June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 1

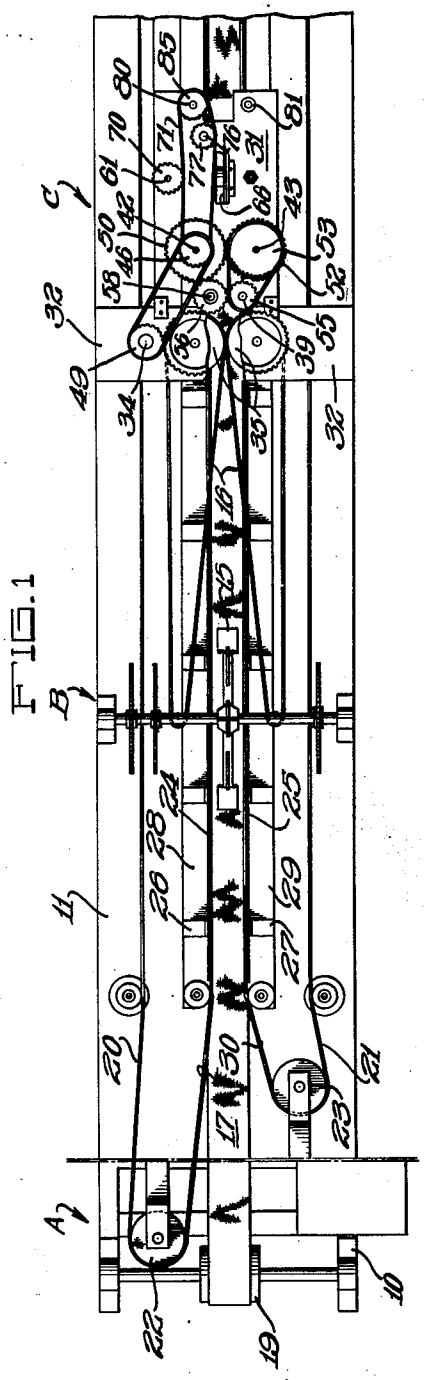


FIG. 1

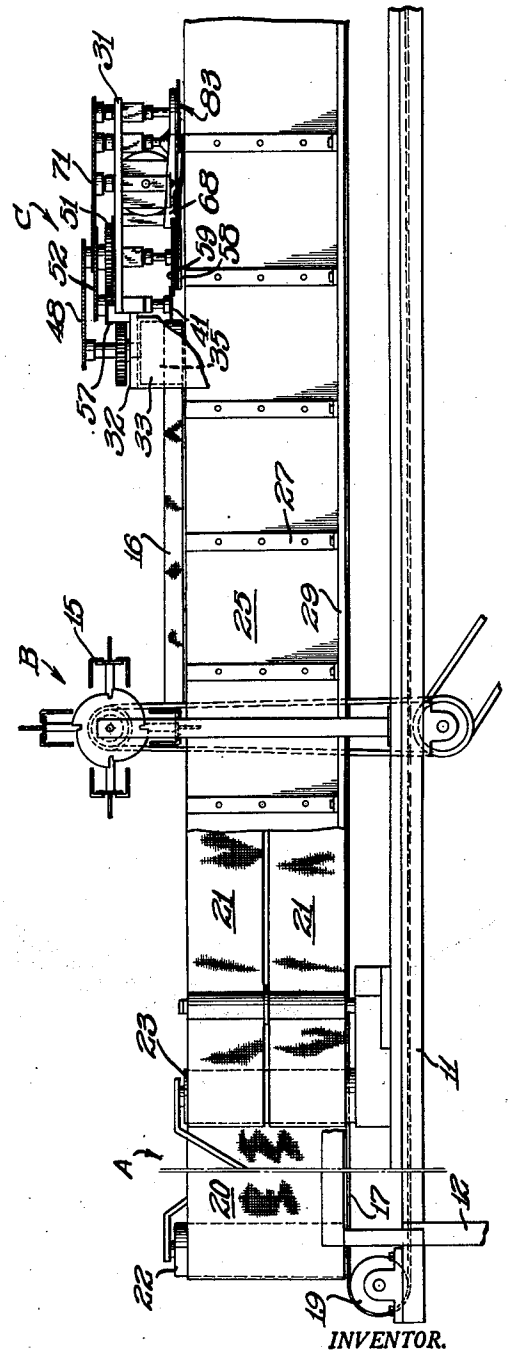


FIG. 2

INVENTOR.
Kenneth Stone
BY
Zabel and Spitzbarth
Attys

June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 2

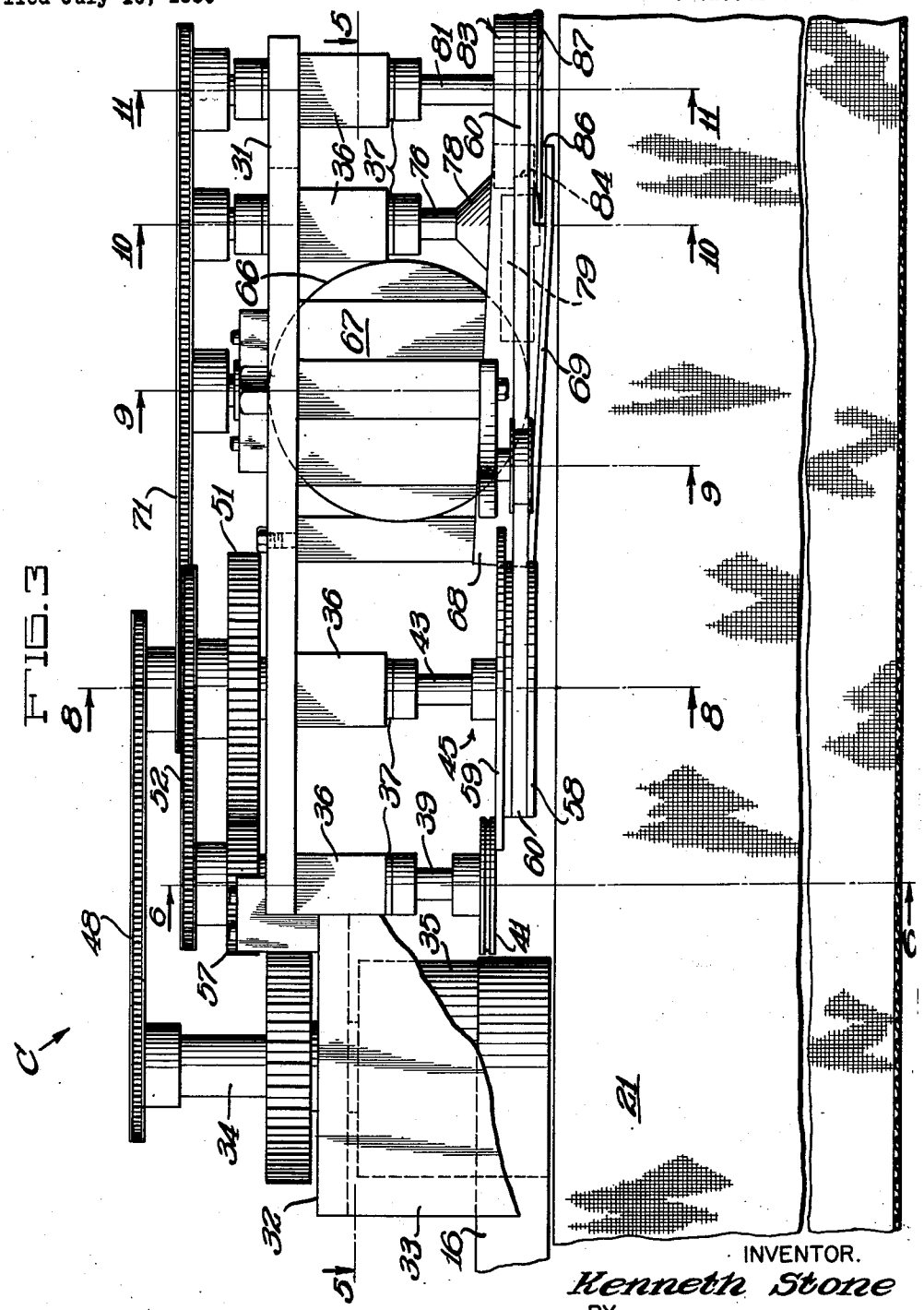


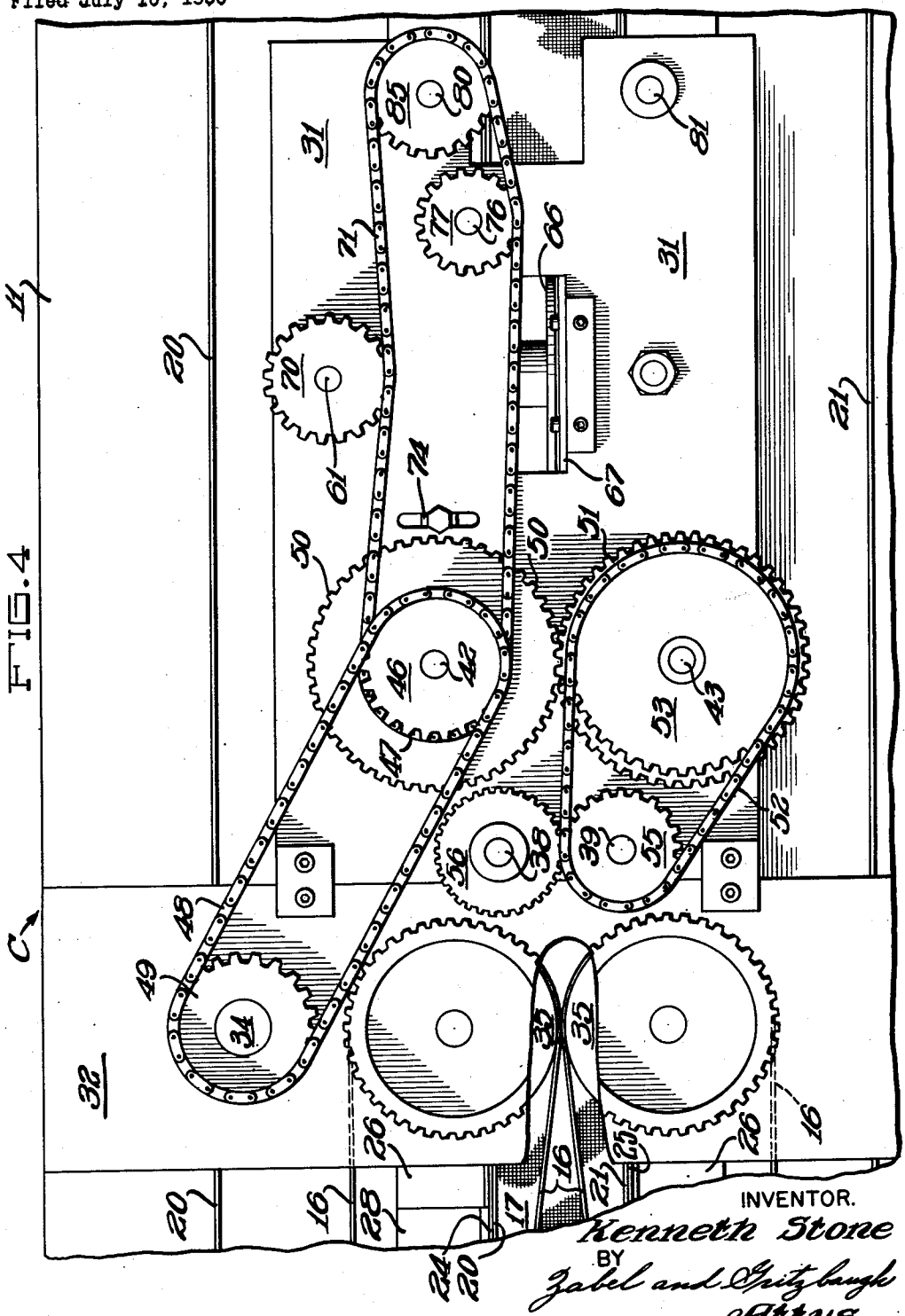
FIG. 3

INVENTOR.
Kenneth Stone
BY
Zabel and Gritzbaugh
Attys

June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 3



June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 4

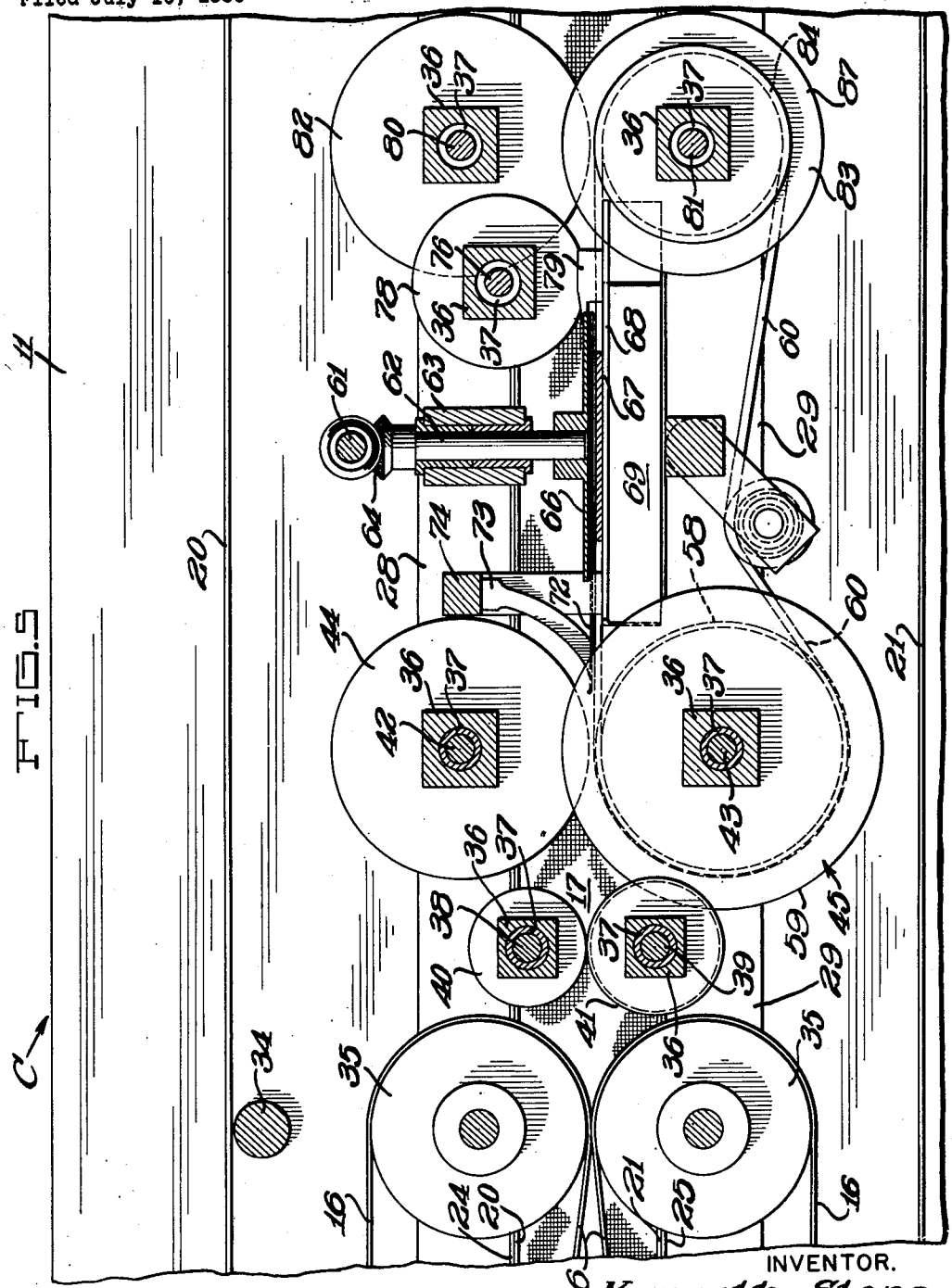


FIG. 5

INVENTOR.
Kenneth Stone
BY
