

Dec. 5, 1944.

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2,364,342

BLANK CREASING AND SLOTTING MACHINE

Filed Jan. 22, 1943

3 Sheets-Sheet 1

Fig. 7.

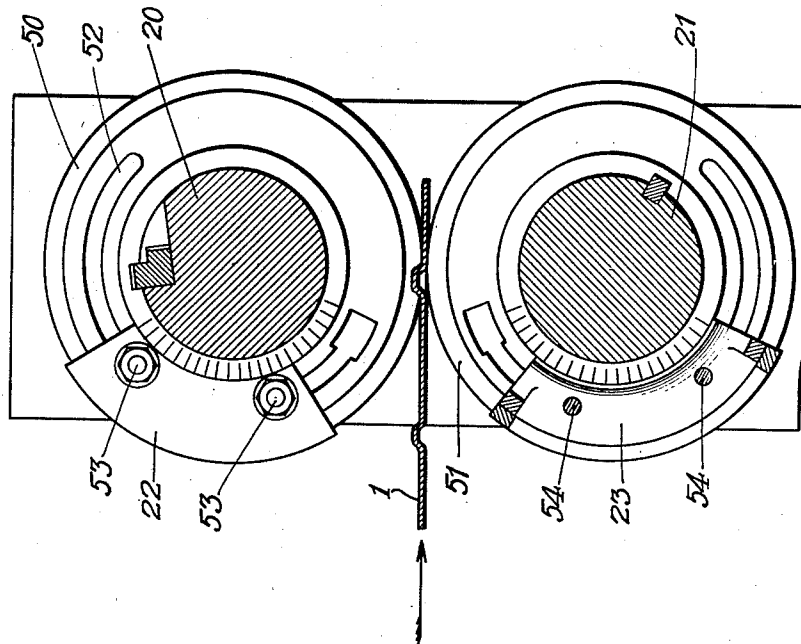
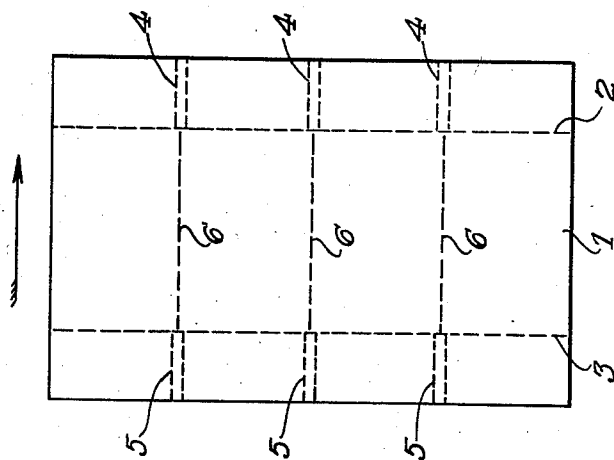


Fig. 1.



