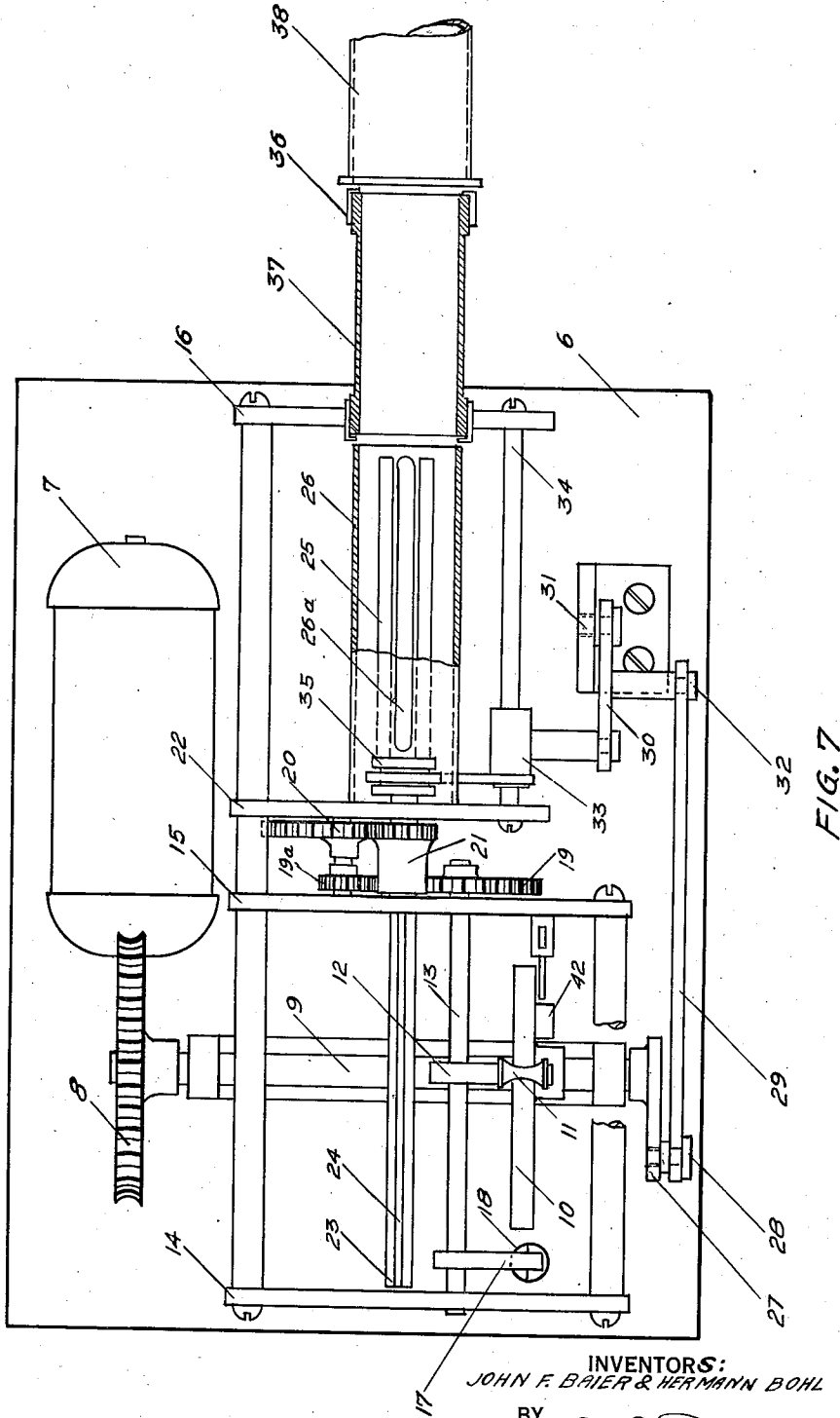


FIG. 7

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METHOD OF AND APPARATUS FOR HANDLING SHEETLIKE MATERIAL

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4 Sheets-Sheet 4

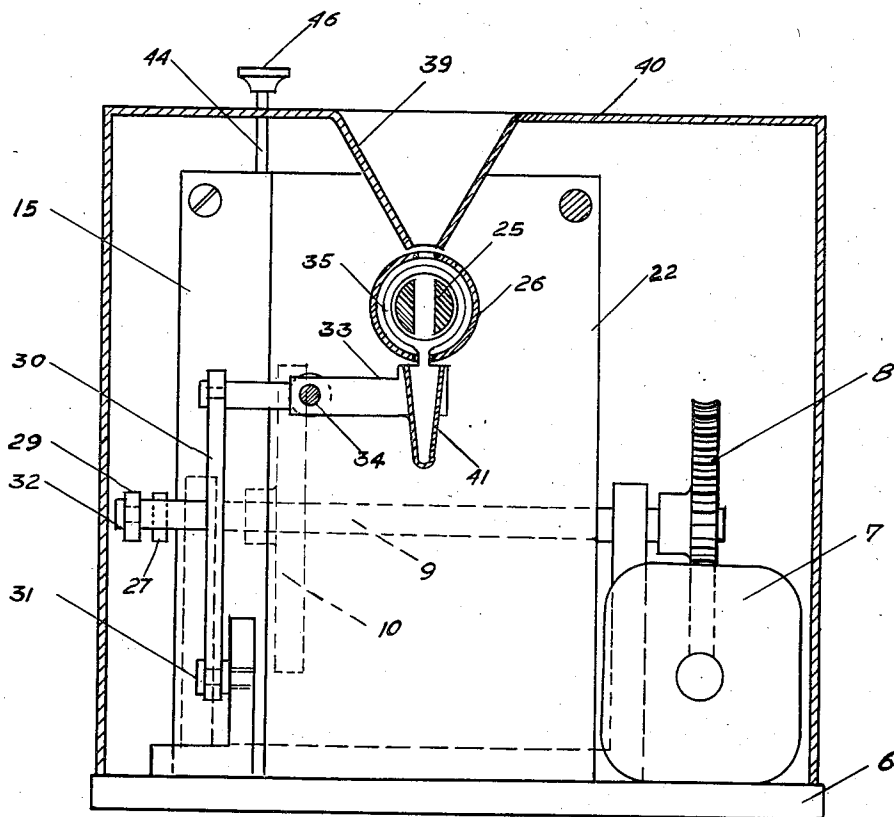


FIG. 8

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UNITED STATES PATENT OFFICE

2,086,375

METHOD OF AND APPARATUS FOR HANDLING SHEETLIKE MATERIAL

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Application June 13, 1936, Serial No. 85,042

10 Claims. (Cl. 93—84)

The present invention relates to the art of handling sheet-like materials, and, more particularly, to an improved method of and apparatus for inserting sheet-like materials, paper slips, and the like into containers or carriers.

Heretofore, in pneumatic tube systems when it was desired to convey paper sales slips, order forms, checks and the like through the system, the slip of paper had to be manually inserted into the carrier. The manual insertion of the paper slips had serious disadvantages in that the slip had to be manually folded by the operator and inserted into the carrier which was a slow and unreliable procedure. In addition to the inevitable loss of time, the type of fold applied to the paper slip was inconsistent and was subject to wide variations corresponding to the individual method of the operator. As a matter of fact, even the same person would fold or roll up the slip of paper in a different way at different times. Frequently, the slip would be folded too loosely so that occasionally the slip would leave the carrier on its travel through the pneumatic tube causing serious inconvenience and costly repairs of the tube system. In the event the slip was inserted too tightly into the carrier, removal of the slip at the receiving end would become difficult and cause considerable loss of time. Moreover, the manual folding of the paper slips permanently deformed the paper so that the slip could not be handled, read or returned conveniently. The above disadvantages were the more serious in view of the fact that pneumatic tube systems represent considerable capital investments made for the very reason of speeding up the transmission of messages or of records. Therefore, the conventional method of manually inserting paper slips and the like into the carrier seriously interfered with the speedy and correct operation of pneumatic tube systems and prevented obtaining the full benefit of an installation primarily provided for the purpose of speeding up routine operations. Although many suggestions and attempts have already been made to eliminate the above disadvantages and inconveniences, none, as far as we are aware, of these various suggestions and attempts was completely satisfactory and successful when carried into practice on a practical and commercial scale.

