# United States Patent

[11] **3,548,998**


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[54] **AUTOMATIC FEEDING MECHANISM**
**21 Claims, 11 Drawing Figs.**


[52] **U.S. Cl.** ..... **198/24**
[51] **Int. Cl.** ..... **B65g 47/00**
[50] **Field of Search** ..... 198/24, 19; 140/1; 209/75, 85



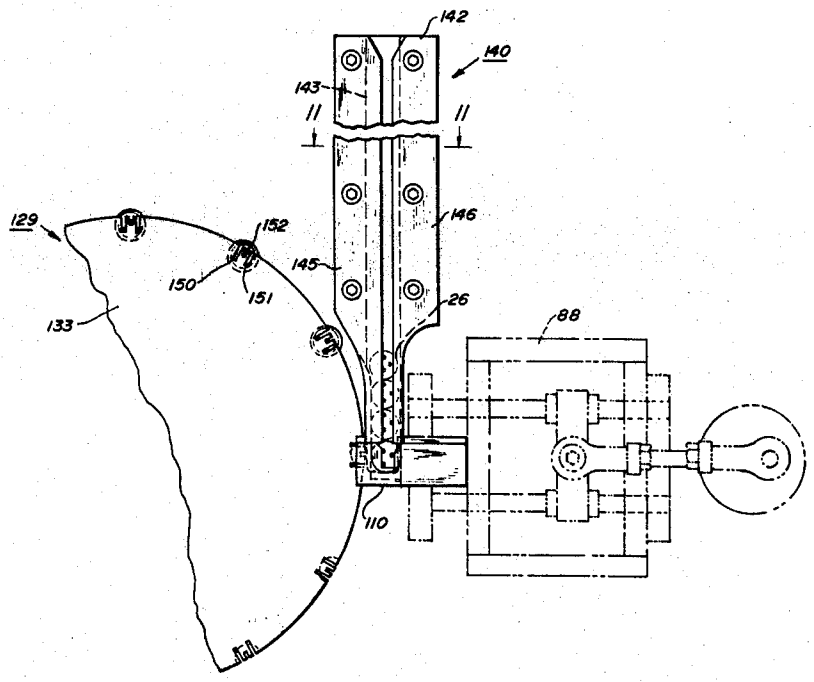
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*Attorney*—Ralph R. Roberts



**ABSTRACT:** A feeding mechanism is cycled in synchronism with a transistor lead cutting and shaping apparatus. This transistor feeding mechanism receives the transistors from a chute in an oriented condition and one at a time transports the transistors to the transfer mechanism for the cutting and bending operations. The feeding mechanism is reciprocated by a crank arm whose length is adjusted to provide a determined dwell time at each end of the feeding cycle.