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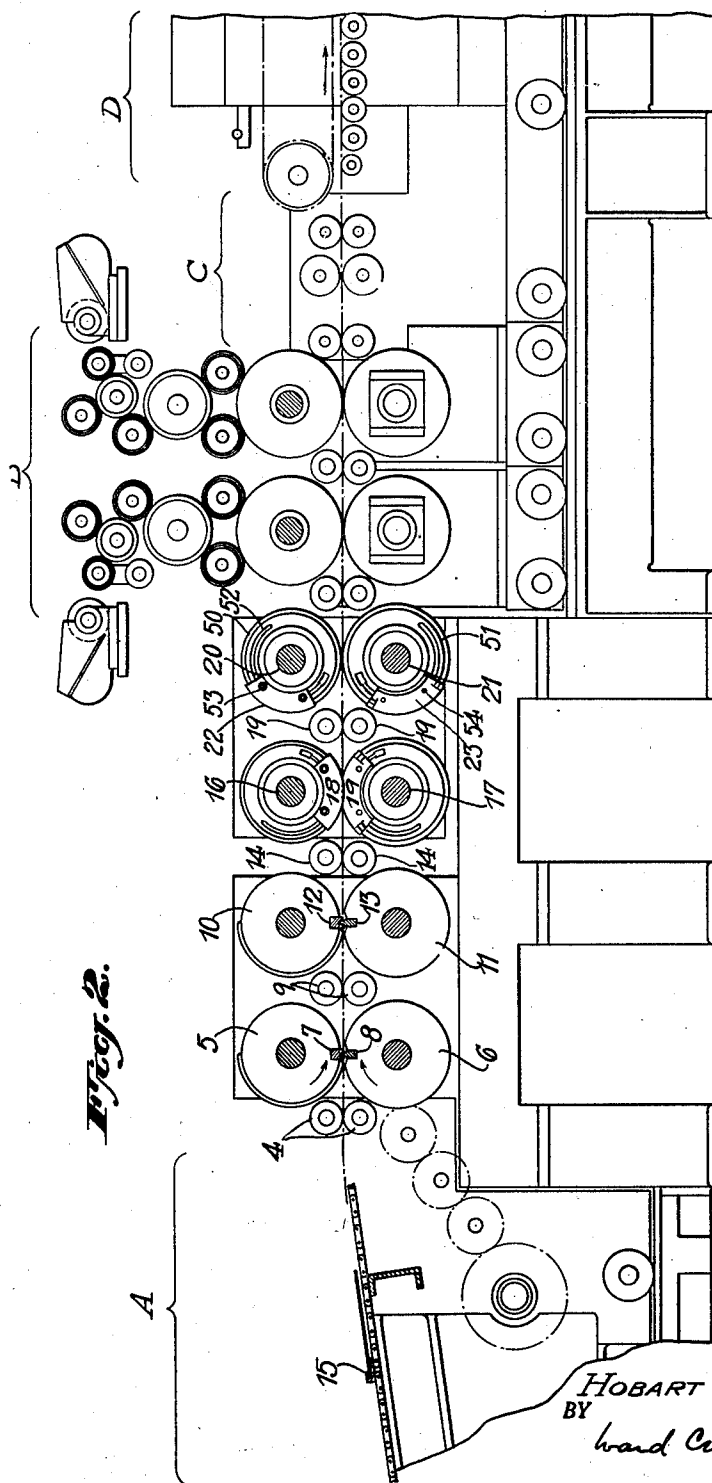
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3 Sheets-Sheet 2