We have discovered that the problem may be solved in a remarkably simple manner.

It is an object of the present invention to provide a novel method of automatically inserting sheets, slips of paper or of other like sheet-like

articles into carriers which eliminates all of the above disadvantages of manual insertion.

It is another object of the invention to provide an apparatus for automatically handling and inserting paper slips and the like articles into the carrier of pneumatic tube systems in a rapid, uniform and fool-proof manner.

It is a further object of the invention to provide an apparatus for handling and inserting sheet-like articles into containers which is simple and inexpensive to build and to operate and which may be readily added to existing handling equipment without requiring substantial or expensive changes.

The invention also contemplates a novel and improved method of folding sheet-like articles prior to the insertion of such articles into a confined space, which method does not subject the article to stresses beyond the elastic limit so that on removal from said limited or confined space the sheet-like article will substantially return to its normal form and shape without suffering any permanent deformation.

Other and further objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings, in which:—

Fig. 1 is a cross sectional view through a simplified apparatus embodying the principles of the present invention showing the apparatus in its initial or neutral position;

Figs. 2, 3, and 4 are similar views illustrating the apparatus shown in Fig. 1 in successive phases of operation;

Fig. 5 depicts a cross sectional view of a paper slip after its release from the handling apparatus embodying the invention;

Fig. 6 illustrates a side elevational view of a modified embodiment of the invention in an automatic inserting machine;

Fig. 7 is a top elevational view of the machine shown in Fig. 6, and

Fig. 8 depicts a vertical sectional view taken on line 8—8 of Fig. 6.

Broadly stated, according to the principles of the invention we provide a rotatable winding member adapted to engage the sheet-like article and to wind it up. We have found that the combination of a rotatable winding member with a stationary winding member is especially satisfactory in operation. We prefer to employ a rotatable member in the form of a fork which cooperates with a stationary cylindrical member provided on its circumference with a pair of narrow slots arranged in axial direction and op-

posite each other so that a sheet-like article may be inserted therebetween. The rotatable or fork-like member is provided with an interval or slot between its two prongs which in the normal position of rest is in alignment with the slots in the stationary member. We have found that if a sheet-like article is inserted through the slots of the cylindrical member between the prongs of the fork-like member, by rotating the fork-like member the sheet-like article will be wound up in a uniform and satisfactory manner. Especially good results are obtained if the sheet-like article is inserted so far into the apparatus that its central portion is engaged by the fork and its two ends protrude through the slots in the stationary member in opposite directions. In this case, rotation of the fork will wind up the sheet-like article in the form of an S. This type of winding has considerable advantages over the simple or spiral winding. First of all, the time required for winding up a sheet of definite length is considerably shortened. In addition, the center portion of the sheet is not bent and the ends of the sheet extending beyond the prongs of the fork are bent and wound in opposite directions. We have found that surprisingly a sheet or slip of paper bent in the described manner will substantially resume its original straight position upon release without suffering any permanent deformations which would interfere with its further use.

After the sheet-like article has been completely wound up on the fork, we advance the fork in an axial direction in such manner that the fork will protrude beyond the stationary cylindrical member and will extend into a cylindrical container or carrier arranged in front of and registering with the opening of the cylindrical member. By means of this axial displacement of the fork which may be combined with a rotary displacement, the slip will be introduced into the carrier or container and will be deposited therein after withdrawal of the fork. The carrier can now be dispatched into the pneumatic tube system by means of manually or automatically operated actuating elements. Various arrangements may be used for rotating the winding member and for inserting the wound article into the carrier, as those skilled in the art will readily understand. The practical design of these elements will largely depend on the circumstance whether the driving power is derived from a hand crank, an electro-motor or a fluid pressure motor. We prefer to combine our automatic inserting machine with a carrier magazine holding a preferred number of empty carriers which are successively fed into registering position with the inserting mechanism. Preferably, the pneumatic tube is directly attached to this magazine in such a manner that the work will push the carrier into this tube. Of course, various other ways of automatically dispatching the carrier may be conceived. To facilitate the insertion of the sheet-like article, a chute or the like inserting member may be provided adapted to the size and to the character of the article employed. The inserting member may be combined with starting means actuating the driving mechanism on the insertion of a sheet or slip or if desired a push button or some other conventional starting means may be employed.

