Jan. 1, 1952 G. B. SAYRE ET AL 2,580,846

MACHINE FOR FOLDING CARTON INSERTS

Filed May 14, 1947 3 Sheets-Sheet 1

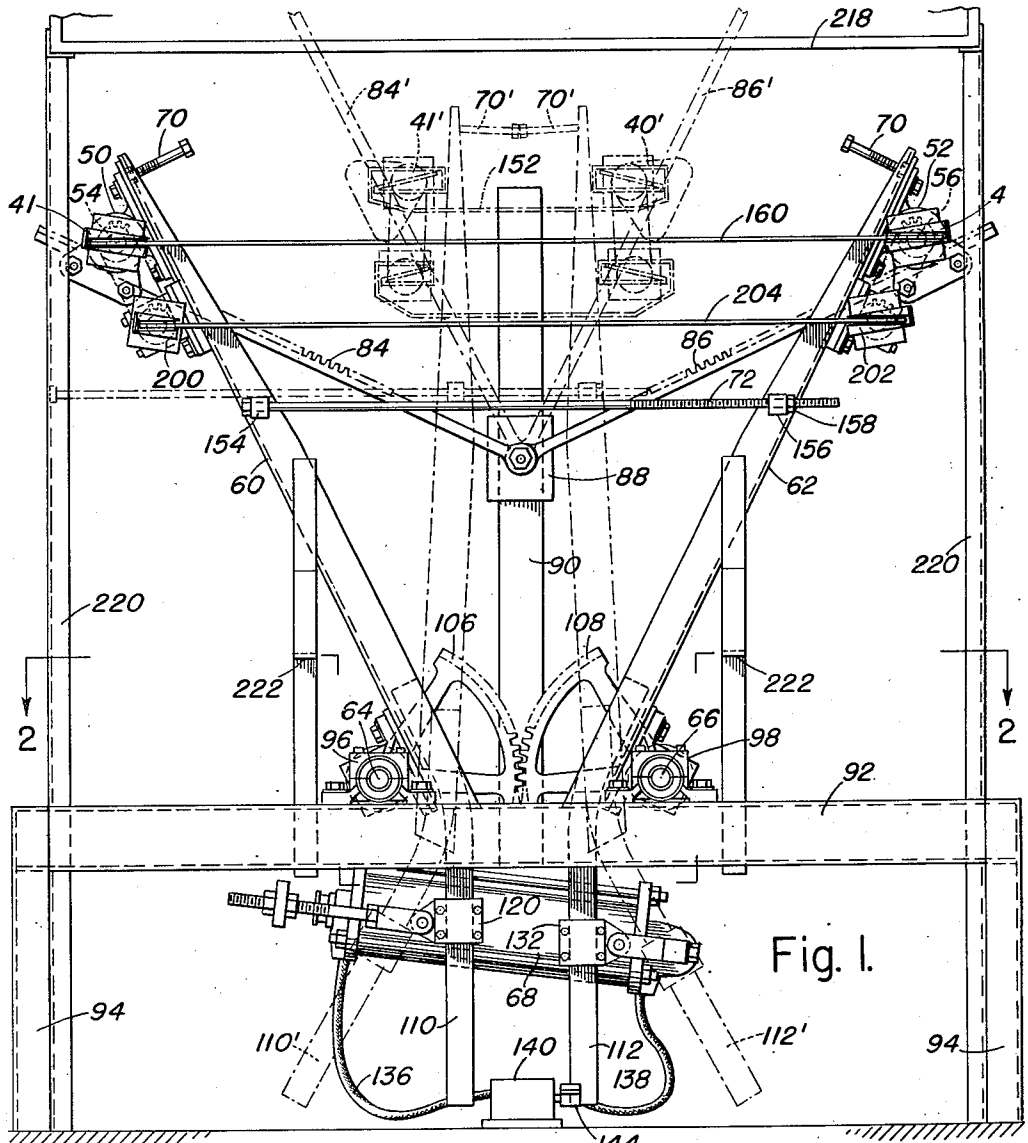


Fig. 1.

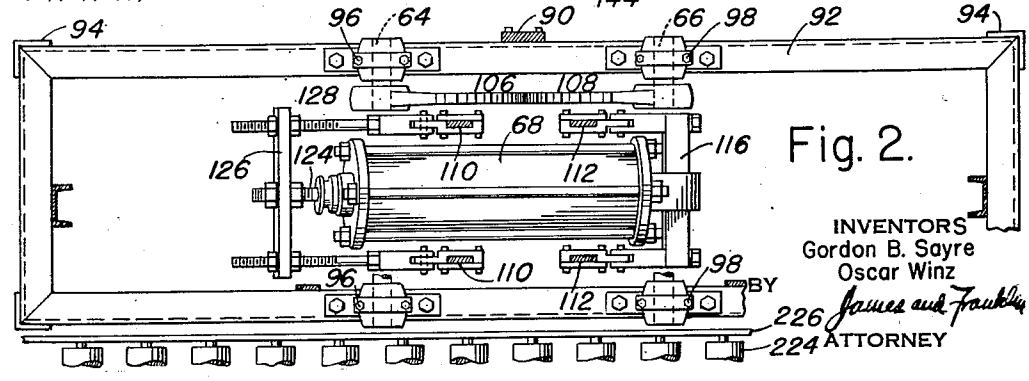


Fig. 2.

