March 29, 1960 A. RITSCHER 2,930,294

DEVICE FOR FOLDING SLIDING BOXES FOR PACKAGE RECEPTACLES

Filed May 23, 1956 4 Sheets-Sheet 1

Fig. 1

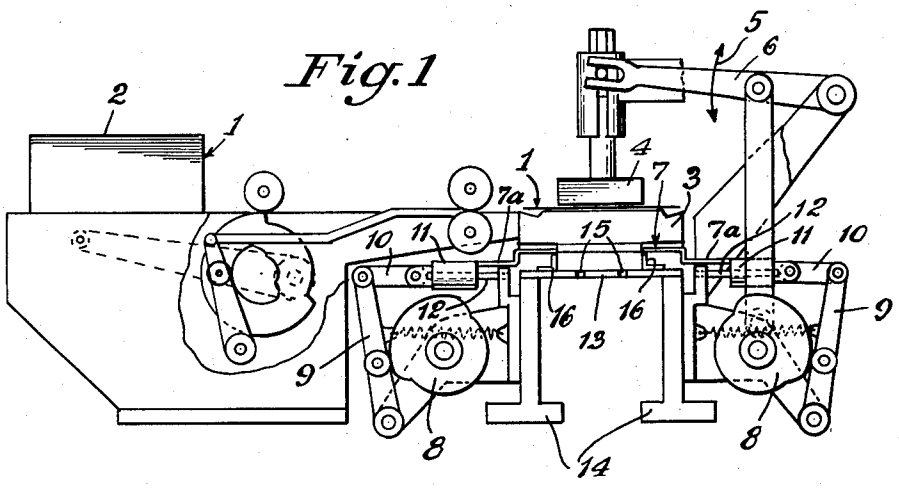

Fig. 2

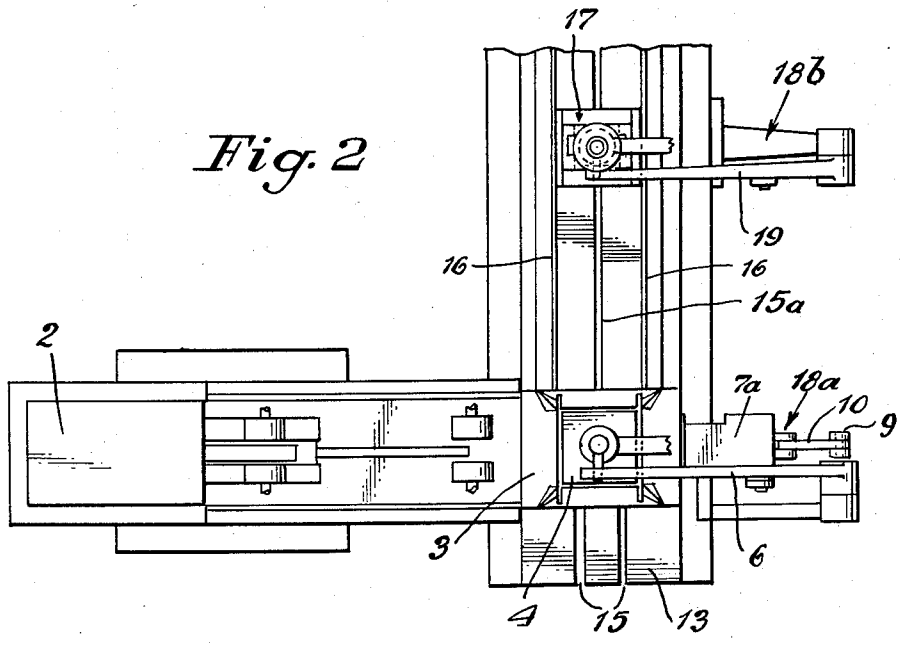

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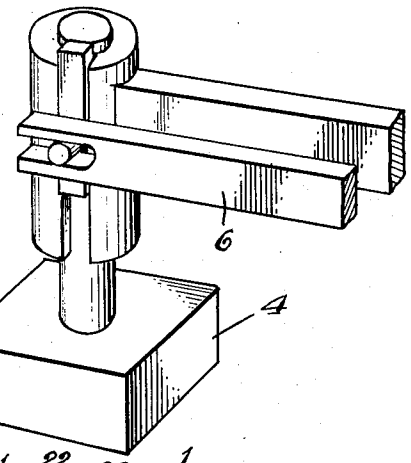
Fig. 3