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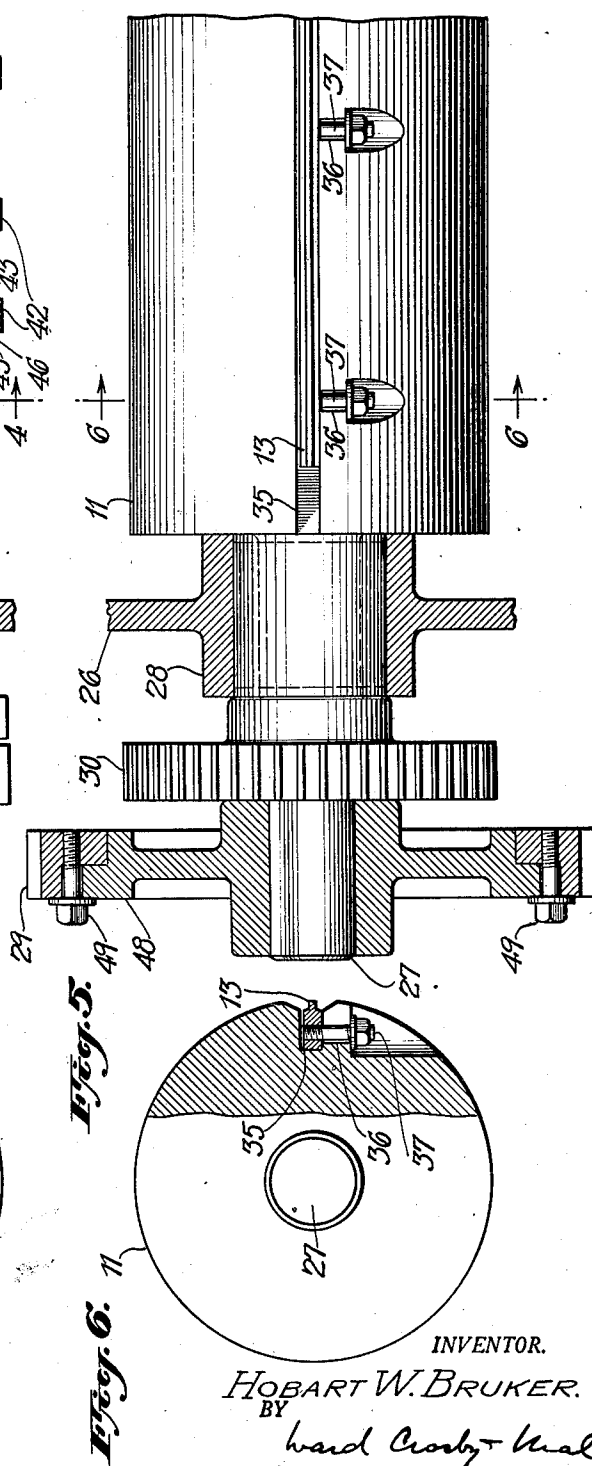
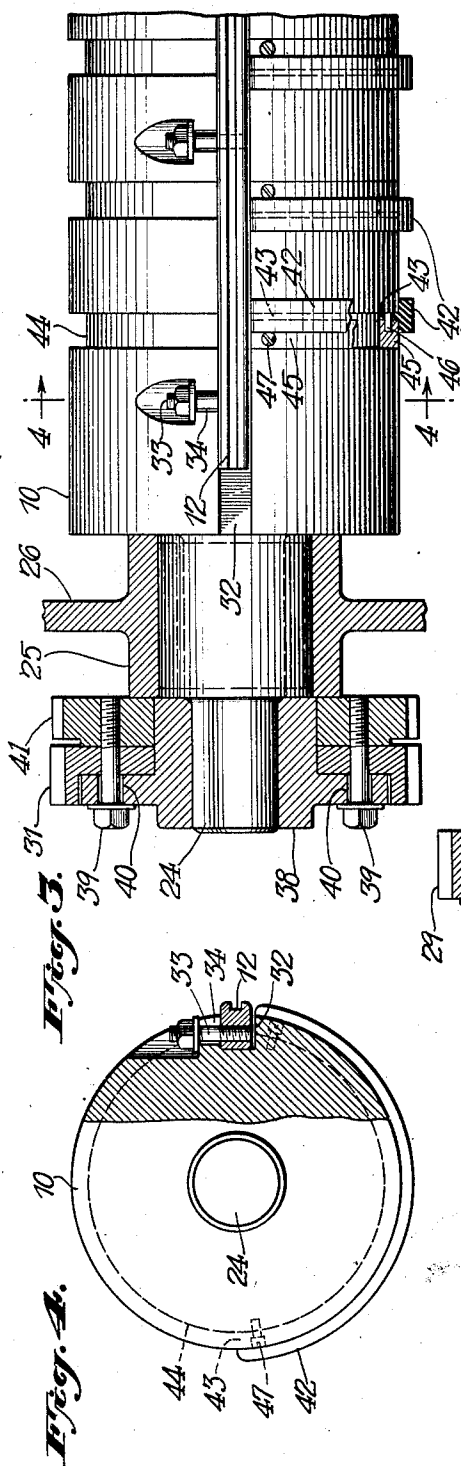
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BLANK CREASING AND SLOTTING MACHINE

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3 Sheets-Sheet 3



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2,364,342

BLANK CREASING AND SLOTTING MACHINE

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6 Claims. (Cl. 93—58)

The invention relates to blank creasing and slotting machines of the general type shown in the patent to George W. Swift, Jr., No. 1,977,812, issued October 23, 1943. Machines constructed in general as shown in this patent have been used for many years in the commercial production of slotted and creased container blanks which are made of so-called solid fibre board.

In the use of machines of the above character, the so-called set-up time involved in resetting the main operating parts to conform to blanks of different sizes, has long been recognized in the trade as a major item of operating expense. In many respects it has previously been found possible to reduce this expense, but in so far as I am aware no practical and satisfactory way has previously been found for alleviating the awkward and time consuming operations required for resetting the creasing and slotting dies. This is the primary object of the present invention, by the use of which it has been found possible to reduce the time required for these last mentioned operations from about fifteen minutes to about three minutes, thus resulting in markedly increased production particularly where a machine has to be reset many times during the day as happens when miscellaneous orders for blanks of various sizes are being run. Further objects and advantages of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained which, taken in conjunction with the accompanying drawings, discloses a preferred embodiment of the invention. Such embodiment however is to be regarded merely as illustrative of the principles of the invention in its broader aspects. In the drawings—

Fig. 1 is a plan view of a common form of paperboard blank and illustrating operations such as the machine is adapted to perform thereon.