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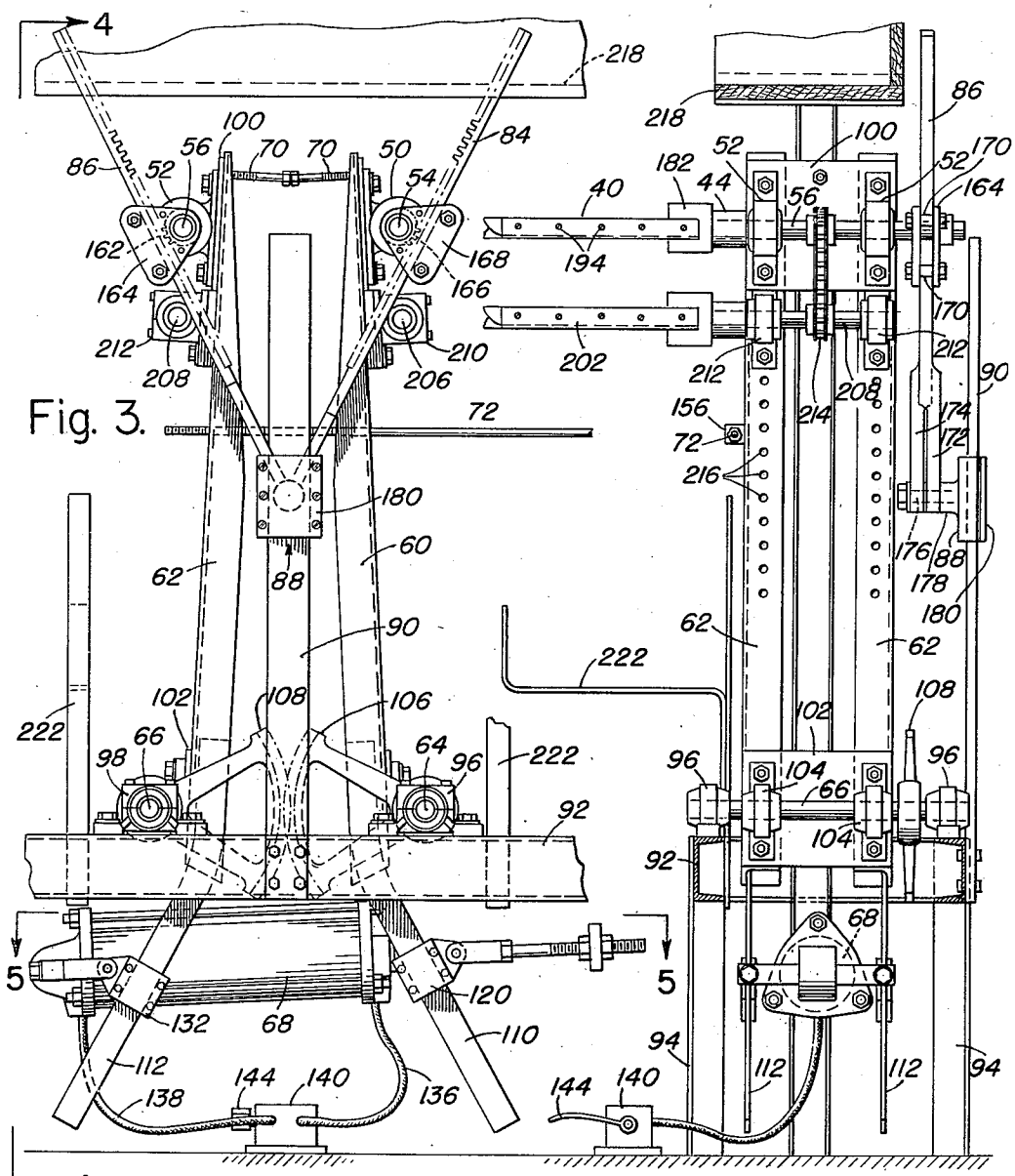


Fig. 3.

Fig. 4.

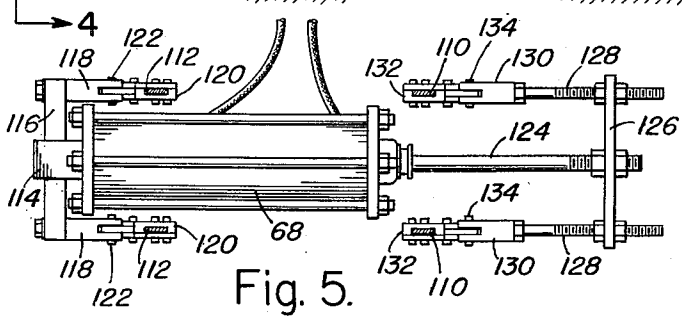


Fig. 5.

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MACHINE FOR FOLDING CARTON INSERTS

Filed May 14, 1947 3 Sheets-Sheet 3

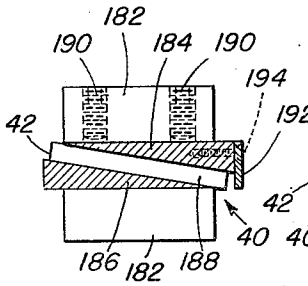


Fig. 6.

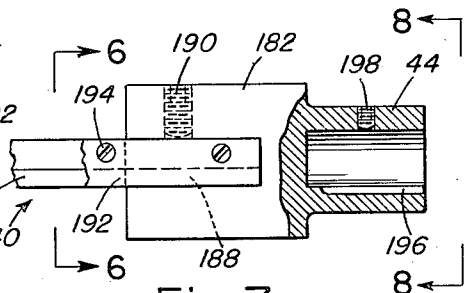


Fig. 7.

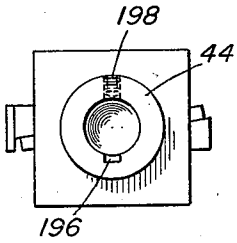


Fig. 8.

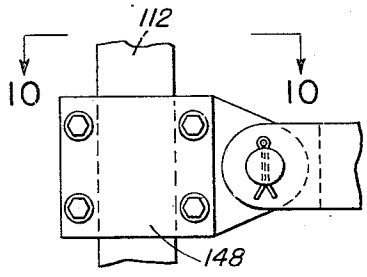


Fig. 9.