Zabel and Fritzinger
Attys

June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 5

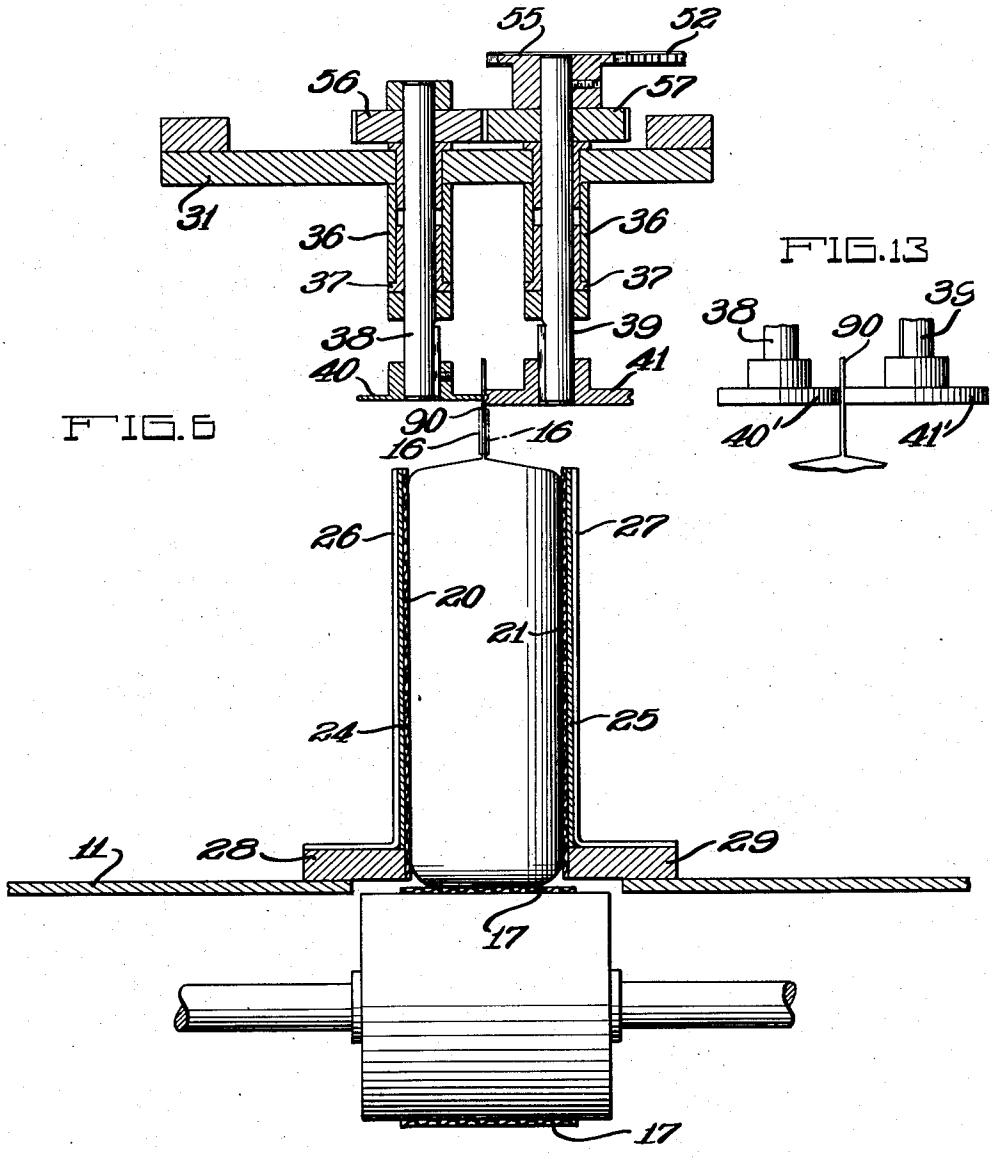


FIG. 6

FIG. 13

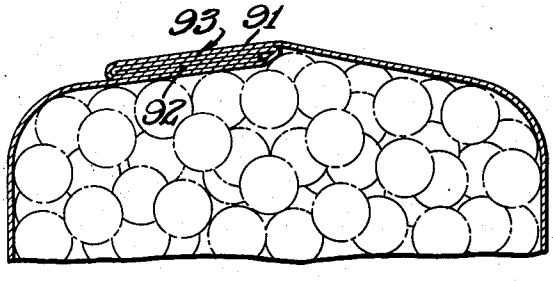


FIG. 7

INVENTOR.
Kenneth Stone
BY
Zabel and Gritzbaugh
Attys

June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 6

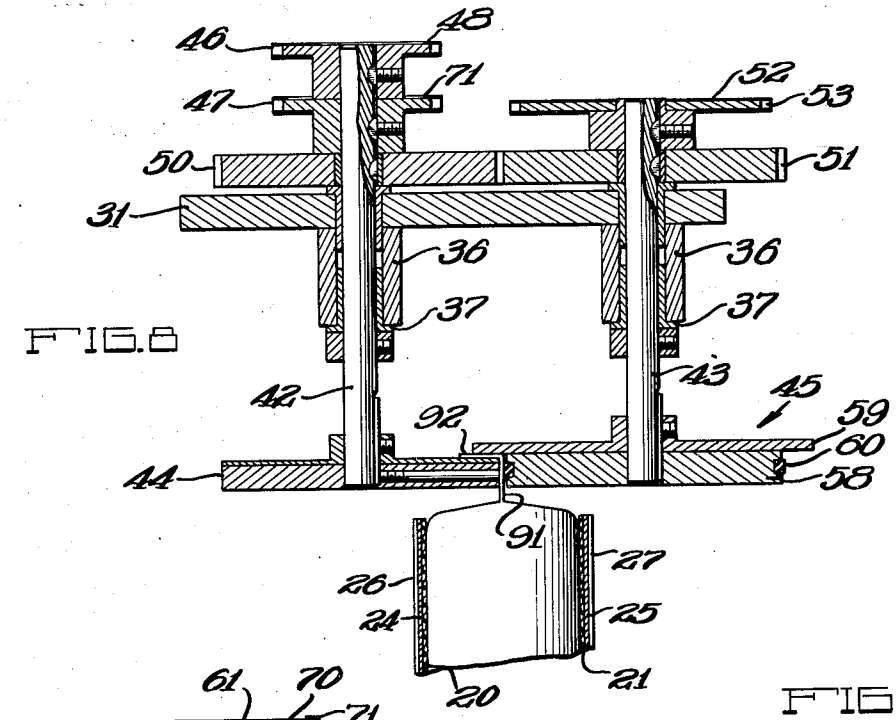


FIG. 8

FIG. 9

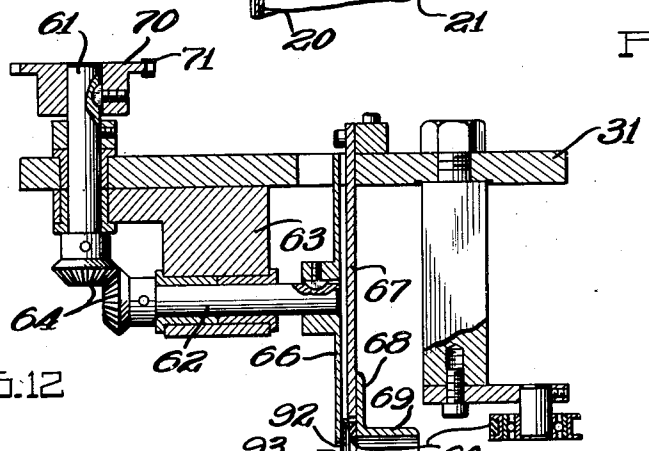
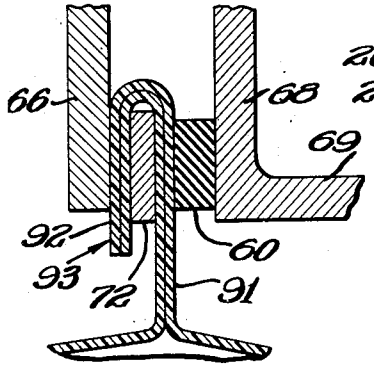


FIG. 12



INVENTOR.
Kenneth Stone
BY
Zabel and Fritzbaugh
Attys

June 16, 1953 K. STONE 2,641,880

FOLDING MECHANISM

Filed July 10, 1950 7 Sheets-Sheet 7

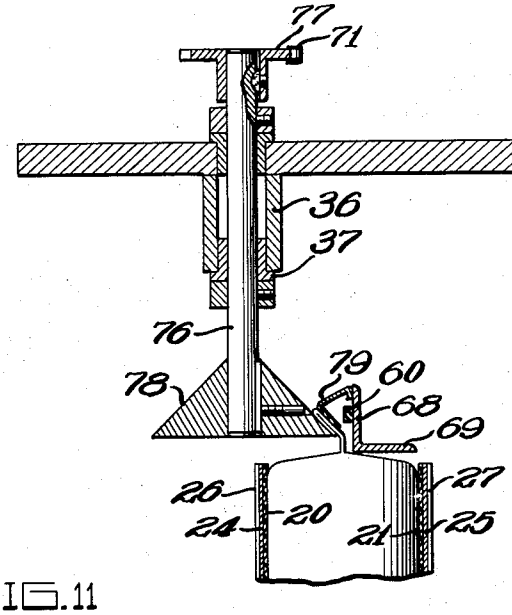