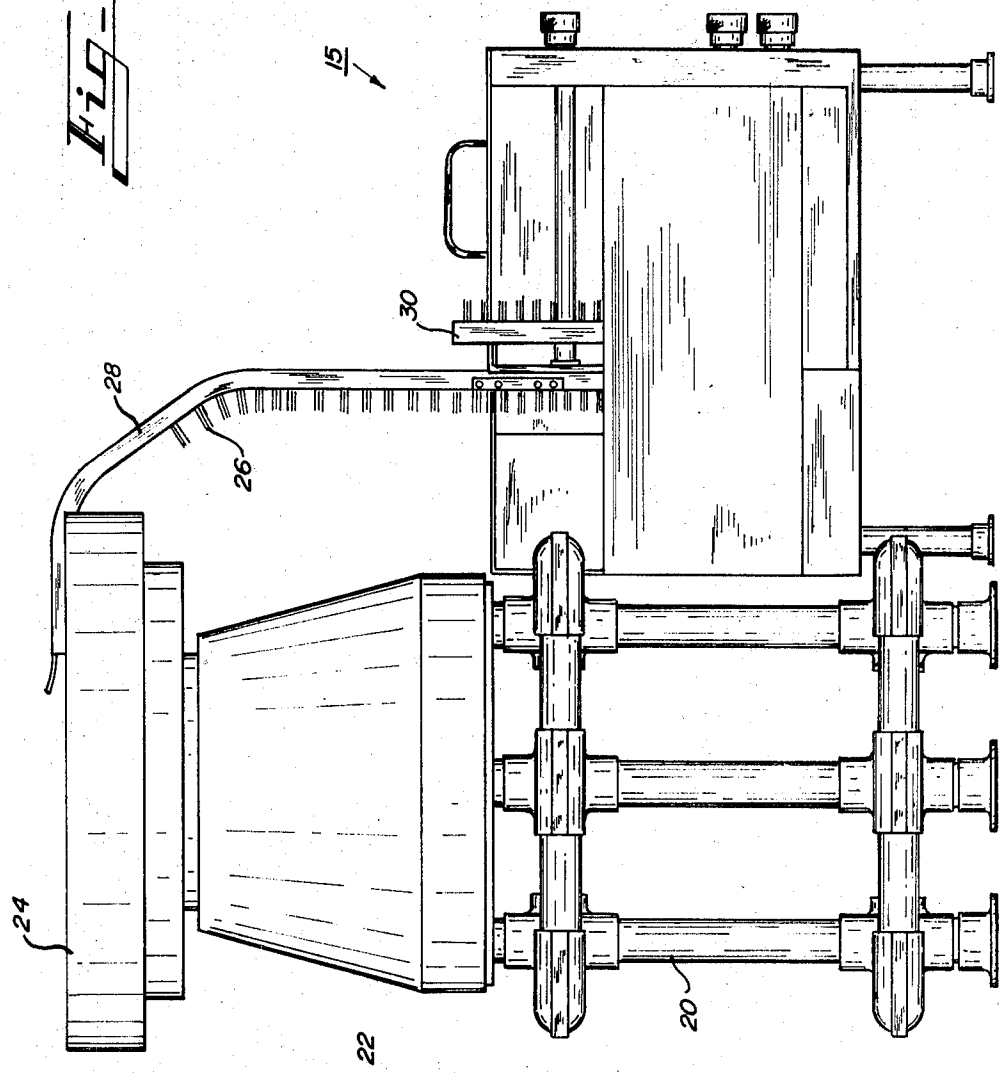



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SHEET 1 OF 3

Fig. 1.




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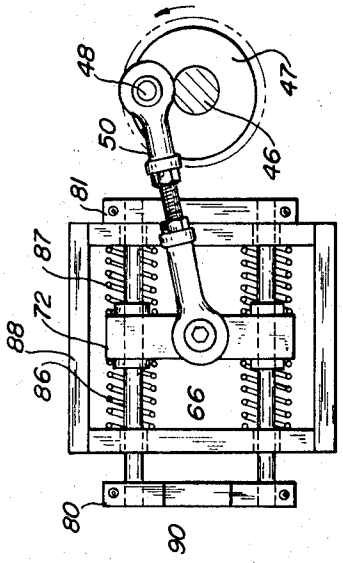



Fig. 4.

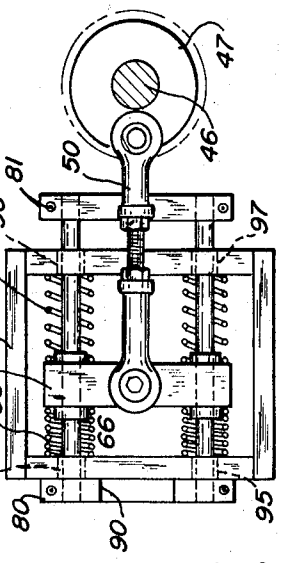



Fig. 5

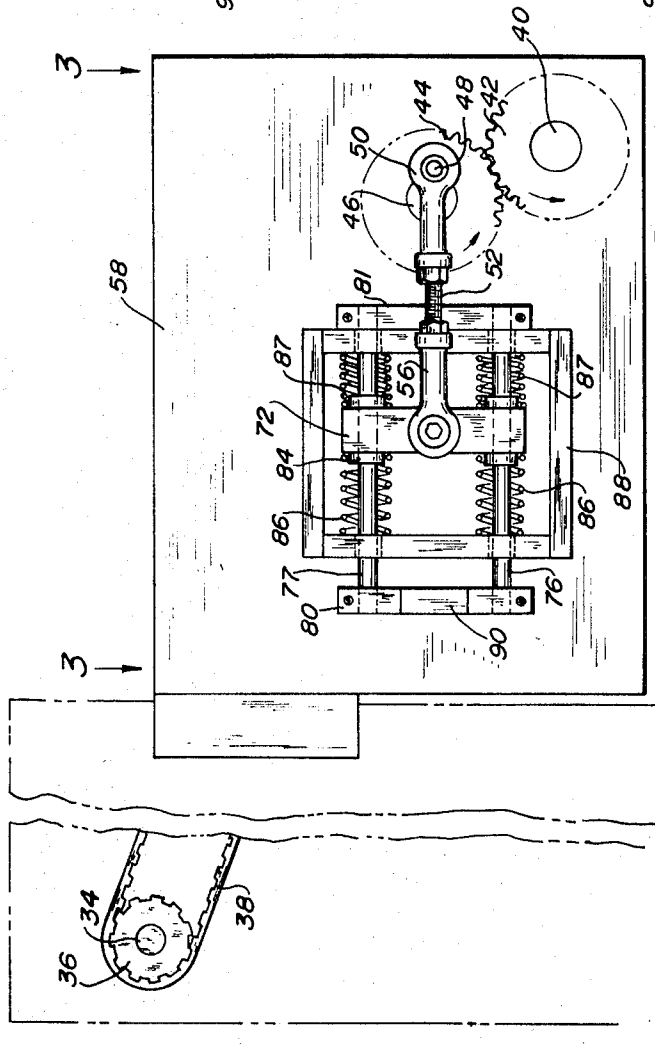



Fig. 2.