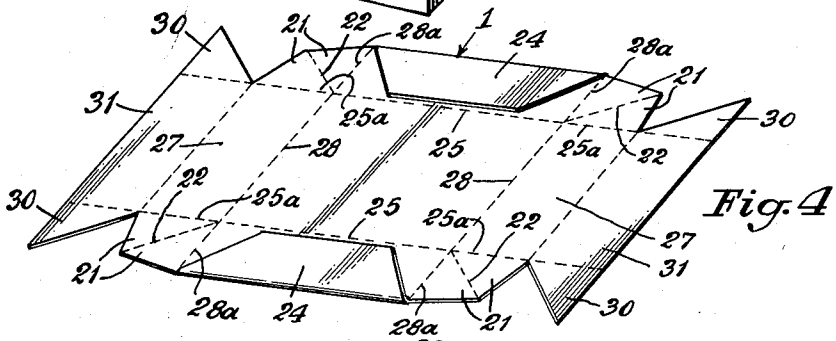


Fig. 4

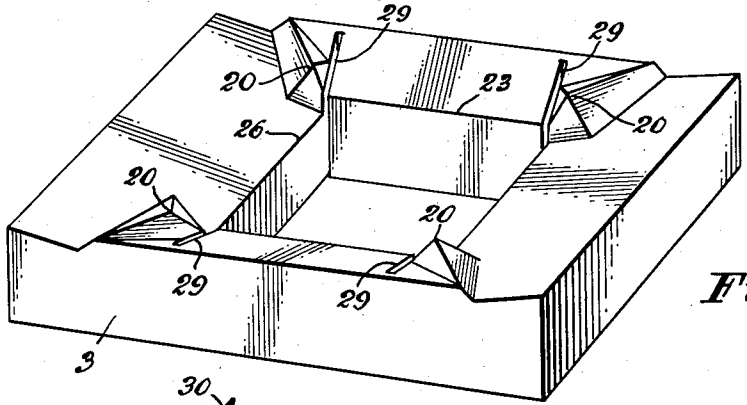


Fig. 5

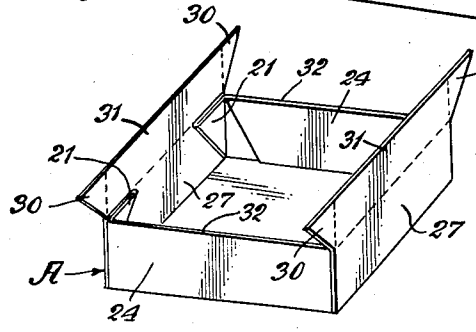


Fig. 6

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DEVICE FOR FOLDING SLIDING BOXES FOR PACKAGE RECEPTACLES