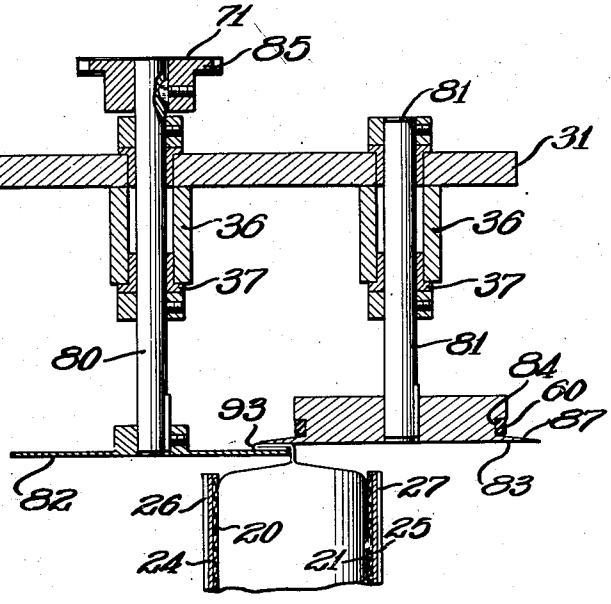


FIG. 10

FIG. 11



INVENTOR.
Kenneth Stone
BY
Zabel and Gritzbaugh
Attys

Patented June 16, 1953 2,641,880

UNITED STATES PATENT OFFICE

2,641,880

FOLDING MECHANISM

Kenneth Stone, Longmeadow, Mass., assignor to Neostyle, Incorporated, Chicago, Ill., a corporation of Nevada

Application July 10, 1950, Serial No. 172,844

14 Claims. (Cl. 53—20)

1

This invention relates to improvements in folding mechanisms, and in particular to a flap folding mechanism which operates on the flap of a continuously moving bag, thus permitting the folding mechanism to be incorporated as a part of a complete machine for shaping and sealing bags.

Heretofore, in flap folding mechanisms the bag is caused to move past a stationary plowshare member which engages and turns down the flap. Mechanisms of this type do not operate satisfactorily on cellophane bags which are characterized by their lack of stiffness, since the friction between the plowshare member and the cellophane will cause wrinkling and also is likely to result in a lopsided fold. Furthermore, in humid weather, the cellophane tends to stick to the plowshare member, and this is likely to result in tearing.

It is an object of my invention to provide a flap folding mechanism in which the friction between the flap and the folding members is largely eliminated to the end that the aforementioned difficulties are avoided.

It is a further object to provide a folding mechanism in which the flap is positively advanced during the folding operation, thus permitting the mechanism to operate on exceedingly compliant materials such as cellophane.

A further object is to provide an improved folding mechanism which is characterized by a plurality of disk-like folding members which operate in succession on continuously moving sheet material to the end that a double fold may be imparted to the material.