The invention will now be more fully explained reference being had to the accompanying drawings.

Referring now more particularly to Figs. 1 to 4,

a simplified winding apparatus is shown to illustrate the method of winding employed according to the principles of the invention. In the apparatus shown an outer stationary cylinder 1 having two axially arranged slots 2 in diametrically opposite positions is provided. Within this stationary cylinder an inner rotatable cylinder 3 is coaxially arranged having a diametrically extending slot 4 which divides the rotatable cylindrical member into two parts or prongs in the form of a fork. In the normal or neutral position of rest the rotatable cylindrical member is so positioned that slot 4 is registering with slots 2 of the stationary cylinder 1 and is capable of receiving the central portion of a sheet or slip 5. As it appears from Figs. 2 and 3, illustrating the position of the sheet after rotating the inner cylinder 3 by 45° and by 135°, respectively, sheet 5 is gradually wound up around the circumference of 3 into an S-like shape. After a rotation of about 180° (Fig. 4), the winding operation is completed, and the paper slip or sheet is completely within the stationary cylinder and is ready to be inserted into the carrier or container. In view of the fact that in the wound-up position the opposite ends of the sheet are bent in opposite direction, the sheet is deformed only to a very slight extent, so that after its release it will assume the position indicated in Fig. 5. Of course, a sheet of this character may be handled, read or re-dispatched with practically the same facility as a new and unused sheet.

Referring now to Figs. 6 to 8, a modified embodiment of the principles of the invention is shown. On a base plate 6 are mounted side walls 14, 15, 22, and 16 adapted to support the winding members and the operatively associated elements. The driving power is supplied by an electro-motor 7 mounted on the base plate driving cam shaft 9 through a reducing or worm gear 8. A cam 10 is rigidly connected to an intermediate portion of cam shaft 9 and is capable of being slowly rotated by energizing the electro-motor 7. The outer circumference of cam 10 is engaged by a small roller 11 which is mounted at the end of actuating lever 12 rigidly connected to actuating shaft 13 mounted between side walls 14 and 15. At the left end of shaft 13 is mounted a short arm 17 which is rigidly connected to the shaft. A powerful spring 18 having one of its ends anchored to the base plate and its other end connected to arm 17 imparts a rotational force to shaft 13 and presses roller 11 against the surface of cam 10. The right end of shaft 13 carries a spur gear 19 rigidly mounted thereon co-operating with a train of gears 19a, 20 and 21. Gear 21 is provided with an extended hub having a key arranged therein co-operating with a keyway 24 extending over the full length of fork shaft 23 so that the fork shaft and fork 25 mounted thereon may be displaced in an axial direction without interfering with the transmission of the rotary displacement caused by the varying positions of roller 11 on the surface of cam 10. Fork 25 is surrounded by a stationary cylindrical member 26 having slots 26a at diametrically opposite portions of the circumference thereof in order to permit insertion of a paper slip in between the prongs of fork 25. The structural elements described hereinabove are provided for the purpose of imparting a rotating motion to the fork 25 which co-operates with stationary cylindrical member 26 to wind up the paper slip in the manner indicated in Figs. 1 to 4. The outer diameter of the fold will correspond

to the inner diameter of the stationary cylindrical member surrounding the fork.