Fig. 2 is a side view, partly schematic, and having certain parts cut away with the details of which the invention is not particularly concerned, of a creasing, slotting and printing machine constructed to operate in accordance with the invention.

Fig. 3 is a detail elevation showing detached, and partly in section, a rotary member carrying a female creasing die and constructed to operate in accordance with the invention.

Fig. 4 is a section taken on line 4—4 of Fig. 3 looking in the direction of the arrows.

Fig. 5 is a view similar to Fig. 3 but showing the complementary male slotting die.

Fig. 6 is a section taken on line 6—6 of Fig. 5 looking in the direction of the arrows.

Fig. 7 is a sectional view showing rotary members carrying respectively male and female slotting dies and of construction appropriate to be used in the machine.

In Fig. 1 I have shown a simple form of rectangular blank 1 which may be understood as made of solid fibre board or the like, and which is to be fed through the machine in the direction indicated by the arrows at the left of the figure, in such manner as to score or crease the forward portion of the blank along the dotted line 2 in a transverse direction perpendicular to the direction of feed, and to score the rear portion of the blank along the dotted line 3 which is parallel to line 2 and spaced from line 2 a distance depending upon the size of the box to be formed out of the blank. Slots indicated by the dotted lines 4 are also to be formed in the forward portion of the blank, these slots extending from the score line 2 to the forward edge of the blank, and similar slots indicated by the dotted lines 5 are to be formed in the rearward portion of the blank, extending from the score line 3 to the rear edge of the blank. These slots define end flaps in the blank, and their positions accordingly must conform to the positions of the score lines 2 and 3.

The present invention deals primarily with the construction and mode of operation of those parts of the machine which must be adjusted to secure proper locations of the creases 2 and 3 and the slots 4 and 5, longitudinally of the machine, i. e., in the direction of feed. As these machines have been constructed according to prior art practice, the dies which form the creases 2 and 3 need no adjustment crosswise of the machine, and the dies which form the slots 4 and 5 are readily adjustable crosswise of the machine, so with these latter adjustments the present invention is not primarily concerned. The machine also will usually be provided with appropriate creasing devices for forming creases 6 which extend between the respective sets of slots 4 and 5, as well as cylinders for printing on the faces of the blank. These printing cylinders and longitudinal creasing devices may likewise be constructed and adjusted in accordance with prior practice or in any appropriate manner and the present invention is not concerned with their details.

In accordance with prior art practice which has existed for many years, the two sets of mating dies for forming the transverse creases 2 and 3 were mounted upon a pair of cooperating

upper and lower rotary members which were geared together, each rotary member thus carrying two dies which were arcuately spaced around its periphery to mate with the two dies carried by the other rotary member. One set of mating dies, for example the set forming the score lines 2 on the blanks, could be left permanently set in respect to their angular position, variations in the length of the forward flaps of the blank being taken care of by adjustment of the mechanism feeding the blanks to the machines as hereinafter described. The distance between the score lines 2 and 3 depended upon the angular or peripheral spacing of the second set of mating dies with respect to the first set. To alter this distance it was necessary for the operator to adjust the position of each die of the second set of mating dies with respect to its supporting rotary member and the die of the first set which was also supported by such member. This adjustment required the operator to move the blank feeding mechanism out of the way, get in between the side frames of the machine, loosen up a large number of cap screws which served to hold each of the mating dies in position, lock one of the rotary members against rotation, and then turn the machine until the loose mating dies became spaced the proper peripheral distance from the fixed mating dies, after which the holding set screws for the respective mating dies were tightened up, the rotary member unlocked and the feeding mechanism moved back to operative position. The above series of operations was exceedingly time consuming and also required a complicated and expensive construction of the rotary members in order to afford arcuate adjustment of the dies.