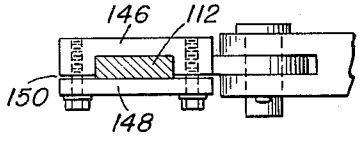


Fig. 10.

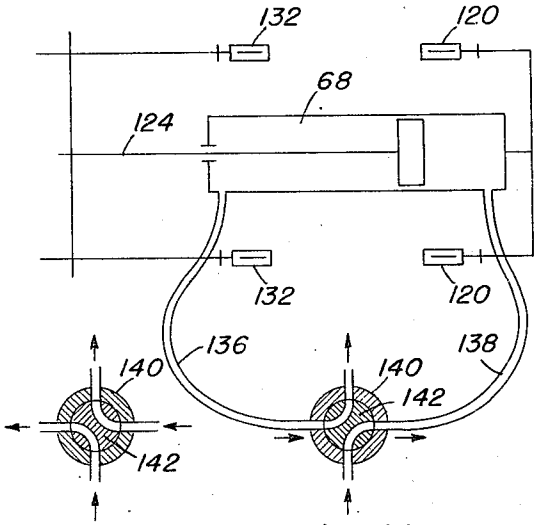


Fig. 11a

Fig. 11.

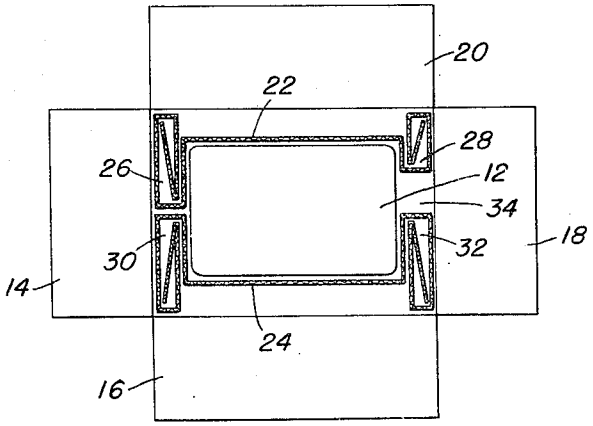


Fig. 12.

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UNITED STATES PATENT OFFICE

2,580,846

MACHINE FOR FOLDING CARTON INSERTS

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Application May 14, 1947, Serial No. 748,062

23 Claims. (Cl. 93—1)

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This invention relates to the folding of inserts for cartons, and more particularly to apparatus for that purpose.

The primary object of the invention is to generally improve the operation of packaging articles in cartons having folded inserts. A more particular object is to expedite and speed up the folding of the insert blanks, and to minimize the labor required for that purpose. From this viewpoint the object of the invention is to provide a machine for folding insert blanks.

More specific objects of the invention are to provide such a machine which is adapted to fold inserts for use in cartons of different size; which is adapted to fold inserts having folded ends of different shape or size; which is adapted to fold inserts having a different number of folds of material at the ends; and which is adapted to fold an insert having a folded end of one size at one end, and of different size at the other end.

The inserts are usually employed in pairs. Thus vertical inserts may be used at the front and back of a carton on each side of the article being protected. In accordance with a further feature and object of the present invention, a single machine is arranged to simultaneously fold two inserts, so that they may be slid into position on opposite sides of the carton by a single operator. An ancillary object is to make it possible to fold the two inserts in a single operation of the machine, even though the inserts may differ somewhat in dimension.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, our invention resides in the apparatus for folding carton inserts and the elements thereof, and their relation one to another, as are hereinafter described in the following specification. The specification is accompanied by drawings, in which:

Fig. 1 is a front elevation of a machine embodying features of our invention;

Fig. 2 is a horizontal view taken approximately in the plane of the line 2—2 of Fig. 1;

Fig. 3 is a rear elevation of the machine;

Fig. 4 is a side elevation taken approximately in the plane of the line 4—4 of Fig. 3;

Fig. 5 is a horizontal view taken approximately in the plane of the line 5—5 of Fig. 3;

Fig. 6 is a transverse section through a form used to fold an end of the insert blank, this section being taken approximately in the plane of the line 6—6 of Fig. 7;

Fig. 7 is a partially sectioned elevation of the form;

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Fig. 8 is an end view of the form;

Fig. 9 is explanatory of a detail of a clamp connection, drawn to enlarged scale;

Fig. 10 is a section taken approximately in the plane of the line 10—10 of Fig. 9;

Figs. 11 and 11*a* are diagrammatic views of the pneumatic means for operating the machine; and

Fig. 12 is a plan view of a carton showing the folded inserts in position.

Referring to the drawings, and more particularly to Fig. 12, an article, in this case, a molded plastic cabinet 12 for a small radio receiver, is packaged in a suitable heavy cardboard carton, the open top of which is later closed by means of the four flaps 14, 16, 18 and 20. The article 12 is spaced from the bottom of the carton by means of a suitable insert, not shown. It is spaced from the side walls of the carton by means of two folded inserts 22 and 24. These are made of blanks, the ends of which are rolled up to form spacers 26, 28, 30 and 32. These spacers not only cushion the article against lateral movement within the carton, but also act as columns to strengthen the carton against compression from top to bottom. In fact, a heavy man can stand on the completed carton without crushing it, and without injuring the article protected thereby (it being understood that a suitable top insert or spacer is placed at the top of the carton before sealing the flaps to close the carton). For purposes of clarity in the drawing, space has been shown around the article 12, and additional space has been shown between the folds of the inserts and between the inserts and the carton, but in actual practice all of these parts fit very snugly together. In fact, it is customary to place the article in the carton (on a bottom insert), before attempting to slide the inserts 22 and 24 into the carton, for the parts fit so snugly that the slight taper of the article 12 makes it easier to slide the inserts around the article than to slide the article between the inserts.