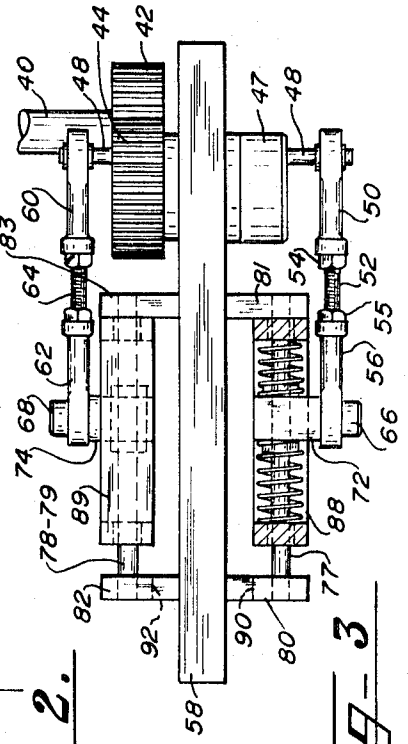



Fig. 3

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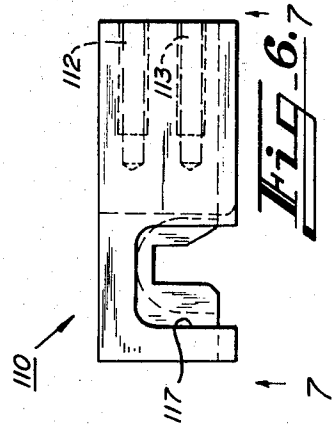



Fig. 6.

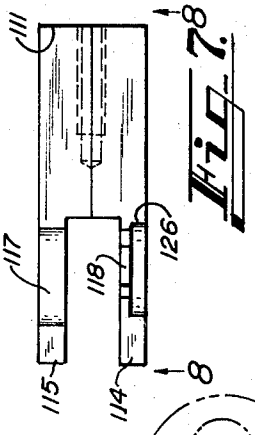



Fig. 7.

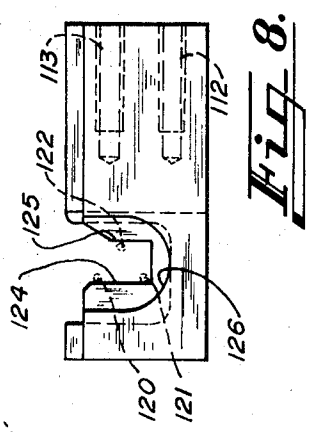



Fig. 8.

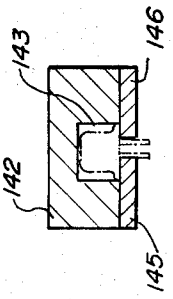



Fig. 11.




Fig. 10.

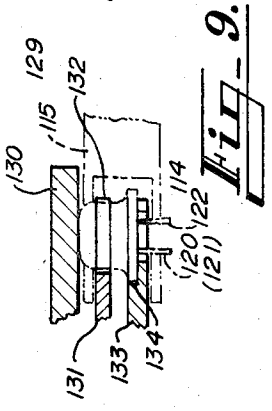
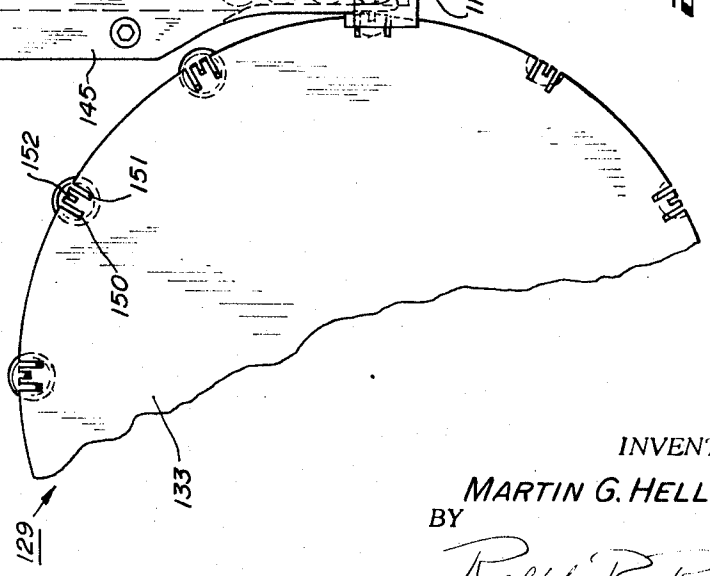



Fig. 9.