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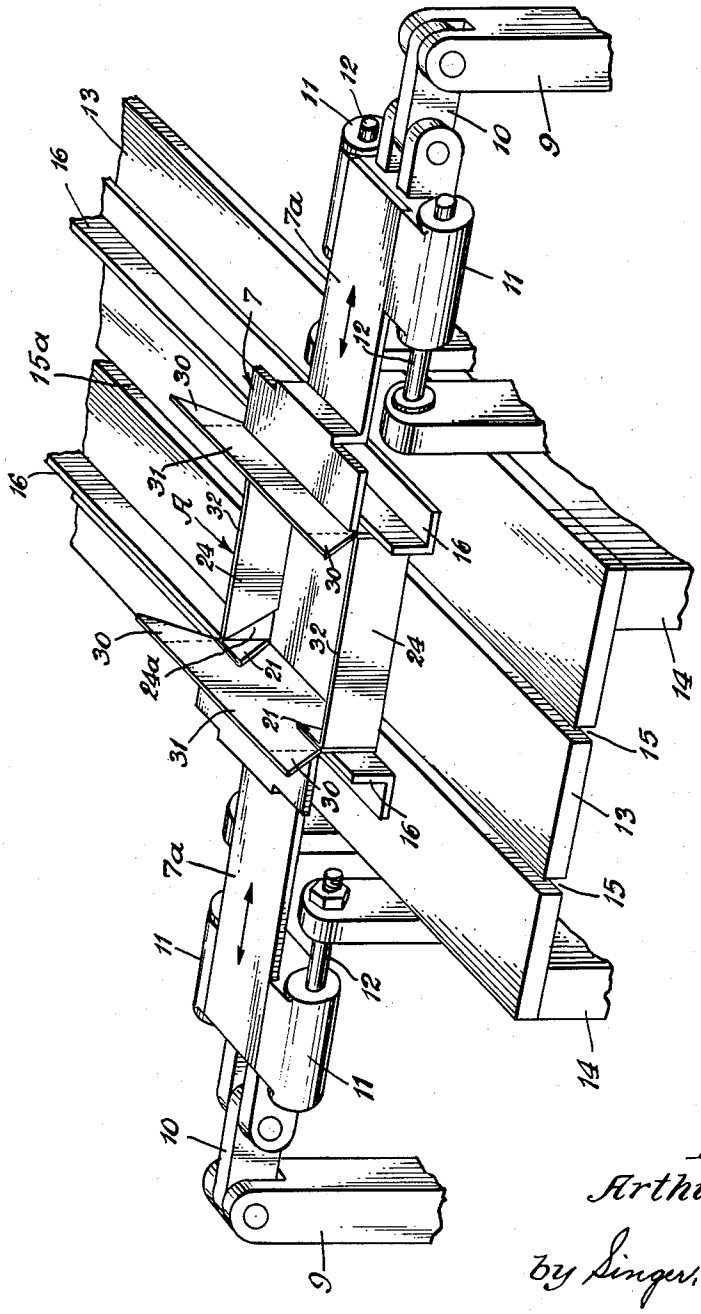

Fig. 7

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DEVICE FOR FOLDING SLIDING BOXES FOR PACKAGE RECEPTACLES

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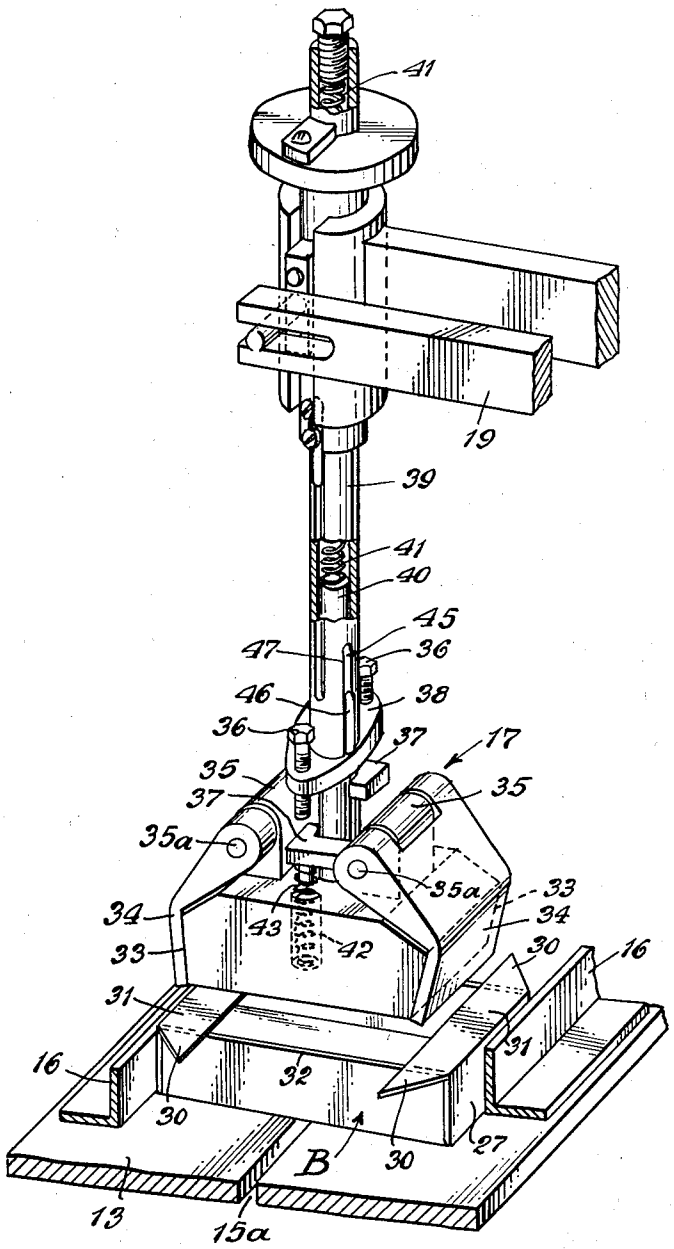