In order to insert the wound-up paper slip into a cylindrical container or carrier, the fork bearing the wound-up slip is to be displaced in an axial direction. We have found that the insertion is greatly facilitated if the fork is maintained in rotation during the time of the axial displacement. At the end of the axial displacement or insertion stroke of the fork the fork is preferably withdrawn without rotation in order to deposit the wound-up slip in the carrier. To obtain the required axial displacement of the fork 25, a crank 27 is rigidly connected to cam shaft 9 and is connected by means of pins 28, 32 and link 29 to a bail rod 30 pivoted in 31 and having its other end connected to fork rider 33 slideably arranged on guide rod 34. Fork rider 33 is engaging a sleeve 35 fixed to fork 25 and to fork shaft 23 so that rotation of cam shaft 9 and of crank 27 will axially displace the fork without interfering, however, with the transmission of angular displacement of the fork caused by the rotation of spur gear 21 having a key co-operating with keyway 24 of fork shaft 23. Thus, the relation between the angular and the axial displacement of the fork is governed by the shape of cam 10, the ratio of gear train 19, 19a, 20, 21, the length of actuating lever 12, the length of crank 27, the location of pin 32, and the amount of lost motion caused by slots 29a and 30a at the ends of connecting link 29 and bail rod 30, respectively.

A carrier magazine 36 is provided in front of the fork and is adapted to hold a plurality of carriers 37 which are successively fed into inserting position and are subsequently dispatched through pneumatic tube 38. A chute or inserting opening 39 is provided above the stationary cylindrical member 26 for the insertion of the slip and forms part of cover 40 of the machine. Preferably, a stop 41 is provided underneath the slot of the stationary cylindrical member limiting the depth to which the slip can be inserted in order to have the fork engage the center portion of the slip. Of course, the stop may be adjustable in order to be adaptable to slips of different size.

From the preceding description the operation of our automatic inserting machine will be readily understood by those skilled in the art. In the normal position of rest, stationary cylindrical member 26 and fork 25 are so adjusted that the axial slots therein are in alignment and permit the insertion of the slip. After the slip is inserted, electro-motor 7 is started by depressing push button 46 (Fig. 6) at one end of rod 44 whereby the other end of the rod will close contacts 45 and will complete the motor circuit. In this position catch 43 will engage a recess in rod 44 and will lock the rod in the contact-closing position. The motor 7 will rotate cam disk 10 and will cause rotation of the fork due to the displacement of roller 11 on the circumference of the cam disk and through the gear train 19, 19a, 20, 21. It will be noted that cam disk has a steeply ascending part at the initial position of the roller 11 thus causing rapid rotation of the fork, while during the same part of revolution of the cam the displacement of the crank will be substantially taken up by the lost motion in the slot 29a of connecting link 29 so that no axial displacement of the fork will take place. After roller 11 has reached the top of its steep ascent, the speed of rotation of the fork will be slower and at the same time the crank will displace link 29 and will axially displace the fork so that the fork still

continuing its slow rotation will insert the wound-up slip into the lowermost carrier. Upon further rotation of the cam and of the crank, the fork is axially withdrawn from the carrier with little or no angular displacement, because the roller 11 has arrived to the portion of the cam having a substantially circular circumference so that the wound-up slip is deposited in the carrier. The carrier may now be withdrawn by means of a manually or automatically actuated dispatching mechanism of conventional character (not shown). During the last part of the rotation of the cam and of the crank, the fork will complete its return movement in axial direction and at the same time will be quickly rotated in a direction opposite to its former rotation due to the descending slope of the cam disk so that it will be returned into its normal or neutral position of rest and is ready to receive and fold up and insert a new slip. Preferably, a stop 42 is provided on cam disk 10 which at the end of one revolution engages catch 43 and lifts it out of the recess of rod 44 whereby spring 47 returns the rod into the normal position of rest and automatically breaks the circuit of the electric motor. Of course, wide variations are possible as to the relative displacements of the fork in angular and axial directions in order to obtain satisfactory and fool-proof insertion of the slip into the carrier. In order to give to those skilled in the art a better understanding of the invention, the following illustrative example may be given indicating a possible co-ordination of angular and axial displacements of the fork which has been found to give satisfactory results:—

1. Fork 25 makes two revolutions without any axial displacement, thereby completely folding or winding up the slip of paper.

2. The fork makes one additional revolution and is simultaneously displaced in axial direction to the extent of about 75% of the full available stroke. This step completely inserts the wound-up slip into the carrier, the object of the angular displacement being to reduce the friction between the wound-up slip and the inner walls of the carrier.

3. The fork completes the remaining part of its axial displacement without any angular displacement. This step may be used to automatically dispatch the loaded carrier, as those skilled in the art will readily understand.