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# AUTOMATIC FEEDING MECHANISM

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of art to which this invention pertains is the general class of wireworking and in particular to the subclass wherein there is "combined machines." The art may also pertain to the class of classifying, separating, and assorting solids and the subclass of "automatic assorting."

2. Description of the Prior Art

The rapidly expanding and extensive use of the transistor in the many every day electrical apparatus as well as computers and the like has brought equipment for the automatic cutting and bending of the several leads of the transistors into widespread use. In particular, the processing of transistor leads by apparatus such as that shown and claimed in U.S. Pat. No. 3,396,758 to R.L. Hall issued Aug. 13, 1968 has been quite successful. Apparatus according to the Hall patent is now used by many companies to daily process many thousands of like transistors. However, the apparatus of the Hall Pat. is adapted for a hand feeding of the transistors to a sloped feeding chute. This hand feeding limits the production of processed transistors of the manual dexterity and effort of the operator, which rate or speed is often less than satisfactory.

Other electrical component processing apparatus such as that shown in U.S. Pat. NO. 3,236,374 to Zimmerman issued Feb. 22, 1966; as in U.S. Pat. No. 3,276,580 to Horn et al. issued Oct. 4, 1966; U.S. Pat. No. 2,961,027 to Ullman et al. issued Nov. 22, 1960, and U.S. Pat. No. 3,032,191 to Clukey et al. issued May 1, 1962 use hand loading techniques for their source of supply.

In the present invention an automatic loading apparatus eliminates the necessity of hand loading and increases the production by about five times. For example, with hand loading, an average operator of the apparatus of the Hall Pat. is expected to feed about one thousand oriented transistors per hour to the chute. With the automatic feeding mechanism of this invention, a feed rate of 5,000 transistors per hour has been produced as an actual reduction to practice.

## SUMMARY OF THE INVENTION

In the automatic feeding mechanism of this invention, transistors in an oriented array are fed one at a time to a gravity discharge chute. At the lower end of this discharge chute a receiving die is cycled from in way of the end of the chute to a transfer position at a receiving pocket in a transport wheel of the transistor lead processing apparatus of the Hall Pat. The receiving die is reciprocated between a receiving limit or position and a discharge limit or transfer position of movement. The cycling action of the die is provided by a crank arm driven adjustable connecting arm attached to a header block. The header block engages opposed compression springs which also engage a cycling frame which removably carries the die. The length of the connecting arm is adjusted to lengthen or shorten the dwell times at the ends of the cycling stroke.

It is an object of this invention to provide an automatic feeding mechanism for transistors, in which mechanism there is provided a receiving die adapted to receive oriented like-sized transistors from a delivery chute and one at a time deliver these oriented transistors to a receiving pocket in a transport wheel of a transistor lead processing apparatus.

It is a further object of this invention to provide an automatic feeding mechanism for transistors wherein a receiving die is carried by a frame member reciprocated in response to the movement of a connecting arm of adjustable length. This frame member is immediately engaged by compression springs engaged by a header block driven by the connecting arm which is shortened or lengthened to adjust the dwell time of the receiving die at its two limits of movement.



## INTENT OF THE DISCLOSURE

Although the following disclosure offered for public dissemination is detailed to insure adequacy and aid in the understanding of the invention, this is not intended to prejudice that purpose of a patent which is to cover each inventive concept therein no matter how it may later be disguised by variations in form or additions. The claims at the end hereof are intended as the chief aid toward this purpose, as it is these that meet the requirement of pointing out the parts, improvements, combinations or methods in which the inventive concepts are found.