In Fig. 12 it may be noted that the column 28 is narrower than the columns 26, 30 and 32. The columns 26 and 30 are in this case designed to snugly fill the full width of the carton, but the column 28 is narrowed in order to provide a space 34 between the columns 28 and 32. This space is used to receive the folded power supply cord, or so-called "hank" of the radio receiver. This same problem might arise in connection with the packaging of substantially all electrical appliances.

Each insert is made up of a long blank of heavy cardboard having a corrugated filler, the said

blank being cut to proper dimension, and being scored in advance at the proper fold lines. Stacks of these blanks in flat condition are shipped to the manufacturer of the article separately from the cartons. At the manufacturer the blanks are folded up by hand, and slid into the carton around the article as previously described. These inserts have been very troublesome to fold and handle. It is usually necessary to have three employees at the folding station, two of whom fold the blank and hold it long enough for the third to seize the folded blank and slide it into the carton. It should be understood that the resilience of the material is such that it tends rather forcibly to unroll as soon as it has been folded. In fact, the security and strength, and cushioning action of the completed carton, depends to a considerable extent on the continuous tendency of the insert to unfold, and while this is desirable in the packaged carton, it makes the packaging operation itself a troublesome one. For example, it is not possible to roll up the inserts in advance, and to have them available in rolled form. Instead, they must be used immediately after being folded, and cannot be let go for an instant until they have been inserted in the carton, for if either end is accidentally released, it will immediately snap open with considerable force and accompanying noise.

Referring now to Figs. 4, 6, 7 and 8 of the drawing, the apparatus of the present invention includes a form **40** dimensioned to act as a core for the insert. This form has means to hold one end of the blank, and for that purpose is preferably split as indicated at **42**. The form is provided with a hub **44**, so that it may be secured to a shaft, and it will be evident that rotation of the shaft will operate to fold one end of the blank. The mounting of the form on the shaft is preferably a detachable one, so that different forms may be used when changing the article being packaged, for each article may require inserts of different dimension and shape.

Referring now to Fig. 1 of the drawing, the apparatus preferably comprises spaced bearings **50** and **52**, which are mounted for relative movement toward or away from one another. These bearings carry shafts **54** and **56**, which in turn carry the form **40**, and a mating form **41**. It will be understood by comparing the solid-line positions with the broken-line positions **40'**, **41'**, that the bearings, shafts, and forms are moved together as they are rotated, thus compensating for the shortening of the blank as it is folded. In the particular machine here illustrated, the bearings **50** and **52** are carried on arms **60** and **62**, pivoted at **64** and **66**, and actuated by suitable means, in this case, a pneumatic piston and cylinder generally designated **68**. Adjustable stop means **70** limit the minimum spacing between the arms, and adjustable stop means **72** limit the maximum spacing between the arms, depending, of course, on the dimensions of the particular insert being folded.

In accordance with an important feature of the present preferred form of our invention, the shaft **54** is driven by a rack **84**, and the shaft **56** is rotated by a rack **86**, and the inner ends of the racks may be secured at a desired height, thereby placing the racks at a desired angle. This, in turn, determines the number of revolutions of the shafts which will result when the arms change from the maximum spacing shown in solid-lines, to the minimum spacing shown in dotted lines. Such an adjustment is most important, because

in one case the folded ends may be large, yet have a small number of folds, and in another case the folded ends may be small, yet have a larger number of folds. Hence it is important that the interrelation between the displacement of the shafts and the number of revolutions accompanying that displacement be made highly variable. In the present case, the inner ends of the racks are secured to an anchor block **88**, which may be clamped at any desired point along a vertical post **90**. When the anchor block is secured in lowermost position, there is substantially no rotation of the shafts in response to movement of the arms. When the anchor block **88** is clamped in uppermost position, so that the racks are substantially horizontal, there is a maximum rotation of the shafts in response to movement of the arms.

Considering the apparatus in greater detail, and referring to Figs. 1 through 4, the machine comprises a rectangular, horizontal frame **92**, supported on corner legs **94**, said frame carrying stationary bearings **96** for shaft **64**, and bearings **98** for shaft **66**. The arm **60** previously referred to is in reality a pair of spaced arms carried on shaft **64**, and similarly, the arm **62** is a pair of spaced arms carried on shaft **66**. This is best shown in Fig. 4, in which it will be seen that arms **62**, most simply made of angle iron, are rigidly secured in spaced collateral relation by means of a top plate **100**, and a bottom plate **102**. The bolts which hold the bottom plate **102** may also be used to hold bearings **104**, carried on the fulcrum shaft **66** previously referred to. The bolts which hold the top plate **100** are used to hold the bearings **52** for the shaft **56** previously referred to. It will be understood that the arm **60** like the arm **62**, may be made up of a pair of members rigidly spaced by plates, which also carry the bearings for the shaft **54** and the fulcrum shaft **64**.

To ensure equal movement of the arms, or symmetrical positioning of the arms relative to a vertical center line, the arms are preferably appropriately interconnected. Linkage may be used for this purpose, but in the present case we have employed gear sectors **106** and **108**, the gear sector **106** being secured to the shaft **64**, and the gear sector **108** being secured to the shaft **66**. If the driving force of the machine is applied to one of the arms, the gear sectors should preferably be relatively heavy in design, in order to take the operating load of the machine. When, however, the operating force is applied simultaneously to both arms as in the present case, there is theoretically no load on the gear sectors, and they may be relatively light in design.