Similar time consuming operations were involved in setting the slot forming dies to different dimensions of the blanks so that the slots would always begin at the score lines 2 and 3 as indicated in Fig. 1. The practice was to mount two sets of mating slotting dies on a second pair of upper and lower cooperating rotary members, and to adjust the peripheral distances between the dies which served respectively the forward and rearward portions of the blanks. Since four or more slots spaced across the width of the blank were required, each rotary member had to carry four or five more dies serving the forward portions of the blank and a like number serving the rearward portions. The dies serving the forward portions could be set permanently to operate properly with respect to the score lines 2, but in adjusting the remaining set of slotting dies to correspond to different sizes of box blank it was necessary to individually release the various sets of slotting dies which are spaced laterally across the machine and located on both the upper and lower rotary members, adjust the loose dies peripherally by an operation similar to that previously described in connection with the creasers, and then tighten up the various individual bolts which held the slotting dies in position.

In accordance with the present invention, I provide one set of cooperating rotary members which respectively carry the mating dies for creasing the forward portions of the blanks, and once these dies are initially set in proper position they may be allowed to remain in that position during all subsequent adjustments. As in the case of the prior art machines above referred to, adjustments in the position of the crease 2 with respect to the forward edge of

the blank may be taken care of by alterations in the timing of the blank feeding mechanism. But in accordance with the present invention the creaser dies which form the crease 3 in the rearward edge of the blank, instead of being mounted upon the same rotary members as the creasing dies above referred to, are mounted on a separate and successive pair of cooperating rotary members, and may be permanently set in proper mating positions on these last mentioned rotary members, i. e., these dies do not have to be shifted angularly on the rotary members which respectively carry them, in making adjustments to suit different sized blanks. In accordance with the present invention the machine is so constructed that one pair of rotary members may be adjusted as a whole, so to speak, either angularly or longitudinally of the machine with respect to the other pair so that it becomes possible to adjust the distances between the creases 2 and 3 by a single adjusting operation made equally and simultaneously upon the second rotary members as a unit, and without peripheral adjustments of the individual dies with respect to their corresponding supporting rotary members. For example, the driving train of gearing for the rotary members above referred to may be of the general character shown in the Swift patent above referred to, and the gear driving the second mentioned pair of rotary members from the train which serves the remainder of the machine, may be detachably connected at the side of the machine to one of such rotary members. The disconnection of this driving gear will still leave the two last mentioned rotary members connected to each other by meshing gears, and thus when so disconnected from the driving train of gears the two rotary members and the creasing dies carried thereby may be concurrently shifted angularly equal amounts by rotating them through the necessary angle as indicated on a suitable scale, when the remainder of the machine is at rest. The connection is then tightened up and the creasing adjustment thus becomes complete with a simple operation which may be readily performed at the side of the machine, without moving the blank feeding mechanism out of operative position, and without the successive peripheral adjustments which formerly required the operator to get in between the side frames of the machine.

The slotting dies serving the forward and rear portions of the blanks are likewise mounted on successive pairs of cooperating members, and are likewise adjusted. Here again the rotary members which form the slots 4 in the forward portion of the blank may be permanently set in position so that they do not have to be adjusted in setting the machine to different sized blanks, and the positions of the rotary members carrying the slotting dies which make the slots 5 in the rearward portion of the blank, are adjusted as above described in respect to the rotary members which make the crease 3. With the machine thus constructed it is found that adjustments which required fifteen minutes or more in the case of the prior art machines above described may be made in three minutes or less and with much reduced risk of maladjustment.

The invention is disclosed as applied to a printer slotter many of the parts of which may be assumed to be of any well known or appropriate construction, and which accordingly will not be described in detail.

Referring to Fig. 2, for example, the parts appearing under the bracket marked "A" may be understood as constituting part of a blank feeding mechanism of the type shown in the patent to George W. Swift, Jr., No. 2,079,668, dated May 11, 1937, this feeding mechanism having a series of pusher bars 15 which successively feed the blanks to a pair of feed rolls 4, as described in the last mentioned Swift patent with respect to the correspondingly numbered parts 15 and 4.