4. The fork is moved backwards in the axial direction to about 60% of the return stroke without any angular displacement, thus leaving the wound-up paper slip undisturbed in the carrier. Preferably, the dispatching mechanism is so adjusted that at the end of this step the carrier is fully withdrawn by means of the dispatching mechanism.

5. The fork completes its return stroke and at the same time makes three complete revolutions in a direction opposite to that of its former rotation whereby the fork is returned into its original or neutral position of rest and is ready to receive the next charge.

It is to be noted that the apparatus according to our invention provides a number of important advantages. First of all, a simple, efficient and fool-proof apparatus is provided which is capable of folding, winding sheet-like articles in a rapid and uniform manner and of inserting such wound-up articles into containers and carriers. Thus, the element of uncertainty inseparable from the manual handling of such articles is completely eliminated and quick, efficient and satis-

factory service is provided under all operating conditions.

It is also to be observed that the apparatus of the present invention does not deform or distort the sheet-like article to any appreciable extent, to the contrary, due to the special method of folding employed in our inserting and handling apparatus upon their removal from the carrier, the paper slips and the sheet-like articles will automatically return to a smooth and substantially flat condition in which the articles may be readily handled, read and reinserted into another carrier, if desired.

Moreover, the apparatus embodying the principles of the invention is very simple and may be readily manufactured on a commercial and industrial scale at a low price.

Although the present invention has been described in connection with a few preferred embodiments thereof, many variations and modifications may be resorted to by those skilled in the art without departing from the principles of the present invention. Obviously, the utility of the present invention is not limited to pneumatic tube systems, but the invention may be used at an advantage in any field where sheet-like articles have to be handled and to be inserted into containers. We consider all of these variations and modifications as within the true spirit and scope of the present invention as disclosed in the present description and defined by the appended claims.

We claim:—

1. In a device for handling sheet-like articles, the combination comprising a rotatable cam, an actuating lever having a roller at one end thereof engaging the circumference of said cam, an actuating shaft connected to said lever, a fork-like winding member having a pair of prongs operatively associated with said actuating shaft and adapted to be rotated when said roller and said actuating lever are displaced by said cam, a stationary hollow cylinder having a pair of diametrically opposite slots on the circumference thereof surrounding said fork-like member and adapted to co-operate therewith to wind up a sheet-like article inserted through said slots in-between said prongs, and means for driving said cam.

2. In a device for handling sheet-like articles, the combination comprising a cam rotatably mounted on a cam shaft, an actuating lever having a roller at one end thereof engaging the circumference of said cam, an actuating shaft connected to said lever, resilient means imparting a rotational force to said actuating shaft, a fork-like winding member having a pair of prongs operatively associated with said actuating shaft and adapted to be rotated when said roller and said actuating lever are displaced by said cam, a stationary cylinder having a pair of diametrically opposite slots in the circumference thereof surrounding said fork-like member and adapted to co-operate therewith to wind up a sheet-like article, a crank rigidly mounted on said cam shaft, means actuated by said crank to axially displace said fork-like member for inserting said wound up article into a container and means for driving said cam and said crank.

3. In a device for handling sheet-like articles, the combination comprising a fork-like winding member adapted to be independently displaced in angular and in axial direction, a cylindrical winding member surrounding said fork-like member and adapted to co-operate therewith to

wind up a sheet-like article when said fork-like member is rotated, means for displacing said fork-like member in the angular direction for winding up said sheet-like article, means for displacing said fork-like member in the axial direction to insert the wound up article into a container, a common driving means for said displacing means, and a lost motion device for delaying said axial displacement until the angular winding displacement is substantially completed.

4. In a device for handling sheet-like articles, the combination comprising a fork-like winding member adapted to be independently displaced in angular and in axial direction, a cylindrical winding member having a pair of longitudinally extending slots surrounding said fork-like member and adapted to co-operate therewith to wind up a sheet-like article, means including a cam and an actuating lever for displacing said fork-like member in the angular direction to wind up said sheet-like article, means including a crank and a lost motion device for displacing said fork-like member in the axial direction and to insert the wound up article into a container, driving means in common for said cam and said crank, manually operative elements for starting said driving means, and means for automatically stopping said driving means after said article has been inserted and said fork-like member has been returned into its normal position of rest.