Fig. 8

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DEVICE FOR FOLDING SLIDING BOXES FOR PACKAGE RECEPTACLES

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Application May 23, 1956, Serial No. 586,717

Claims priority, application Germany May 27, 1955

4 Claims. (Cl. 93—51)

This invention relates to the fabrication of sliding boxes for package receptacles in general, and more particularly to an improved method and device for performing the folding operations of sliding boxes used in package receptacles for packaging items such as cigarettes, or the like.

A general object of the invention is to provide an improved device for rapidly accomplishing the folding operations for sliding boxes of package receptacles.

Another object is to provide an improved method of fabricating a sliding box.

Still a further object is to provide an improved die shape which will rapidly effect the folding of a sliding box.

Yet a further object is to associate beneath a die a forming device which will effect a further folding operation subsequent to the punching of a blank through the die.

Another object is to provide an improved construction for a punch such that effective folding of a sliding box may be accomplished.

An ancillary object of the invention is to provide an improved punch and die construction such that the folding of different size boxes may be accomplished upon the same forming machine.

Yet a further object of the invention is to provide an improved die so configured that different folding operations are carried out at different levels as the punch moves within the die.

In the prior art there are numerous devices known for producing the sliding parts of push boxes, or package receptacles wherein during opening one part of the receptacle is pushed relative to another part. Thus it has been known to remove a blank from a stack of such blanks and place the same upon a conveying band. As the blank is moved along the conveying band, the article to be packed is supplied. Such an article may be a pack of cigarettes or a similar item. Following this step, the outer parts of the blank are bent over at different operational stations along the conveyor band enclosing the cigarette pack and forming the sliding part of the finished box. This method of forming the sliding push box part has several disadvantages. One of these disadvantages is that the cigarette block may often be damaged during the processing at the different stations, particularly when any disturbances occur. In addition, such a folded sliding of the box does not have a sufficient inherent support by itself, since the side, bottom and head parts of the sliding part are only folded about the cigarette pack and are not connected with each other in any manner, for instance by a glued connection.

It has also been known in the art to take the blank of the sliding part, and fold the same at several folding stations to form the completed sliding part prior to the insertion of the cigarette block into the same. For instance, at one station the side portions of the blank are folded by means of a cooperating punch and die. Following this operation of folding the side parts, specially designed devices, independent of the aforesaid punch,

begin the folding of the end parts of the sliding box. At a subsequent station extension flaps provided at the ends of the sliding part are folded into the inside of the sliding box by means of a rotating flap, or forming bar. Since this rotating flap must extend at an angle from the respective end parts of the sliding box, it must be adjusted to be able to be thrust inside of the sliding box, and this necessitates a complicated design of the particular rotating flaps and forming bar.

In accordance with the present invention, the corner parts of the blank are first folded. These corner parts of the blank connect the side parts with the opposite end parts of the box. Subsequently, in consecutive manner, the side and end parts are bent over to form a prefolded sliding part in a single operational step. This is accomplished by pressing a punch through a die. This result is attained by positioning the corners and the edges of the die, which bring about the folding of the several portions of the sliding box, at different levels, so that the parts of the blank are pressed for folding in the correct sequence, as will be described later on.