From the feed rolls 4 the blanks pass between a pair of upper and lower rotary members 5 and 6 respectively which carry respectively a female creasing die 7 and a male creasing die 8 positioned transversely of the machine. The detailed construction of these dies will be passed for the moment. As previously mentioned the proper position of the crease 2 on the blank may be secured in accordance with prior art practice by adjustment of the timing of the feeding mechanism, and thus neither the positions of the rotary members 5 and 6 with respect to the driving train of gears, nor the position of the dies 7 and 8 on the respective rotary members, have to be changed in adjusting the machine to suit different sized boxes.

From the rotary members 5 and 6 the blank passes to a second set of feed rolls 9 similar to the rolls 4 previously described, and from thence to a second pair of rotary members marked 10 and 11 respectively which carry a second set of creasing dies 12 and 13 respectively similar to the parts 7 and 8 above described. The detail construction of these members 10 to 13 will also be passed for the moment, it being noted that proper spacing between the crease 3 as formed on the blank by dies 12 and 13, with respect to the crease 2, may be obtained by conjointly rotating the rotary members 10 and 11 through the proper angle, while the dies 7 and 8 and their supporting rotary members and the main driving train are held stationary.

From the rotary members 10 and 11 the blank passes between a further set of feed rolls 14 similar to the rolls 4 and 9 previously described, and from thence to a pair of upper and lower rotary members 16 and 17 which respectively carry a male slotting die 18 and a female slotting die 19. Several of these pairs of slotting dies will be spaced adjustably across the machine in proper position to make the slots 4, and description of their detailed construction will be passed for the moment, it being understood that these dies may be set initially into proper angular position to register with the creasing dies 7 and 8, so that in setting the machine to suit different sized boxes no adjustment either of the positions of the rotary members 16 and 17, nor of the positions of the dies 18 and 19 thereon, is required.

From the rotary members 16 and 17 the blank passes between a set of feed rolls 19 similar to the rolls 4 previously described, and from thence between another pair of upper and lower rotary members 20 and 21 which respectively carry slotting dies 22 and 23 similar to the parts 18 and 19 previously described. Other pairs of these slotting dies 22 and 23 are likewise adjustably spaced across the machine, and they serve to form the slots 5 in the blank as shown in Fig. 1. Detailed description of the construction of these rotary members 20 and 21 will be passed for the moment, it being understood that in the present embodiment of the invention, these rotary mem-

bers are so constructed that after disconnecting them from the main driving train of the machine they may be conjointly rotated while the machine is at rest through the necessary angle to register the slots 5 properly with the transverse crease 3 as formed by the dies 12 and 13.

After the blank slotting operation is completed the blank will usually pass to appropriate printing mechanism indicated diagrammatically in Fig. 2 by the parts appearing under the bracket marked "B," then to appropriate slitting mechanism indicated diagrammatically by the parts under the bracket in Fig. 2 labeled C, and then to suitable chain creasing mechanism indicated diagrammatically in Fig. 2 by the parts appearing under the bracket marked D, and which form the longitudinal creases 6 shown in Fig. 1. With these parts B, C and D the present invention is not previously concerned so they will not be described in detail.

It should also be understood that an appropriate driving train of gearing, for example, as shown in the Swift first patent above referred to, will be used for driving the various rotary members in proper timed relation to each other. Since driving mechanisms appropriate for this purpose are known no detailed driving train is described herein, except in respect to certain individual gears as hereinafter mentioned, which may be directly associated with the parts of the machine with which the present invention is particularly concerned.

Passing now to a more detailed description of an appropriate construction for the rotary members 10 and 11, and the dies 12 and 13 carried thereby, I have shown in Figs. 3 and 4 the rotary member 10 as being in the form of a cylinder having a stud shaft 24 passing through a bearing 25 in side frame 26 of the machine. The lower rotary member 11 as shown in Figs. 5 and 6 is likewise provided with a shaft 27 at each end which passes through a bearing 28 in side frame 26. The lower rotary member 11 is driven by the gear 28 at one side of the machine (and of a construction such as hereinafter described) it being understood that this gear 29 is a part of the main driving train. A gear 30 on the shaft 27 meshes with a gear 31 on the shaft 24, thus driving the rotary member 10 from member 11.