To operate the arms **60** and **62**, they are preferably provided with downward extensions, to which the operating force is applied. In the present case the arm **60** has a pair of downward extensions **110**, and the arm **62** has a pair of downward extensions **112**. These are preferably bent relative to the arms **60** and **62**, in order to provide operating room therebetween, as is indicated by the change from the solid-line to the broken-line positions in Fig. 1. Referring now to Fig. 5, it will be seen that the closed end of cylinder **68** is carried on a block **114**, having a cross-bar **116** carrying forked bearings **118** receiving clamps **120** by means of fulcrum pins **122**. The piston rod **124** is threaded at its outer end, and secured by nuts to a crosshead **126**, which in turn is secured by nuts to threaded rods

128. These carry forked bearings 130, which are pivotally connected to clamps 132 by means of pins 134. The clamps 132 are bolted tightly on the extensions 110, while the clamps 120 are bolted tightly on the extensions 112. It will thus be evident that relative movement of the piston and cylinder is applied to the extensions, and thence to the arms 60 and 62.

The piston may be actuated by any suitable fluid medium, which in the present case is compressed air. Referring to Fig. 11, it will be seen that the ends of the cylinder are connected, preferably through flexible pipes 136 and 138, to a conventional four-way valve 140. It will be evident from comparison of the positions of the rotor 142 in Fig. 11 and Fig. 11A that compressed air may be applied to either end of the cylinder, the opposite end then being vented for discharge of air, and that the movement of the linkage, and consequently the arms, is positive in both directions. The pipes 136, 138, and the valve 140 are shown in Figs. 3 and 4, which also show a foot pedal 144 connected to valve 140, by means of which the operator may control the machine while using both hands to apply the flat blank to the machine, or to remove the folded blank from the machine for insertion in the carton.

Referring now to Figs. 9 and 10, it will be seen that the clamp is made up of an inner part 146 dimensioned to fit around the extension 112 of the arm, and an outer plate 148 which is secured to the part 146 by means of four screws. The part 146 is so dimensioned as to provide a clearance at 150 between the parts 146 and 148, in consequence of which the position of the clamp on the extension is rigidly determined. While it is not essential to provide for adjustability of the operating cylinder in a vertical direction, such an adjustment is convenient for two reasons. One is that when the arms are to swing through only a short stroke, the cylinder may be lowered, thus providing greater leverage, and utilizing more of the stroke of the piston. The vertical adjustment is not essential, because another plan would be to employ only a small part of the available piston stroke, but the ability to use a larger part of the stroke is an advantage, as for example when using unusually stiff material for the insert, or when the available fluid pressure is comparatively low.

Another reason the vertical adjustment is desirable will be clear from inspection of Fig. 1 of the drawing, in which it will be seen that the clamp 132 has been fixed at a lower position than the clamp 120. Thus the arm 62 is subjected to a greater torque than the arm 60. This may be done when the folds at one end of the blank differ from those at the other end of the blank, so that the operation at one end constitues a greater load than the operation at the other end. Here again the relative adjustment is a refinement which is not essential, for any difference in load would be taken care of by the meshing gear sectors. However, by taking advantage of the available adjustment, the load on the gear sectors may be reduced to substantially zero.

It has already been mentioned that the inward and outward movement of the arms is limited by adjustable stops. In the present case, the inward movement is limited by stops 70, which come into abutting relationship when the arms move inward as is indicated at 70' in Fig. 1, and at 70 in Fig. 3. Inasmuch as the stops 70 are threaded bolts, the effective length thereof may be varied by changing the position of the nuts at the base of the bolt. For a large change in dimension, the bolts 70 are replaced by other bolts of a different length. However, for small changes such as to adjust the tension of the web portion of the blank extending between the folded ends, the bolts may be adjusted by means of the thread thereon. In Fig. 1 it will be noted that the web portion 152 of the folded blank is somewhat slack, and sags downwardly slightly. The stops 70 are preferably adjusted to produce this effect, in order to facilitate sliding the folded insert from the forms.

The outward movement of the arms is limited in the present case by means of a stop in the form of a threaded link 72 passing through ears 154 and 156, on arms 60 and 62 respectively. It will be understood that the link 72 is slidable through either or both of the ears 154. In the specific form here illustrated, the link 70 is threadedly received in the ear 156, and is locked in adjustment by means of a lock nut 158. The head end of the rod 72 is slidable through the ear 154. This arrangement has the advantage of not subjecting the threaded end of rod 72 to sliding friction. The link 72 is adjusted to such an opening of the arms that the insert blank 160 will just fit between and fill the forms 40 and 41 substantially as shown in Fig. 1 of the drawing.

The mechanism for rotating the forms may be described with reference to Figs. 3 and 4 of the drawing. The form 40 is secured to the forward end of the shaft 56, which is carried in bearings 52. The rear end of shaft 56 carries a pinion 162, and a rack guide 164, which holds the rack 86 in mesh with the pinion 162, the rack guide 164 being freely rotatable about the shaft 56, in order to accommodate changes in the angle of rack 86. In similar fashion the rear end of shaft 54 carries a pinion 166, and a rack guide 168, for the rack 84. The rack guides may, of course, be provided with anti-friction rollers as is indicated at 170 in Fig. 4, on which the straight smooth outer edges of the racks may ride.

The lower ends of the racks are secured to clamp 88, and referring to Fig. 4, it will be seen that the rack 86 is displaced sidewardly at its lower end, as is indicated at 172, while the rack 84 is displaced sidewardly in opposite direction, as is indicated at 174. In this way the lower ends of the rack may be brought into overlapping relation at the pivot 176, held rigidly in a boss 178, on clamp 88. The back plate 180 (Fig. 4) of clamp 88 is held on the remainder of the clamp by means of six screws, best shown in Fig. 3. It will be understood that there is a slight clearance between the front and back parts of the clamp, much as was described in connection with Fig. 10, so that when the screws are tightened the clamp will be locked in position on the post 90. The post 90 is a smooth uniform piece of stock rigidly secured in upright position. In the present case it is simply bolted to the frame 92.