A further feature of the present invention is the special design of the punch used in the second operational step for folding over the extended end parts into the inside of the preshaped sliding box. In accordance with the present invention, this punch is substantially reduced in cross-sectional area, and the end parts thereof which face the ends parts of the sliding box have side surfaces which are inclined. The reduction of cross-sectional area is rather substantial, and it is much smaller than the internal cross-sectional area of the sliding box. In front of the side surfaces of the punch are hinged forming flaps, which become operative only after the bottom surface of the punch reaches the inner bottom surface of the sliding box. When this occurs, the respective forming flaps will move away from the side surfaces of the punch, and will press the extended end parts of the blank against the inner surfaces of the end parts of the blank, and will thus terminate the folding of the sliding box. Prior to the return movement of the punch to its original starting position, the forming flaps will be returned so as to lie immediately adjacent to the side surfaces of the punch, so that the punch may be easily removed, without obstruction, from the interior of the completely folded sliding box.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings, which show one embodiment of the present invention. Only those parts are illustrated, which are directly engaged in the folding operations, and the driving means for the individual parts of the arrangement are only partly shown. In the drawings:

Fig. 1 illustrates somewhat schematically a side view of the inventive arrangement;

Fig. 2 illustrates a plan view of Fig. 1, and in addition shows the second folding station;

Fig. 3 shows a perspective view of the punch;

Fig. 4 illustrates a perspective view of the blank which is used in the folding operations;

Fig. 5 shows the configuration of the die in perspective;

Fig. 6 illustrates, in perspective, the prefolded sliding box;

Fig. 7 illustrates, in perspective, the folding operations performed on the blank after the completion of the movement of the punch through the die of Fig. 5, the forming device of Fig. 7 being disposed below the die; and,

Fig. 8 illustrates in perspective the punch of the second operational station, which folds the end parts interiorly within the sliding box, thereby completing the folding operations.

Referring to the drawings, and more particularly to Figs. 1 and 2 thereof, the reference numeral **1** designates a blank, which is removed from a stack **2** of such blanks, and transported by known conveying means to a prefolding operational station **18***a*. As shown in Figs. 1 and 2 the blank **1** is deposited upon the surface of a matrix, or die **3**, the configuration of which is more clearly apparent from an inspection of Fig. 5 of the drawings.

The blank **1** has a special shape, as seen in Fig. 4. The punch **4**, as shown in Figs. 1 and 3, is employed for pushing the blank **1** through the die **3**, as shown in Fig. 5. The vertical reciprocating motion of the punch **4**, as indicated by an arrow **5** in Fig. 1, may be brought about in known manner by a cam-operated lever **6**. Beneath the matrix **3** is disposed a thrust, or forming device **7**, as more clearly shown in Fig. 7, which performs a subsequent folding operation upon the prefolded part "A," shown in Fig. 6, which results from completion of the movement of the punch **4** through the die **3**. The forming plates **7***a* of the forming device **7** are reciprocated in the direction indicated in Fig. 7 by means of rotatable cams **8**, cam-follower arms **9** and links **10**. Cylindrical guide supports **11**, movable upon guide rods **12** stationarily mounted, serve to control the motion of the forming plates **7***a*. The base plate **13** (Fig. 7), for the sliding box parts "B," is supported upon a supporting frame **14** (Fig. 1). The base plate **13** is provided with openings **15** and **15***a*, as shown more clearly in Fig. 2, which accommodate carrier elements, not shown, the latter transporting the sliding box part "B" from the first operating station **18***a* to the second operating station **18***b*.

Lateral guides **16**, shown more clearly in Figs. 1 and 7, are employed for directing movement of the sliding box parts "B." An additional punch, generally designated by the reference numeral **17**, and shown more clearly in Figs. 2 and 8 is associated with the second operating station **18***b*, and completes the folding operations. Its use results in the finished sliding box, as partly shown in Fig. 8. The vertical reciprocating motion of the second punch **17** may be obtained in the same manner as in the case of the first punch **4**, shown in Fig. 1.