In the illustrated form of the invention, female creasing die 12 is mounted in a slot 32 in rotary member 10, and held in position by a series of bolts 33 seating in the die member 12 and passing through slots 34 in member 10. The male creasing die 13 (Figs. 5 and 6) is likewise held in position in a slot 35 in rotary member 11, by means of bolts 37 passing through slots 36. In order initially to set the female slotting die 12 so as to register with die 13, the gear 31 may be recessed as shown in Fig. 3 to receive a collar 38 fastened to shaft 24, bolts 39 passing through arcuate slots 40 in such collar, so that when these bolts are loosened up, the shaft 24 and rotary member 10 may be adjusted angularly with respect to the rotary member 11. In the specific form illustrated these bolts 39 pass through the gear 31 and are seated in a further gear 41 fixed with respect thereto, this gear 41 serving to drive auxiliary feed rolls by connections which may be of known form and accordingly are not illustrated or described in detail.

Preferably the rotary member 10 is provided with blank feeding peripheral strips extending at least throughout part of its periphery which fol-

lows the die 12 in engagement with the blank. These strips 42 (Fig. 3) of resilient rubber-like material are preferably of T-shape cross section, having an inner web 43 which is received within a slot 44 in rotary member 10. As shown the feed strips 42 are held detachably in position by arcuately shaped pieces 45 which fit within the slots 44 and are fastened to the webs 43 by pins 46, the arcuate pieces 45 and feed strips 42 being detachably held in position by bolts 47 which pass through the pieces 45 and seat in the bottoms of the slots 44. These feed strips 42 insure that the blanks will be passed along properly into engagement with the feed rolls 14.

In order to adjust the rotary members 10 and 11 and their creasing dies 12 and 13 with respect to the remainder of the machine and thus alter the position of the crease 3 of Fig. 1, the driving gear 29 may be recessed as indicated in Fig. 5 to receive a collar 48 which is fixed to shaft 27 and detachably clamped to gear 29 by bolts 49 which are seated in the gear 29. When these bolts are loosened up the gear 29 and the remainder of the main driving train being then at rest, it is possible to rotate the shaft 27 by hand and thereby turn the rotary members 10 and 11 and the dies 12 and 13 carried respectively thereby, thus angularly displacing the dies 12 and 13 with respect to the dies 7 and 8 until the transverse crease 3 is spaced the desired distance from crease 2 as formed by the dies 7 and 8. This adjusting operation may be made by the operator at the side of the machine without removing the blank feeding mechanism A or getting in between the side frames of the machine, the operation involving merely loosening the bolts 49, twisting the shaft 27 to the proper angular position as indicated by a suitable graduated scale (not illustrated) and then tightening the bolts 49 up again.

The positions of the rotary members 20 and 21 and their respective slotting dies 22 and 23 may be adjusted in precisely the same manner. In Fig. 7 I have shown more in detail a pair of upper and lower rotary members 20 and 21 in the form of cylindrical shafts on which are mounted any desired number of upper and lower slotting heads 50 and 51, which may be understood as adjustable crosswise of the machine in known manner as described in the above mentioned patent to George W. Swift, Jr., No. 1,977,812. The upper slotting head 50 is shown as provided with an undercut circular slot 52 in which engage the heads of bolts 53 which clamp the male slotting blade or die 22 in position. In similar manner the female die 23 is clamped by bolts 54 to the lower slotting head 51. The driving gears for the rotary members 20 and 21 may be understood as being the same as already described in connection with the shafts 24 and 27 of Fig. 3, and it should also be understood that the respective sets of slotting dies 22 and 23 once they have been initially positioned to register with each other, need not be thereafter shifted in adjusting the machine to suit boxes of different sizes. It should also be understood that a single adjustment at one side of the machine will adjust all of the slotting dies simultaneously to an equal extent, in contrast with the individual adjustments of each pair of slotting heads as required in adjusting the above described machines of the prior art. No particular means is described herein for effecting sidewise adjustments of the pairs of slotting heads since this may be understood as accomplished in known manner.

The slotting dies 18 and 19 as carried by the rotary members 16 and 17 respectively, like the creasing dies 7 and 8, need not be adjusted in setting the machine to suit boxes of different heights. The creasing dies will not require adjustment crosswise of the machine to suit boxes of different widths. Crosswise adjustment of the respective pairs of slotting dies 18 and 19 like the slotting dies 22 and 23, may be effected by any known or appropriate mechanism which is not described since the present invention is not particularly concerned therewith.