With reference now to the drawings in which like reference numerals designate like parts:

Fig. 1 is a plan view of a bag closing machine embodying a preferred form of my invention;

Fig. 2 is an elevation thereof;

Fig. 3 is an enlarged elevation of the flap folding mechanism;

Fig. 4 is a plan view of Fig. 3;

Fig. 5 is a horizontal section taken along line 5—5 of Fig. 3;

Fig. 6 is a vertical section taken along line 6—6 of Fig. 3;

Fig. 7 is a section taken through a completely closed bag showing the folded flap;

Fig. 8 is a section taken along line 8—8 of Fig. 3 showing the first folding station;

Fig. 9 is a section taken along line 9—9 of Fig. 3 showing the second folding station;

Fig. 10 is a section taken along line 10—10 of Fig. 3 showing the tab deflecting station;

2

Fig. 11 is a vertical section taken along line 11—11 of Fig. 3 showing the third folding station;

Fig. 12 is an enlarged detailed view of a portion of Fig. 9; and

Fig. 13 is a detailed section similar to Fig. 6, but showing a modification.

With reference now to Figs. 1 and 2, the machine comprises a frame designated generally by the reference numeral 10 and which includes a base plate 11, and one or more legs 12, and other conventional frame elements not shown.

As shown in Figs. 1 and 2, the machine comprises a bag receiving portion A, a bag shaping and closing portion B, and a flap folding mechanism C. The machine may also include bag sealing means disposed to the right of the flap folding mechanism C, which forms no part of the present invention and is not shown herein. The bags move from left to right as shown in Figs. 1 and 2. The bag receiving portion A is of substantial length, but for the sake of clarity, only a portion of it is shown, as indicated by the break lines.

The bag shaping and closing portion B includes a tucker 15, the construction and operation of which is described more fully in my co-pending application Serial No. 84,791 filed April 1, 1949.

The bags are advanced forwardly by means of a conveyor belt 17, the upper span of which may be supported by a suitable track, not shown. The conveyor belt is disposed between two pulleys, one of which, pulley 19, is disposed at the left end of the machine and the other one of which is at the right end of the machine and not shown.

Vertically disposed shaper belts 20 and 21 are also provided which engage the side walls of the bag and serve to shape the bag as it moves through the machine. The shaper belts and the conveyor belt are driven at the same rate of speed by conventional means, not shown herein. Each shaper belt is disposed between two pulleys, only one of which is shown herein. The pulley 22 is disposed at the extreme left end of the machine, and pulley 23 about which the shaper belt 21 passes, is disposed at the left-hand end of the shaping and closing portion B. Thus, the conveyor belt 17 and the shaper belt 20 extend all the way out to the bag receiving portion A. Filled bags are placed on the conveyor belt at the bag receiving portion, and they lean against the shaper belt 20 and are advanced by belts 17 and 20 up to the closing and shaping portion B.

In shaping and closing portion B, the belts 20 and 21 pass over shaper plates 24 and 25 so that the side walls of the bag may be shaped. These shaper plates are suitably mounted by means of brackets 26, 27 on supporting plates 28 and 29 respectively, which are spaced above the base plate 11 and are mounted in suitable ways, not shown, for sliding movement toward and away from each other. Thus, the distance between the shaper belts may be adjusted for different size bags.

Suitable guide pulleys are provided so that the belt paths converge to form a throat 30. As the bags pass through the throat, the shaper belts straighten up the bags and perform a preliminary shaping operation. From the throat, the bags are continuously advanced past the tucker 15 which is intermittently rotated in such a manner that the end walls of the bags are tucked inwardly so that the side walls of the bag may be brought together or closed by the closing belts 16, thereby providing the flap 90 which is folded by the flap folding mechanism C.

The flap folding mechanism as shown in Figs. 1–4 comprise a top plate 31 which is suitably spaced from the base plate 11, and which is supported at one end by a bridge plate 32. The bridge plate in turn is supported by uprights 33. A vertically disposed drive shaft 34 is journaled in bridge plate 32 and is driven by suitable means not shown. Also journaled in the bridge plate 32 are pulleys 35 which drive the closing belts 16.

Mounted in the top plate 31 are suitable sleeves 36 and bushings 37 in which are journaled various vertically disposed shafts, including shafts 38 and 39, as shown in Fig. 6. Secured to the lower ends of shafts 38 and 39 are creasing wheels 40 and 41, respectively, which cooperate with each other to engage the flap 90 of a bag and to provide a crease or score line therein.

Shafts 42 and 43 are also suitably journaled in the top plate 31 and carry at their lower ends a first pair of folding wheels 44 and 45, respectively. The shaft 42 also carries at its upper end sprockets 46 and 47. Shaft 42 is driven from drive shaft 34 by a chain 48 which meshes with sprocket 46 and with a sprocket 49 which is carried at the upper end of the drive shaft 34. Shaft 43 is driven from shaft 42 by means of gears 50 and 51, as shown in Fig. 4. Shaft 43 carries a sprocket 53 for driving a chain 52, the chain meshing with a sprocket 55 carried on shaft 39 so that the latter may be driven from shaft 43. Shaft 38 is driven from shaft 39 by means of gears 56 and 57.

By means of these sprockets, chains and gears above referred to, the shafts 38, 39, 42 and 43 are driven from the drive shaft 34. When a bag is advanced into folding mechanism by the conveyor belt 17 and the shaper belts 20 and 21, the flap 90 will pass first between the creasing wheels 40 and 41 and then between the folding wheels 44 and 45, as shown in Figs. 6 and 8. The creasing wheel 41 is provided with a groove which accommodates the edge of creasing wheel 40. Thus, when bags of relatively heavy paper, such as kraft paper, are operated upon, a crease or a score may be formed in the flap which will facilitate the first bending operation. However, when relatively pliable bag materials are used, such as cellophane, the creasing operation is not necessary, and feeding wheels 40' and 41' may be substituted for the creasing wheels 40 and 41, as shown in Fig. 13.

The folding wheel 45 comprises two parts, an abutting wheel 58 and an overlapping disk 59.