There has been chosen a specific embodiment of the automatic feeding mechanism for transferring oriented transistors from a chute to a transistor lead processing apparatus and for synchronized use therewith. The embodiment includes a preferred means for feeding the transistors in an oriented manner to a gravity chute. This specific embodiment has been chosen for the purpose of illustration and description as shown in the accompanying drawings wherein:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a side view of a supply hopper and an automatic feeding mechanism for use with a processing apparatus for bending and trimming the leads of a transistor;

FIG. 2 represents a partially diagrammatic side view showing a portion of the internal arrangement of the transistor feeding mechanism with the transistor transferring apparatus disposed in one limit position of operation;

FIG. 3 represents a fragmentary plan view of the cycling apparatus of FIG. 2, the view being taken on the line 3–3 of FIG. 2 and looking in the direction of the arrows;

FIG. 4 represents the cycling frame of the apparatus of FIG. 2 wherein the connecting arm has been moved to a different orientation of the cycling stroke;

FIG. 5 represents the cycling frame of FIG. 4 wherein the connecting arm has now been moved to its forwardmost position of cycling stroke;

FIG. 6 represents a side view of a transistor receiving die disposed for use with the cycling mechanism of FIG. 2;

FIG. 7 represents a top or plan view of the receiving die of FIG. 6, the view taken on the line 7–7 of FIG. 6 and looking in the direction of the arrows;

FIG. 8 represents a side view of the other side of the receiving die of FIG. 6, the view taken on the line 8–8 of FIG. 7;

FIG. 9 represents a partly fragmentary and diagrammatic representation of the transport wheel of the transistor processing apparatus and the relationship of the receiving die of FIG. 7 thereto;

FIG. 10 represents a partly fragmentary and diagrammatic representation of the transistor feeding mechanism and showing in particular the receiving wheel of the transistor processing apparatus and the disposition of a feeding chute to the receiving die of FIGS. b, 7 and 8; and

FIG. 11 represents a cross-sectional view of the transistor transfer chute of FIG. 9, the view taken being on the line 11–11 of FIG. 10.

In the following description and in the claims, various details will be identified by specific names for convenience; these names, however, are intended to be generic in their application. Corresponding reference characters refer to like members throughout the several FIGS. of the drawings.

## BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in particular to the assembly of FIG. 1, it is to be noted that the apparatus for the processing of transistor leads is generally indicated as 15. This apparatus is shown and described in particular in U.S. Pat. No. 3,396,758 issued to R. L. Hall on Aug. 13, 1968. In the apparatus and method as disclosed in said U.S. patent the transistors for processing are oriented and fed one by one to the transfer wheel by means of

a finger chute. These transistors are oriented and fed by hand to the wheel. The structure and method of the lead processing apparatus of U.S. Pat. No 3,396,758 is incorporated by reference into the present specification. In particular, the preferred embodiment of this invention is directed to automating the feeding of oriented transistors to the transfer wheel shown in this patent.

In the general arrangement of FIG. 1 and to the left of the apparatus generally indicated as **15**, there is provided a pipe stand **20** upon which is mounted a vibratory feeder unit **22**. This feeder unit carries an orienting and storage bowl **24** of special design and adapted to align and feed transistors having their leads extending from one side. From this bowl, a continuous supply of transistors **26** are fed by means of a chute **28** to the transistor lead processing apparatus **15**. Although only one bowl and vibratory feeder apparatus is shown, it is contemplated that two such feeders and chutes may be used to provide the transistor lead processing apparatus with a dual supply when said apparatus is adapted to process a pair of transistors at one and the same time. As the transistors are of various sizes, the vibratory feeders, chutes and associated components are assembled so as to orient and feed from a large supply of like-sized transistors a stream of transistors to the feeding mechanism to be more fully described hereinafter.

The vibratory feeder assembly and associated chute are only indicative of one means of supplying oriented transistors to the processing apparatus within housing **15**; however, whether supplied from a bowl feeder or supplied from a vertical prefilled delivery chute to be hereinafter more fully described, it is contemplated that the delivery of the transistors to the feeding mechanism be by gravity and in a vertical manner. In particular, a removable preloaded chute or delivery guideway **30** is shown to the right of the chute **28**. This removable chute provides a method whereby oriented transistors are pregrouped for feeding to the lead processing apparatus. These prefilled chutes are usually of a size and capacity to retain orientated groupings of two hundred or more transistors.

Referring next to FIGS. **2** and **3**, there is shown the automatic feeding mechanism and means for transferring transistors one at a time into a feeding or transfer wheel of the transistor lead processing apparatus **15**. As seen in particular in FIG. **2**, power to operate the feeding mechanism is derived from the lead processing apparatus. On one of the powered shafts of the processing apparatus, which shaft is identified as the driver or power shaft **34**, there is mounted a timing belt pulley **36** which drives a timing belt **38**. This belt extends to and rotates a timing belt pulley, not shown, and which is mounted on and drives a driven shaft **40**. This belt **38** is preferably positioned to the outside of the apparatus so as to provide ready access for repair and places the drive out of the way of the feeding mechanism. A spur gear **42** is carried on shaft **40** and this gear meshes and, as it is rotated, turns a like-sized spur gear **44** carried on and driving a shaft **46**. A hub member **47** is mounted on the near end of shaft **46** and carries a crankpin **48** which retains one end of an antifriction rod end **50**. Gear **44** also carries a like crankpin **48** which is aligned with the near crank pin **48**. As shaft **46** is rotated, both crankpins are moved simultaneously with their axis in coincidence.