By adjusting the clamp upwardly or downwardly, the exact number of revolutions of the forms may be adjusted. In the case of the carton insert here illustrated, the ends are folded one-and-a-half revolutions. Thus the open limit stop 72 is adjusted to receive the flat blank; the closed limit stop 70 is adjusted to receive the folded blank; and the clamp 88 is then adjusted on post 90 to provide the desired one-and-a-half revolutions of the shafts during the movement of the arms from the open limit position to the closed limit position. It may be mentioned that in the particular design here illustrated, location

of the clamp in uppermost position will result in five revolutions of the shafts, while location of the clamp in lowermost position will result in only a half-revolution of the shafts.

The construction of the forms is best shown in Figs. 4, 6, 7 and 8 of the drawing. In Fig. 4 it will be seen that there are long members the ends of which are received in spaced jaws 182 formed integrally with a hub 44. In Fig. 6 it will be seen that the long core members 184 and 186 are generally triangular in section. At the base end a filler piece 188 of rectangular cross-section is provided between the cores 184 and 186. This filler piece terminates flush with the ends of the jaws 182, and creates the desired slot 42 between the cores. The three superposed parts 184, 186 and 188 are clamped between the jaws 182, as by means of screws 190. However, it will be understood that bolts passing entirely through the opposite jaws may be employed. A thin strip of metal 192 may be secured along one edge of the core 184, as by means of small screws 194. This is not essential, but is very convenient in holding the flat blank against endwise movement in the forms. Thus reverting to Fig. 1, it will be seen that in initial position the strips are on the outer edges of the forms, so that the blank is slid into the forms between the strips. This eliminates the possibility of improper registration with the fold lines in the blank as the folding operation proceeds.

Reverting to Figs. 7 and 8, it will be seen that the hub portion 44 is provided with a key-way 196, and a set screw 198 for detachably securing the form to the end of the shaft. The shaft, of course, is matingly keyed. The forms are changeable, so that when a different packaging job is being handled, forms appropriate to the inserts for the new job may be used.

In Figs. 1, 3 and 4, it will be noted that the arms 60 and 62 carry forms 200 and 202 disposed beneath the forms 40 and 41 so far referred to. In the present case the cores of the form 200 are substantially narrower than those of the other three forms. The forms 200 and 202 receive an insert blank 204, which is rolled up to provide the insert 22 shown in Fig. 12. Inasmuch as column 28 is narrower than column 32, the blank for insert 22 is shorter than that for insert 24. Reverting to Fig. 1, this is taken care of by the slope of the arms 60 and 62, and it is merely necessary to displace the forms 200 and 202 such a distance lower than the forms 41 and 40 as will compensate for the desired difference in length.

Referring to Figs. 3 and 4, the forms 200, 202 are carried by shafts 206 and 208 received in bearings 210 and 212 much as previously described for the upper shafts. However, no pinion and rack mechanism is provided for the lower shafts, although if completely independent adjustment of the number of revolutions of the lower shaft were desired, that could be done. In the present case, the lower shafts are driven by the upper shafts, and for that purpose the shafts are provided between the bearings with sprocket wheels connected by sprocket chains, one of which is shown at 214 in Fig. 4. In the illustrated machine there is a 1:1 ratio, for both inserts have ends which are folded one-and-a-half revolutions. However, if in any particular packaging problem one insert is to have a somewhat different number, say two revolutions, the ratio of the teeth on the upper and lower sprocket wheels is appropriately modified. For this purpose a larger sprocket wheel may be provided on the lower shaft, there being no cross-plate at the lower bearings, the larger number of turns being taken at the upper shaft.

The arms 60 and 62 are provided with a series of uniformly spaced holes 216 (Fig. 4), so that the lower bearings may be secured at any desired position along the arms. When the bearings are lowered, it is of course necessary to lengthen the sprocket chain 214. The object of this adjustment is to accommodate a situation in which the lower blank 204 (Fig. 1) is even shorter than the upper blank 160, for movement of the lower bearings along the arms brings them closer together. If, however, the converse situation arises, and both blanks are of equal length, the lower bearings are moved outwardly by means of spacer blocks secured on the outside of the arms, between the arms and the bearings.

For the convenience of the operator, a shelf 218 is provided at the top of the machine on suitable upright supports 220, this shelf being loaded with a supply of the upper blanks. Additional supports, preferably made of metal strap, are indicated at 222 in Figs. 1 and 4, the lower ends of the supports being secured to the frame 92. A stack of the lower blanks is carried on the supports 222. It will be understood that to load the machine, the operator simply takes an upper blank from shelf 218, and inserts it in the upper form, then takes a lower blank from the supports 222, and inserts it in the lower forms, and then operates the air valve to bring the arms together. The machine instantly folds the blanks and, what is equally important, holds them in folded condition for the convenience of the operator.

A suitable conveyor is preferably provided at the front of the machine, and this is indicated in Fig. 2, in which the ends of the rollers 224 secured in a suitable conveyor track 226 are shown. The cartons with the radio receiver or other article already placed therein come moving along the conveyor to the operator standing in front of both the conveyor and the machine. The operator seizes the folded ends of one of the inserts, and pulls the insert from the forms. He then bends the folded ends or columns approximately 90 degrees to assume the relationship shown in Fig. 12, and slides the insert in one side of the carton. The operator thereupon reaches up and slides the other insert from the forms, and bends the columns approximately 90 degrees during movement of the insert to the carton, where he slides, or rather wedges it into position. The folded ends are kept under control at all times, first by the machine itself, then by the hands of the operator, and finally by the carton. A single operator performs the work more readily and expeditiously than was heretofore the case with three operators.