The abutting wheel 58 abuts with the folding wheel 44 to hold securely in upright position the base portion 91 of the flap 90 at the time when the end portion 92 is engaged by the overlapping disk 59 and folded down over the surface of the folding wheel 44. Thus, a 90° fold is imparted to the flap. The shafts 42 and 43 are driven at such a speed that the peripheral speeds of the folding wheel 44 and the abutting wheel 58 are equal to each other and equal to the speed at which the bag is being advanced. Due to the relative movement between the overlapping surfaces of the elements 44 and 59, it has been found there is a tendency to wrinkle when pliable material is folded, which tendency is overcome by positively holding the base portion 92 of the flap at the time that the end portion is being folded. This holding is effected by the provision of the abutting wheel 58, and in part by the provision of a belt or silent chain 60 which is received in a groove formed in the periphery of the abutting wheel 58.

From the first pair of folding wheels 44 and 45, the bag is advanced to a vertically disposed folding wheel 66 which is secured to a horizontal shaft 62 driven from a vertical shaft 61 by means of beveled gears 64. As shown in Fig. 9, the vertical shaft is suitably journaled in the top plate 31, and the horizontal shaft is suitably journaled in a bracket 63 depending from the underside of the top plate. Closely spaced from the plane of rotation of the vertical wheel 66 is a vertical plate 67 which is secured to and depends from the top plate 31. An angle iron 68 is carried at the lower part of the plate 67 and is disposed generally horizontally, and as shown in Fig. 3 it is extended beyond plate 67. The angle iron is provided with a presser flange 69 adapted to engage the top surface of a bag as shown in Fig. 10, and it is inclined downwardly and to the right so that the top surface of the bag will be brought into engagement therewith in the course of its movement. The belt 60 passes along the vertical surface of the angle iron so that the outer surface of the base portion 91 is positively engaged and advanced by the belt as the end portion is folded downwardly against the inside surface of the base portion to form a tab 93. This relationship of the parts is shown in Figs. 9 and 12.

In order to facilitate the folding operation, and in particular, in order to maintain the fold line oriented in the direction of bag movement, an anvil 72 is provided over which the flap is folded. This anvil is in the form of a thin strip of steel, which may be somewhat resilient, the anvil being carried by a finger 73 shown in Fig. 5 which is supported by a suitable bracket 74. The anvil extends from the vicinity of the bite between elements 44 and 58 to a point opposite the vertical fold wheel 66.

The vertical shaft 61 carries a sprocket 70 which is engaged and driven by chain 71. As shown in Fig. 4, the chain passes around sprockets 47 and 85, and also serves to drive a sprocket 77.

A vertical shaft 76 is journaled in top plate 31 and carries the aforementioned sprocket 77. A cone wheel 78 is carried by the shaft 76 at its lower end and cooperates with a deflector 79 to deflect the tab 93 to one side, to facilitate the third folding operation. As indicated in Figs. 3, 5 and 10, the deflector 79 is mounted on the angle iron 68, and extends to the left of the axial plane of the cone wheel 78 as viewed in Fig. 3. The deflector is shaped so as to initially engage the

tab 93 when it is in its upright position, and to gradually deflect the tab into the position shown in Fig. 10. The provision of the cone wheel 78 serves to localize the bending of the base portion at a point which will substantially coincide with the fold line made by a second pair of fold wheels 82 and 83.

The latter fold wheels are carried by vertical shafts 80 and 81 respectively which are journaled in the top plate 31 which are shown in Fig. 11. The fold wheels 82 and 83 overlap in much the same manner as fold wheels 44 and 45. If desired, the fold wheel 83 may be provided with an abutting wheel portion, corresponding to element 58, but since the tab 93, due to previous folding operations is stiffer than the flap 90 in its unfolded position, this abutting element may be eliminated, if desired. The fold wheel 83 includes a pulley portion 84 for the belt 60.

The fold wheel 82 and its shaft 80 are driven by the chain 71 which meshes with the aforementioned sprocket 85. The fold wheel 83 is driven by means of the belt 60.

The extended portion of angle iron 68 is slotted as indicated by the reference numeral 86 in Fig. 3 to accommodate the overlapping portion 87 of fold wheel 83.

The operation of the folding mechanism, which has heretofore been described in detail in connection with the description of the several parts thereof, may be summarized as follows: a bag after its end walls have been tucked in by the tucker 15 to form a flap 90, is advanced in its upright position by means of the conveyor belt 17 and shaper belt 20 and 21 so that the flap 90 first passes between rotating elements 40 and 41 as shown in Fig. 6. The length of the flap is determined by the position of the closing belts 16 which are shown in dotted lines in Fig. 6. The rotating elements 40 and 41 serve to bring together the central portion of the flap preparatory to the first folding operation. If the bag is formed of heavy sheet material, it is desirable that the rotating elements 40 and 41 score or crease the flap; in case of cellophane bags the scoring operation may be eliminated, if desired.

The first folding operation is shown in Fig. 8. The overlapping fold wheels 40 and 45 impart a first 90° fold to the flap so that the end portion 91 of the flap is disposed substantially 90° to the base portion 92. The second fold operation causes the end portion to be folded against the base portion to form a tab 93, as shown in Figs. 9 and 12. Although the flap is folded over a stationary anvil, the friction between the flap and the anvil will not cause wrinkling since both surfaces of the resulting tab are being positively advanced by the belt 60 and by the vertical wheel 66, respectively.

The tab 93 is then folded downwardly through a 90° angle by means of a second pair of folding wheels 82 and 83, as shown in Fig. 11. This folding operation may be facilitated by the deflecting means shown in Fig. 10 which comprises a stationary deflector 79 and a cone wheel 78, the flap contacting peripheral portions of which are driven at substantially the same peripheral speed as the speed of bag movement. Thus, throughout all of the operations heretofore mentioned, the flap is being positively advanced by the folding or deflecting elements to the end that there will be no retarding force which acts on the flap in such a manner as to cause wrinkling.