In accordance with the present invention, the operational steps of the arrangement are as follows; the blank **1** is disposed upon the matrix, or die **3** and is pressed therein by the thrusting motion of the punch **4** into the die **3**. The blank **1** is consecutively folded as follows: First the bending corners, or ridges **20** of the die **3** (Fig. 5) effect folding of the corner parts **21** of the blank **1** (Fig. 4) along the scoring lines **22** provided in the blank. During this step the corner parts **21** are bent over the folding lines **25***a* and **28***a*, as shown in Fig. 4. The foregoing effects a preliminary bending, or folding of the blank **1**. As the punch **4** moves further into the die **3**, the edges **23** of the die effect bending of the side parts **24** of the blank **1** along the folding lines **25** provided in the blank **1**. Finally the edges **26** of the die **3** come into play, and effect a folding of the end parts **27** of the box along the bending, or folding lines **28**, as shown in Fig. 4. To bring about the foregoing consecutive operational folding steps, preferably the bending ridges **20**, and the folding edges **23** of the die **3** are disposed in different planes, or levels at different heights in such a manner that the distance from the horizontal plane of the bending ridges **20** to the next lower plane of the bending edges **23** is nearly equal to the distance from the last-mentioned plane of the edges **23** to the lowermost plane associated with the folding edges **26**.

At the interior edges of the matrix **3** are provided through slots **29**, shown in Fig. 5, which permit the ready passage of corner portions **30** of the extended parts **31** of the prefolded part "A," shown in Fig. 6, through the die **3**. As illustrated in Figs. 5 and 6, the distance across the corners **30** of the extended portions **31** of the prefolded box "A" is greater than the lateral width of said box "A."

By the continued movement of the punch **4** through the matrix **3**, the side parts **24** and the end parts **27** will be folded over their respective folding lines **25** and **28** by 90°, with the result that the prefolded sliding box "A," shown in Fig. 6, will be forced below the die **3**. The folded-over corner parts **21** will then lie along the inner end surfaces **27** of the prefolded box, as shown in Fig. 6.

As mentioned above, and as shown in Fig. 1, the forming device **7** is disposed immediately beneath the die **3** and comes into operation after the prefolded box "A" is pushed by the punch **4** through the die **3**. The forming plates **7***a* of the forming device **7** move inwardly, as illustrated in Fig. 7, and effect the folding of the extended end parts **31** by 90°, so that they lie over the edges **32** of the side parts **24** of the prefolded box "B." Reference may be had to Fig. 8 in this connection. Thus the prefolded box "B" is different from the prefolded box "A" by the inward folding of the end extensions **31**.

Upon completion of the operational step performed by the forming device **7**, the prefolded sliding box "B" is conveyed, by means well known in the art operating through the slot **15***a* of Fig. 8, to the second operation station **18***b*. Hence, there is provided a second punch **17** of special construction, which completes the folding operations upon the sliding box.

With particular reference to Fig. 8, it will be noted that the side surfaces **33** of the punch **17**, which face the end parts **27** of the prefolded box "B," are inclined relative to the bottom surface of the punch. In addition, rotatable pressing flaps **34** are provided over said side surfaces **33**, which pressing flaps are supported on the punch **17** by means of boss supports **35** and pivot pins **35***a*. The external dimensions of the punch **17**, with the pressing flaps **34** bearing upon the side surfaces **33** of the punch, are substantially smaller than the internal dimensions of the prefolded sliding part "B." Upon the downward movement of the punch **17**, first the extended end parts **31** are pressed inside of the prefolded sliding box "B." At the moment when the bottom surface of the punch **17** reaches a bottom inside surface of the sliding part "B," the abutment screws **36** (Fig. 8) strike the actuating arms **37** secured to the rotatable pressing flaps **34**.

The aforementioned abutment screws **36** are adjustably supported on a base **38**, and the base **38** is secured to a hollow thrust rod **39**. The punch **17** itself is secured to a solid thrust rod **40**. The thrust rod **40** is slidably movable within the lower part of the hollow thrust rod **39**, having a lost-motion connection **45** therewith. A laterally projecting lug **46**, secured to the thrust rod **40**, is slidably movable within a slot **47**, provided in a side wall of the hollow thrust rod **39**, thereby providing the aforesaid lost-motion connection **45**. A biasing compression spring **41** is disposed interiorly within the hollow thrust rod **39**, having its lower end seating upon the top of the thrust rod **40**, and having its upper end bearing against an adjustable stop, which is secured to, and movable with, the hollow thrust rod **39**. The tension of the spring **41** can, therefore, be adjusted.