It is believed that the construction and operation of our improved machine for folding carton inserts, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that while we have shown and described our invention is a preferred form, many changes may be made in the apparatus specifically described, without departing from the spirit of the invention, as sought to be defined in the following claims.

We claim:

1. Apparatus for folding both ends of a carton insert blank, said apparatus comprising spaced bearings, means movably mounting the same to afford relative movement of the bearings toward or away from one another, shafts carried by said

bearings, forms mounted on said shafts, said forms being so dimensioned as to act as cores for the folded ends of the insert, each of said forms having means to hold an end of the blank, and means to cause rotation of the shafts to fold the ends of the blank, said movable mounting of said bearings affording approach of said bearings to accommodate the shortening of the blank as the ends of the blank are folded.

2. Apparatus for folding a carton insert blank, said apparatus comprising spaced bearings mounted for relative movement toward or away from one another, shafts carried by said bearings, forms mounted on said shafts, said forms being so dimensioned as to act as cores for the folded insert, each of said forms having a slit to receive an end of the blank, means to rotate the shafts to fold the ends of the blank, and means to move the bearings together as the blank is folded.

3. Apparatus for folding a carton insert blank, said apparatus comprising spaced bearings mounted for relative movement toward or away from one another, shafts carried by said bearings, forms mounted on said shafts, said forms being so dimensioned as to act as cores for the folded insert, each of said forms having means to hold an end of the blank, means to move the bearings toward one another, and means to rotate the shafts as the bearings move toward one another.

4. Apparatus for folding a carton insert blank, said apparatus comprising spaced bearings mounted for relative movement toward or away from one another, shafts carried by said bearings, forms mounted on said shafts, said forms being so dimensioned as to act as cores for the folded insert, each of said forms having means to hold an end of the blank, means to rotate the shafts to fold the ends of the blank, means to move the bearings together as the blank is folded, and means affording relative adjustment of the aforesaid two means.

5. Apparatus for folding a carton insert blank, said apparatus comprising spaced bearings mounted for relative movement toward or away from one another, shafts carried by said bearings, forms detachably mounted on said shafts, said forms being so dimensioned as to act as cores for the folded insert, each of said forms having a slit to receive an end of the blank, means to rotate the shafts to fold the ends of the blank, means to move the bearings together as the blank is folded, and means affording such relative adjustment of the aforesaid two means that the relative movement of the bearings may be adjusted in relation to the number of revolutions of the shafts so as to be commensurate with the dimensions of the forms.

6. Apparatus for folding both ends of a carton insert, said apparatus comprising bearings, means movably mounting the same to afford relative movement of the bearings toward or away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded ends of the insert, gears on said shafts, and racks meshing with said gears and extending in a direction different from the direction of motion of the bearings, at least one end of each rack being stationary during operation of the machine, said meshed gears and racks serving to positively determine the relationship between the number of revolutions of the shafts and the movement of the bearings.

7. Apparatus for folding both ends of a carton insert, said apparatus comprising bearings, means movably mounting the same to afford relative movement of the bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded ends of the insert, gears on said shafts, racks meshing with said gears and extending in a direction different from the direction of motion of the bearings, the inner ends of the racks being carried by an anchor block, and means whereby said anchor block may be secured at a desired point along a line extending transversely of the direction of movement of the bearings, whereby adjustment of the position of the anchor block positively determines the relationship between the number of revolutions of the shafts and the movement of the bearings.

8. Apparatus for folding both ends of a carton insert, said apparatus comprising bearings, means movably mounting the same to afford relative movement of the bearings toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded ends of the insert, gears on said shafts, racks meshing with said gears and extending in a direction different from the direction of motion of the bearings, the inner ends of the racks being carried by an anchor block, a post extending transversely of the direction of movement of the bearings, and means to adjustably clamp said anchor block at a desired point along said post, whereby adjustment of the anchor block on the post positively determines the relationship between the number of revolutions of the shafts and the movement of the bearings.

9. Apparatus for folding a carton insert, said apparatus comprising bearings mounted for relative movement toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded insert, means to rotate the shafts, adjustable means to determine the number of revolutions of the shafts, and fluid-operated piston and cylinder means for moving said bearings toward or away from one another.

10. Apparatus for folding a carton insert, said apparatus comprising bearings mounted for relative movement toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded insert, means to rotate said shafts, fluid-operated piston and cylinder means for moving said bearings toward or away from one another, adjustable stop means to limit the inward movement or minimum separation of the bearings, and adjustable stop means to limit the outward movement or maximum separation of the bearings.

11. Apparatus for folding a carton insert, said apparatus comprising bearings mounted for relative movement toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded insert, gears on said shafts, racks meshing with said gears, the inner ends of the racks being carried by an anchor block, means to secure said anchor block at a desired point along a line extending transversely of the direction of movement of the bearings, whereby adjustment of the anchor block determines the relationship between the number of revolutions of the shafts and the movement of

the bearings, fluid-operated piston and cylinder means for moving said bearings toward or away from one another, and adjustable stop means to limit the resulting movement of the bearings.

12. Apparatus for folding a carton insert, said apparatus comprising bearings mounted for relative movement toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded insert, gears on said shafts, racks meshing with said gears, the inner ends of the racks being carried by an anchor block, a post extending transversely of the direction of movement of the bearings, and means to adjustably clamp said anchor block at a desired point along said post, whereby adjustment of the anchor block on the post determines the relationship between the number of revolutions of the shafts and the movement of the bearings, and fluid-operated piston and cylinder means for moving said bearings toward or away from one another.