After the final folding operation, the bag may pass under suitable sealing means not shown which press the tab against the upper surface of the bag as shown in Fig. 7, and seal it in this position.

It is contemplated that the embodiment herein shown and described be used in connection with heat sealing bags so that the sealing is effected by a heated roller. However, other sealing means may be employed without departing from the spirit of this invention.

The terms "inner surface" and "outer surface" of the base portion 91, as used herein, refer to the left and right surfaces respectively as viewed in Figs. 8, 9 and 12. The terms "vertical" and "horizontal" are used herein in the relative sense only.

I claim:

1. Means for folding continuously moving vertically disposed sheet material comprising a first pair of horizontally disposed overlapping disks for imparting a 90° fold in which the end portion of said sheet material is disposed substantially 90° to an adjacent base portion, a vertically disposed disk spaced from said first pair of disks for engaging said end portion at a point adjacent the line of said fold to impart a second 90° fold to said end portion whereby said end portion is folded against said base portion to form a tab, a vertically disposed thin strip positioned to lie adjacent the inner surface of said base portion at a point opposite said vertically disposed disk to provide an anvil over which said second 90° fold may be made, and means to rotate said disks at peripheral speeds substantially equal to the speed of movement of said sheet material whereby said end portion will be independently advanced during said folding operations.

2. Folding mechanism as claimed in claim 1 which includes means for engaging and advancing the outer surface of said base portion at a point opposite said anvil so that both outer surfaces of said tab may be independently advanced during the second folding operation.

3. Folding mechanism as claimed in claim 1 which includes a belt engaging the outer surface of said base portion at a point opposite said anvil, and means to advance said belt at a speed substantially equal to the speed of movement of said sheet material.

4. Folding mechanism as claimed in claim 1 which includes a second pair of overlapping disks spaced from said vertically disposed disk for imparting a 90° fold to said tab, and means to rotate said last mentioned disks at peripheral speeds substantially equal to the speed of movement of said sheet material.

5. Folding mechanism as claimed in claim 4 which includes deflecting means disposed between said vertically disposed disk and second pair of overlapping disks.

6. Folding mechanism as claimed in claim 5 in which said deflecting means comprises a stationary deflector disposed at one side of said tab, and a rotating cone disposed on the opposite side of said tab and cooperating with said deflector to engage and advance a tab past said stationary deflector.

7. Mechanism for folding the flap of a continuously moving bag comprising a pair of horizontally disposed overlapping rotating disks for folding said flap so that the end portion thereof is disposed substantially 90° to the base portion of said flap, a vertically disposed rotating disk spaced from said pair of disks for engaging said end portion to fold the same downwardly ad-

jacent said base portion to form a folded tab, an anvil extending from a point in the vicinity of the bite of said pair of overlapping disks to a point adjacent said vertically disposed disk and positioned to lie adjacent the inner surface of said base portion immediately beneath the fold line to maintain said fold line oriented in the direction of bag movement, a belt bearing against said anvil and adapted to press said base portion against said anvil, and means for driving said belt so as to advance said flap past said vertically disposed disk.

8. The method of folding the flap of a continuously moving bag through 180° to provide a tab which comprises the step of engaging and advancing the flap at a point below the fold line at the same time that a first 90° fold is imparted to the flap, and the steps of engaging and advancing the outer surfaces provided by the folding of said flap at the same time that a second 90° fold is imparted to said flap, and simultaneously engaging the inner surface, provided by the folding of said flap, at said fold line to support the same during said second folding operation.

9. Bag folding means comprising means for advancing a bag to be folded and for maintaining said bag with the flap in an upright position in combination with a first means for imparting a ninety degree fold to said flap, said first means comprising a pair of abutting wheels disposed in the path of said flap and having vertically disposed peripheral edges for advancing both surfaces of the flap at substantially equal rates of speeds, one of said wheels having a flange portion overlapping the other of said wheels for imparting said ninety degree fold to said flap, and second means for imparting a second ninety degree fold to said flap and for simultaneously engaging and advancing said flap, said second means comprising a vertically disposed rotating disk for engaging, advancing and folding one surface of said flap, means engaging and advancing an opposite surface of said flap, and an anvil disposed between said vertically disposed disk and said last mentioned means to maintain the fold line of said flap oriented in the direction of bag movement.

10. Bag folding mechanism as claimed in claim 9 including a pair of closing belts adapted to engage the side walls of a bag to bring them together so as to define said flap portion, said closing belts being disposed in advance of said abutting wheels.

11. Folding mechanism as claimed in claim 10 including a pair of flap scoring wheels disposed between said closing belt and said abutting wheels.

12. Folding mechanism as claimed in claim 9 which includes a pair of overlapping wheels disposed beyond said vertically disposed disk for imparting a third 90° fold to said flap.

13. Mechanism for folding the flap of a continuously moving bag comprising a pair of horizontally disposed overlapping rotating disks for folding said flap so that the end portion thereof is disposed substantially 90° to the base portion of said flap, a vertically disposed rotating disk spaced from said pair of disks for engaging said end portion to fold the same downwardly adjacent said base portion to form a folded tab, and means disposed adjacent said vertically disposed disk and cooperating therewith for advancing said flap as it is being folded.

14. In a bag folding machine of the type which folds the flap of a continuously moving bag through 180° in two 90° folding steps, means for imparting the second 90° fold to said flap comprising a vertically disposed rotating disk for engaging one of the outer surfaces of said partially folded flap to fold the same downwardly and to simultaneously advance the same, means engaging and advancing the opposite outer surface of said flap, and an anvil disposed between said vertically disposed disk and said last mentioned means to maintain the fold line of said flap oriented in the direction of bag movement.

KENNETH STONE.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,938,750	Litchfield	Dec. 12, 1933
1,956,160	Shoemaker	Apr. 24, 1934
2,218,585	Merkle	Oct. 22, 1940
2,253,036	Kimple	Aug. 19, 1941