5. In a device for handling sheet-like articles, the combination comprising a fork-like winding member having a pair of prongs and adapted to be independently displaced in angular and in axial direction, a stationary cylindrical member having a pair of longitudinally extending slots surrounding said fork-like member, said slots and the recess between said prongs being in registering position in the normal position of rest, means for guiding the insertion of a sheet-like article through said slots in between the prongs of said fork-like member, means for limiting the depth of inserting said sheet-like article so that substantially the central portion of said article is engaged by said fork-like member, means including a cam for moving said fork-like member in angular direction to wind up said article to an S-like shape, means including a crank for moving said fork-like member in an axial direction to insert the wound up article into a carrier, and driving means in common for said angular and said axial moving means.

6. In a device for handling sheet-like articles, the combination comprising a rotatably mounted cam having a quickly ascending portion and a slowly descending portion, an actuating lever having a roller at one end thereof engaging the circumference of said cam, an actuating shaft connected to said lever, a gear train associated with said shaft, a winding shaft having a key-way extending along the full length thereof adapted to co-operate with a key in one of the gears of said gear train to drive said winding shaft and to permit displacements thereof in axial direction, a fork-like winding member on said winding shaft, a stationary winding member cooperating with said fork-like member, means for rotating said cam, and means for axially displacing said winding shaft whereby said winding shaft and said fork-like member thereon will be quickly rotated in one direction by the quickly ascending portion of said cam to wind up a sheet-like article, and said fork-like member is slowly rotated in the opposite direc-

tion and is returned into its normal position of rest after said wound up sheet-like article has been inserted into a container by the axial displacement of said fork-like member.

5 7. In a device for handling sheet-like articles, the combination comprising a fork-like winding member adapted to be independently displaced in angular and in axial direction, a cylindrical winding member surrounding said fork-like
10 member and adapted to co-operate therewith to wind up a sheet-like article, cam-controlled means for rotating said fork-like member in one direction to wind up said sheet-like article prior to an inserting operation and in the opposite
15 direction to return said fork-like member into its normal position of rest after the inserting operation, crank-controlled means for axially displacing said fork-like member to insert said wound up article into a carrier, driving means
20 in common for said cam and crank-controlled means, and means including lost motion devices for maintaining predetermined time relationship between said angular and axial displacements.

8. The method of inserting sheet-like articles
25 into cylindrical containers which comprises engaging the central portion of a sheet-like article substantially without deforming said engaged portion, subjecting said engaged central portion to rotational displacement, slideably confining
30 the ends of said article to a cylindrical surface to wind up same into an S-like shape, displacing said wound up article in axial direction into a container forming a continuation of said cylindrical surface at the same time maintaining said
35 rotational displacement, discontinuing said rotational displacement after said wound up article has been transferred into said container, and subsequently disengaging said article.

9. The method of inserting sheets into containers which comprises slideably engaging the central portion of a sheet in two lines substantially equidistantly from the center thereof, subjecting said engaged central portion to rotary displacement, slideably confining the ends
5 of said sheet to a cylindrical surface to loosely wind up said sheet into an S-like shape without permanently deforming the same, displacing said wound up sheet in axial direction into a container forming a continuation of said cylindrical
10 surface at the same time maintaining said rotational displacement, discontinuing said rotational displacement after said wound up article has been transferred into said container, and
15 subsequently disengaging said article.

10. The method of inserting sheets into cylindrical containers which comprises engaging the central portion of a sheet, subjecting said engaged central portion to rotational displacement,
20 slideably confining the ends of said sheet to a cylindrical surface to loosely wind up said sheet into an S-like shape without permanently deforming the same, displacing said loosely wound sheet in axial direction into a container forming
25 a continuation of said cylindrical surface at the same time maintaining said rotational displacement, discontinuing said rotational displacement after said wound up sheet has been transferred into said container, and subsequently disengag-
30 ing said central portion whereby said sheet will be released and will be retained in said container by its resilient pressure against the inner walls of said container.

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