13 Apparatus for folding a carton insert, said apparatus comprising bearings mounted for relative movement toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as cores for the folded insert, gears on said shafts, racks meshing with said gears, the inner ends of the racks being carried by an anchor block, a post extending transversely of the direction of movement of the bearings, and means to adjustably clamp said anchor block at a desired point along said post, whereby adjustment of the anchor block on the post determines the relationship between the number of revolutions of the shafts and the movement of the bearings, fluid-operated piston and cylinder means for moving said bearings toward or away from one another, adjustable stop means to limit the inward movement or minimum separation of the bearings, and adjustable stop means to limit the outward movement or maximum separation of the bearings.

14. Apparatus for folding both ends of carton inserts, said apparatus comprising arms pivoted at their lower ends in such a manner that the upper ends are movable toward or away from one another, bearings on said arms, shafts carried by said bearings, forms mounted on said shafts, said forms being dimensioned to act as cores for the folded ends of the insert and being split to receive the ends of an insert blank when the arms are in open position, and means for rotating said shafts a desired number of revolutions, said pivotal mounting of said arms affording moving together of said bearings to accommodate the shortening of the blank as the ends of the blank are folded by rotation of the shafts.

15. Apparatus for folding carton inserts, said apparatus comprising arms pivoted at their lower ends in such a manner that the upper ends are movable toward or away from one another, means for causing symmetrical movement thereof, fluid-operated piston and cylinder mechanism for moving said arms toward or away from one another, bearings on said arms, shafts carried by said bearings, forms mounted on said shafts, said forms being dimensioned to act as cores for the folded ends of the insert, and means for rotating the shafts when the arms change from maximum to minimum spacing.

16. Apparatus for folding carton inserts, said apparatus comprising arms pivoted at their lower ends in such a manner that the upper ends are movable toward or away from one another, meshing gear sectors on said arms for causing symmetrical movement thereof, extensions on said arms below said pivots, fluid-operated piston and cylinder mechanism connected between said extensions for moving said arms toward or away from one another, adjustable stop means for limiting the maximum spacing between the arms, bearings on said arms, shafts carried by said bearings, forms mounted on said shafts, said forms being dimensioned to act as cores for the folded ends of the insert, and means for rotating the shafts when the arms change from maximum to minimum spacing.

17. Apparatus for folding carton inserts, said apparatus comprising arms pivoted at their lower ends in such a manner that the upper ends are movable toward or away from one another, meshing gear sectors on said arms for causing symmetrical movement thereof, fluid-operated piston and cylinder mechanism for moving said arms toward or away from one another, adjustable stop means for limiting the minimum spacing between the arms, adjustable stop means for limiting the maximum spacing between the arms, bearings on said arms, shafts carried by said bearings, forms mounted on said shafts, said forms being dimensioned to act as cores for the folded ends of the insert, gear racks meshing with said gears, the inner ends of said gear racks being secured to an anchor block, a vertical post, means to adjustably clamp the anchor block at a desired height on said post, the adjustment of said anchor block on said post determining the number of revolutions of the shafts when the arms change from maximum to minimum spacing.

18. Apparatus for folding carton inserts, said apparatus comprising arms pivoted at their lower ends in such a manner that the upper ends are movable toward or away from one another, means for causing symmetrical movement thereof, extensions on said arms below said pivots, fluid-operated piston and cylinder mechanism connected between said extensions for moving said arms toward or away from one another, adjustable stop means for limiting the minimum spacing between the arms, adjustable stop means for limiting the maximum spacing between the arms, bearings on said arms, shafts carried by said bearings, forms mounted on said shafts, said forms being dimensioned to act as cores for the folded ends of the insert and being split to receive the ends of an insert blank when the arms are in open position, gears on said shafts, gear racks meshing with said gears, the inner ends of said gear racks being secured to an anchor block, a vertical post, means to adjustably clamp the anchor block at a desired height on said post, the adjustment of said anchor block on said post determining the number of revolutions of the shafts when the arms change from maximum to minimum spacing.

19. Apparatus as defined in claim 14, in which each arm is provided with a plurality of bearings, shafts and forms, for simultaneously folding a plurality of carton insert blanks, the shafts on each arm being appropriately geared together for simultaneous rotation.

20. Apparatus as defined in claim 17, in which each arm is provided with a plurality of bearings, shafts and forms, for simultaneously folding a plurality of carton insert blanks, the shafts on each arm being appropriately geared together for

simultaneous rotation in response to the drive of the aforesaid gear rack and gear.

21. Apparatus as defined in claim 14, in which each arm is provided with two spaced bearings, shafts and forms, and in which at least one of the lower forms is smaller in dimension than one of the upper forms, and in which the initial spacing between the lower shafts is less than that between the upper shafts by an amount compensating for the smaller amount of material required around the smaller form.

22. Apparatus as defined in claim 17, in which each arm is provided with two spaced bearings, shafts and forms, and in which at least one of the lower forms is smaller in dimension than one of the upper forms, and in which the initial spacing between the lower shafts is less than that between the upper shafts by an amount compensating for the smaller amount of material required around the smaller form, each of the lower shafts being geared to the upper shaft on the same arm for rotation therewith in response to relative movement of the gear and rack previously referred to.

23. Apparatus for folding both ends of a carton insert, said apparatus comprising bearings, means mounting the same to afford relative movement of the bearings toward and away from each other, shafts in said bearings, forms mounted on the shafts, said forms being dimensioned to act as

cores for the folded ends of the insert, gears on said shafts, racks meshing with said gears, the inner ends of the racks being carried by an anchor block, a guide track extending transversely of the direction of movement of the bearings, means to adjustably clamp said anchor block at a desired point along said guide track, whereby adjustment of the anchor block on the guide track determines the relationship between the number of revolutions of the shafts and the movement of the bearings, and a source of power so connected to the apparatus as to cause rotation of the shafts in order to fold the ends of the blank, said movable mounting of said bearings affording an approach toward one another of said forms to accommodate the shortening of the blank as the blank is folded.

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