Rod end **50** has its threaded end mounted on a threaded shaft or stud **52**. Lock nuts **54** and **55** are also carried on this shaft **52**. The left end of shaft **52** has mounted thereon an antifriction rod end **56**. The combination of members comprising the rod ends **50** and **56**, shaft **52** and nuts **54** and **55** provide a connecting rod assembly which is adjustable in length for a purpose to be hereinafter more fully described. As seen in FIG. **3**, this connecting rod assembly is disposed at the bottom of the view. A like connecting rod assembly is also shown in the upper portion of the FIG. **3** and on the opposite side of support plate **58**. This upper or opposite connecting rod assembly includes antifriction rod ends **60** and **62** mounted on and carried by threaded shaft or stud **64**. Nuts **54** and **55** act as lock nuts to retain shaft **64** in position in the rod ends.

As seen in FIGS. **2** and **3**, the crankpins **48** have their axis spaced a determined distance from the axis of shaft **46** whereby. As shaft **40** is rotated, gear **42** causes gear **44** to turn so that the pins **48**, as carried by gear **44** and hub **47**, are carried in a circular path as well as the rod ends **50** and **60** mounted on the respective pins **48**. The rod ends **56** and **62** providing the other ends of the connecting rod assemblies are mounted on shouldered capscrews **66** and **68** which are removably mounted in header blocks **72** and **74**. These blocks are substantially alike and are disposed to carry the rod ends on the outwardly facing portions of the block. Each header block has a pair of spaced bores disposed to carry a pair of ball bushings therein. These header blocks, by means of the ball bushings, are reciprocably carried on shafts or rods **76**, **77**, **78** and **79**. Header block **72** is carried on and is reciprocated on shafts **76** and **77** while header block **74** is carried on and is reciprocated on shafts **78** and **79**. The ends of these shafts or rods are mounted in and are carried by support blocks **80**, **81**, **82** and **83**.

On each side of the header block and mounted partly in the bushing holes in the block are shoulder retaining members **84**. The outer diameters of these shoulder retaining members are sized to receive and retain one of the ends of like compression springs **86** and **87**. These springs are disposed on each side of the header block and have their other ends disposed so as to engage the end members of a die frame **88** or **89**. Die frame **88** is the near frame and die frame **89** is the far frame. The springs **86** and **87** are alike in their length and compressive tension and in their installed condition are under a determined amount of compression As the header block is moved back and forth on the shafts toward and away from the support blocks, the springs **86** and **87** are alternately compressed or allowed to expand. It is to be noted that the forward support blocks **80** and **82** are each provided, intermediate their ends, with cutouts ductouts **90** and **92** to permit the movement therethrough of a die to be described hereinafter.

## CYCLING OF THE DIE FRAME

Referring particularly to FIGS. **2**, **3**, **4** and **5**, it is noted that die frames **88** and **89** are carried on and are reciprocated on the shafts or rods **76** through **79**. Bushings **94**, **95**, **96** and **97** are mounted in the end members of each die frame and are sized to slidably guide the die frames. As shaft **46** is turned in response to the rotation of shaft **40** and the meshed gears **42** and **44**, the header blocks **72** and **74** are moved for forwardly and backwardly on the rods. As either the spring **86** or **87** is compressed beyond its average compression, the other spring is relaxed in tension, thereby allowing the frame to be moved by the tensioned spring. For example, as the header blocks **72** and **74** are moved to the left, each spring **86** is compressed and moves the engaged frame **88** or **89** leftwardly. On the reverse stroke or rightward movement of the blocks, the expanded springs **87** are compressed until their compression is greater than springs **86** whereupon the frames **88** and **89** are moved rightwards toward shaft **46**. The use and advantage of this means for cycling of the die frame is more fully described in the use and operation of the complete automatic feeding mechanism described hereinafter.