As mentioned previously, when the bottom surface of the thrust piston **17** reaches the inner bottom surface of the prefolded sliding part "B," continued downward movement of the hollow thrust rod **39** will cause the thrust rod **40** to move upwardly within the hollow thrust rod **39**, thereby compressing the spring **41** and giving up the lost-motion **45**. At the same time the abutment screws **36** strike the actuating arms **37** and cause rotation of the pressing flaps **34** around their axes **35***a*. As a result, the pressing flaps **34** move away from the side surfaces **33** of the punch **17**, and press the extended end parts **31** strongly against the inside surfaces of end parts **27**. Because of the inclined positioning of the end surfaces **33** of the punch **17**, the pressing flaps **34**, in their

pressed position, will be parallel to the plane of the end parts 27 and 31. The corners 30 of the extended end parts 31 will then extend into the recesses 38 (Fig. 7) of the side parts 24. Following the final folding operation of the sliding box, the hollow thrust rod 39 is then raised by an operating arm 19 to its original position.

During the upward return stroke of the thrust piston, or punch 17, the compression springs 43, disposed in recesses 42 of the punch 17, will effect retracting, rotatable movement of the pressing flaps 34, so that they will again bear against the side surfaces 33 of the thrust piston 17. At the same time the tension of the compression spring 41 is relaxed, the lost-motion 45 taken up, and the lower end of the slot 47 will engage lug 46. When this occurs, the hollow thrust rod 39 and the solid thrust rod 40 will move upwardly together as a unit. Thus the punch 17 will be withdrawn upwardly out of the interior of the finished sliding box.

It will be noted that since the number of operational steps in the aforesaid method of fabricating sliding boxes is reduced to a minimum, the method and construction of the device is readily adaptable to the economical manufacture of large quantities of sliding push boxes for packaging items. The described construction can be a part of a production machine for the manufacturing of sliding parts for push boxes. In addition, it can also be used as an auxiliary apparatus for conventional packing machines, and in the connection it will be observed that without any complications, it is possible to adapt the packing machine for different size boxes by merely changing only the punch and die sizes, with the remaining portion of the packing machine being used without change. Simplification is thereby achieved.

From the foregoing description it will be apparent that I have provided an improved method, and structure for carrying out that method, in machines for performing the folding operations in the fabrication of sliding push boxes for the packaging of items, such as cigarettes or the like. The number of parts employed are a minimum, and the arrangement adaptable for high-speed quantity production. Different size boxes may be made on the same machine by merely changing the punch and die shapes. And most importantly, by the proper carrying out of the folding operations in consecutive order, the folding operations are speeded up and considerably simplified.

Although I have shown and described a particular method, and structure for carrying out that method, it is to be understood that the same was merely for the purpose of illustration, and that changes and modifications may readily be made therein by those skilled in the art, without departing from the spirit and scope of the invention.

What I claim as my invention is:

1. A folding device for folding the parts of a sliding push box having folded corner portions, a bottom, side walls and end walls out of a single blank including a die, a punch cooperating with said die and movable therewithin, means for positioning a single blank upon said die, means for forcing said punch within said die to press said blank therewithin, means providing one or more side folding edges upon said die to effect folding of said blank, a forming device, means positioning said forming device beneath said die, said forming device including means for effecting lateral inward folding of extended end wall portions of said blank over the upper side edges of said push box to form a prefolded box, a second punch, means conveying said prefolded box beneath said second punch, and means moving said second punch interiorly within said prefolded box to press said extended end wall portions of said blank against the end walls of the finished push box.

2. A folding device according to claim 1, wherein a pair of rotatable pressing flaps are associated with said second punch being separable from the side surfaces thereof.

3. A pressing punch for effecting the interior folding of end flaps associated with a folding box including a hollow thrust rod, a thrust rod disposed interiorly of said hollow thrust rod, means securing the second said thrust rod to said pressing punch, means providing a lost-motion connection between said hollow thrust rod and said interiorly disposed thrust rod, spring means for biasing said pressing punch away from said hollow thrust rod, a pair of pressing flaps, means rotatably supporting said pair of pressing flaps upon said pressing punch, and means movable with the hollow thrust rod for effecting rotatable movement of said pair of pressing flaps outwardly when said pressing punch has contacted the inner bottom surface of said folding box.

4. A pressing punch according to claim 3, wherein the side surfaces of said pressing punch, upon which said pressing flaps bear, are inclined outwardly in a direction toward the open end of said folding box.

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