While the invention has been disclosed as carried out by a machine of the above described construction, it should be understood that many changes may be made therein without departing from the invention in its broader aspects, within the scope of the appended claims.

I claim:

1. A container blank creasing and slotting machine of the class described having side frames carrying successive cooperating pairs of rotary members, one of said pairs of rotary members carrying cooperating dies constructed and arranged to perform one of the aforesaid operations on the forward portions of advancing blanks, and another of said cooperating pairs of rotary members carrying dies constructed and arranged to repeat the above mentioned operation on the rear portions of advancing blanks, a gear train for driving said rotary members, and means operable to free one of said dies from said driving train of gearing to afford angular displacement of said die with respect to the other pair of rotary members and thereby afford adjustment of the distance between said forward and rear operations.

2. A container blank creasing and slotting machine of the class described having side frames carrying successive cooperating pairs of rotary members, one of said pairs of rotary members carrying cooperating dies constructed and arranged to perform one of the aforesaid operations on the forward portions of advancing blanks, and another of said pairs of rotary members carrying dies constructed and arranged to repeat the above mentioned operation on the rear portions of advancing blanks, and means affording conjoint adjustment of the positions of one of said pairs of rotary members and the dies carried thereby with respect to the other pair of rotary members and the dies carried thereby, thereby to afford adjustment of the distance between said forward and rear operations.

3. A container blank creasing and slotting machine of the class described having side frames carrying successive cooperating pairs of rotary members, one of said pairs of rotary members carrying cooperating dies constructed and arranged to perform one of the aforesaid operations on the forward portions of advancing blanks, and another of said cooperating pairs of rotary members carrying dies constructed and arranged to repeat the above mentioned operation on the rear portions of advancing blanks, a gear train for driving said rotary members, and means operable to free one of said pairs of rotary members and the dies carried thereby from said driving train of gearing to afford conjoint angular displacement of said last mentioned pair of rotary members and the dies carried thereby with respect to the other pair of rotary members and the dies carried thereby, thereby to afford adjustment of the distance between said forward and rear operations.

4. A container blank creasing machine of the class described having side frames carrying successive pairs of rotary members, each of said pairs of rotary members having gears interconnecting same, and also carrying mating creasing dies running transversely of the machine, one of said sets of creasing dies being constructed and arranged to perform said creasing operation on the forward portions of advancing blanks the other of said creasing members being positioned to perform said creasing operation on the rear portions of advancing blanks, and means affording conjoint adjustment of one of said pairs of rotary members and the creasing dies carried thereby, with respect to the other pair of rotary members and the creasing dies carried thereby, to thereby afford adjustment of the distance between the forward and rear creases made by the successive sets of dies.

5. A container blank creasing machine of the class described having side frames carrying successive pairs of rotary members, each of said pairs of rotary members having gears interconnecting same, and also carrying mating creasing dies running transversely of the machine, one of said sets of creasing dies being constructed and arranged to perform said creasing operation on the forward portions of advancing blanks, the other of said creasing members being positioned to perform said creasing operation on the rear

portions of advancing blanks, a gear train for driving said rotary members and means operable to free one of said pairs of rotary members and the dies carried thereby from said driving train of gearing to afford angular conjoint adjustment of said last mentioned pair of rotary members and the dies carried thereby with respect to the other pair of rotary members and the dies carried thereby, thereby to afford adjustment of the distance between the forward and rear creases made by the successive sets of dies.

6. A container blank slotting machine of the class described having side frames carrying successive pairs of rotary members, each of said pairs of rotary members having gears interconnecting same, arcuate slotting blades carried respectively by rotary members of said successive pairs and each cooperating with a peripheral recess in the other rotary member of the corresponding pair, said blades being respectively positioned to form slots in the forward and rear portions of advancing blanks, and means operable to afford adjustment of the position of one of said slotting blades with respect to the corresponding rotary member of the other pair and the slotting blade carried thereby, thereby to afford adjustment of the distance between the forward and rear slots formed by said blades.

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