## TRANSISTOR TRANSPORTING DIE

Referring next to FIGS. **6**, **7** and **8**, there is shown a transistor transporting die **110** which is provided on its rear or mounting surface **111** with a pair of threaded holes **112** and **113**. These threaded holes are for mounting of the die to the frame **88** by bolts not shown. The other end of the die is contoured and is provided with extending ear portions **114** and **115** constructed so as to provide a determined space therebetween. In the extending ear portion **115**, there is provided a cutout pocket **117** which is sized to receive and retain the body of the transistor **26**. The other extending ear portion **114** is formed with a notch **118** having entering chamfers disposed to act as guides for the leads of the transistor. FIG. **8**

shows, in phantom outline, the grouping of leads **120**, **121** and **122** of the oriented transistor **26**. The leads are disposed in the notch **118** with the leads **120** and **121** engaged and retained by a forward face **124** of the notch while the third lead **122** is disposed to engage a back or rear face **125** of the notch. Relief **126** is provided in ear **114** so as to reduce to a practical minimum the support surface of the notch **118**. The less the surface of the notch and the closer to the body of the transistor, the less is there a possibility of a bent lead to affect the orientation and desired positioning of the transistor in the ear portions of the die.

Referring next to FIG. **9**, there is shown a fragmentary view of the transfer wheel **129** of U.S. Pat. No. 3,396,758 to Hall and in particular to the FIGS. **3**, **4**, **4A** and **5** of the patent. In FIG. **9** of this application, the main disc **130** has adjacent thereto a carrier disc **131** with spaced cutouts **132** therein. An outer lead retaining disc **133** has cutouts **134** formed therein for the shoulder of the transistor body. Groups of three notches are also provided in disc **133** to coincide with the disposition of the leads of the transistors. The extending ear portions **114** and **115** are shown in phantom outline and are sized and spaced so that as the die is cycled they are caused to enter between the discs **130** and **131** and to the outside of disc **133**. Although the disc **130** is shown as being a rotating member in the patent, it has been found that this disc can also be made nonrotating. The fixing of the disc reduces the flywheel effect of the transfer wheel assembly and permits a speedup of this mechanism. Whether nonrotating or rotating, the ear **115** enters between disc **130** and **131**, and ear **114** is brought outside and adjacent disc **132**.

Referring next to FIGS. **10** and **11**, there is shown the transport die **110** in attached condition to the front face of die frame **88** which is shown in phantom outline. A chute **140** includes a main back member **142** having a groove **143** formed therein. This groove is sized to receive and slidably guide the head or body of the transistors. Right- and left-hand cover members **145** and **146** are attached to the face of the back member and have their facing edges spaced and positioned so as to act as retaining guides for the oriented transistors **26** carried therein. The two leads **120** and **121** are slidably engaged by the right edge of cover member **145** and the third lead **122** is slidably engaged by the left edge of cover member **146**. The inner faces of the cover members slidably engage the head or body of the transistors. The cooperative operation of the chute and transport die is more fully described below.

## USE AND OPERATION OF EXEMPLIFIED APPARATUS

The automatic feeding mechanism is disposed to receive a supply of transistors **26** from the feeder bowl **24** wherefrom they are fed to and through chute **28** until they are delivered to the chute **140**. In an oriented condition, the transistors are fed by gravity through this chute to the transport die **110** which is adapted to receive and retain a single transistor when the die is positioned as in FIG. **10**. The single transistor **26** in the die **110** supports those transistors which are in the chute **140** above. The die member **110** is moved forwardly from the receiving position to carry the transistor **26** to and into the pocket in the transfer wheel **129**. This forward movement of the die is in timed relationship to the movement of the wheel. This timed relationship is established and maintained by means of the timing belt system of FIG. **2**. As it is moved into the pocket of the transfer wheel, the three leads of the oriented transistor enter the notches **150**, **151** and **152** in the outer disc **133** of the wheel, and the body of the transistor enters the cutout **132** of the carrier disc **131**. As the transfer wheel **129** is moved in a counterclockwise direction, the transistor **26** is lifted from the die **110**, after which the die is moved back to the receiving position of FIG. **10**.

As described in the referenced patent, the transfer wheel **129** is intermittently moved, and by means of the timing belt system, so also is the die **110**. The frame **88** is cycled from the receiving condition of FIG. to the discharge position by the forward movement of header block **74**. The novel feeding mechanism as seen in FIGS. **2**, **3**, **4** and **5** utilizes this timed rotation of shaft **34** to precisely rotate shaft **40** and shaft **46**. As shaft **46** rotates, the orbital path of the crankpins **48** cause header blocks **72** and **74** to reciprocate. From the extreme rear condition of FIG. **2**, the header block **72** is moved to the condition of FIG. **4** whereat spring **87** is allowed to expand to its substantially midlength mounted condition and spring **86** from its expanded condition is beginning to be compressed to a condition in excess of that of spring **87**. In the condition of FIG. **5**, the crankpin **48** is in its forwardmost condition, and the header block has been moved to its forwardmost condition. Spring **86** has been compressed and in so doing, its compressive condition becomes greater than that in spring **87**. Spring **86** thus urges die frame **88** forwardly until it engages and is stopped by support block **80**. As the crank arm **48** is continued in its circular or orbital path, spring **86** is allowed to expand although still compressed by the leftwardly moving header **72**. Spring **87** is compressed until the force in spring **87** is greater than that in spring **86**, whereupon the compressed spring **87** moves die frame **72** rightwardly to the condition of FIG. **2** with the frame stopped against support block **81**. Die frame **89** is also cycled in the same manner and in synchronism with frame **88**.

In the operation of the feeding mechanism, a delay time is needed at each limit of movement of the die **110**. These delay periods permit the transistor at the loading period to fall into the die, and at unloading period to be lifted from the die. In their movement the frames **88** and **89** are caused to be retained at each stop limit for determined periods of time. A calculated overtravel of the header block causing the alternate compression of springs **86** and **87** provides this determined delay time. By adjusting the position of rod ends **50** and **66** on threaded shaft **52**, the forward and rearward extremes of position of the header block is adjusted to the desired condition to provide a delay of determined duration. These delays provide time for the transistor **26** to drop into the die **110** and after moving the die to transfer the transistor into the pocket in the transfer wheel **129**, a delay is provided so that the transistor may be lifted from the die. As the crank arm moving the header is made longer, the delay time in which the die **110** remains in the transfer wheel **129** is made longer. Conversely as the crank arm is made shorter, the time in which the die **110** remains in way of the chute **140** is made longer.

The die **110**, the chute **140** and the components of the transfer wheel **129** are all made readily removable so that like members designed to receive and process other size transistors may be substituted for other members. This procedure is necessary to accommodate transistors of different sizes and lead arrangements and positions. This change in feeding mechanism components corresponds to the availability of changing the dies for forming and trimming the leads as is provided for in the apparatus of the reference patent. The chute **140** is usable with the vibratory feeding apparatus of FIG. **1**, or separate chutes **30** already preloaded with oriented transistors may be used to feed the chute **140**.

The cutouts **90** and **92** permit the cycling passage of the dies through the forward support blocks **80** and **82**. The die **110** as shown and described is for mounting on the die frame **88** while a die which is a mirror image is used on die frame **89** to transport a second lot of transistors to the processing apparatus. Of course, one transferring apparatus and die is needed for each processing line of the apparatus of the reference patent. When desired, two lines of transistors are simultaneously automatically fed and processed.

In the exemplified embodiment the transport die **110** is constructed so that the upper surface of its shank portion is brought in way of the next above transistor as the die is in its transport cycle. It is also recognized that a spring-loaded member can be carried by and actuated by the movement of die frame **88** so as to engage and retain the next above transistor in the chute **140** as the die is cycled. Electromagnetic and pneumatic actuated devices could also be used as a transistor holding device for those transistors in the chute **140**.

Terms such as "left," "right," "up," "down," "bottom," "top," "front," "back," "in," "out," "clockwise" "counterclockwise" and the like and applicable to the embodiment shown and described in conjunction with the drawings. These terms are merely for the purposes of description and do not necessarily apply to the position in which the automatic transistor transferring apparatus is constructed or used.

The conception of this transferring apparatus is not limited to the specific embodiment shown but departures therefrom may be made within the scope of the accompanying claims and advantages and protection is sought to the broadest extent the prior art allows.

I claim:

1. An automatic feeding mechanism for transferring oriented transistors, each having a plurality of leads, the transistor, as it is automatically fed by the mechanism, is moved from a receiving position to a transport mechanism of a transistor processing apparatus, the feeding mechanism including: (a) means for feeding an oriented array of transistors to and through a chute; (b) a transport die adapted to receive one of the transistors from the chute, said die having a pair of extending ear portions contoured to provide a determined space between the ears, one ear having a pocket with upwardly extending sides disposed to guide the body of the transistor into the pocket which is sized so as to receive and retain the body of the transistor, and the other ear is formed with a notch having sides spaced so that one side is disposed to slidably engage at least one of the leads of the oriented transistor while the other side of the notch slidably engages at least two of the leads of the transistor; and (c) means for moving the transport die from a loading position in way of the chute to a transport mechanism having turn transistor receiving means, whereat the transistor in the die is moved into the transistor retaining means of the transport mechanism.

2. An automatic feeding mechanism for transferring oriented transistors as in claim 1 in which the ear portions of the transport die are sized and cycled so that a first ear enters between a main disc and a carrier disc of the transport mechanism and the other ear is spaced from said first ear so that with the first ear between the main and carrier discs the second ear is outside and adjacent a lead retaining disc of the transport mechanism.

3. An automatic feeding mechanism for transferring oriented transistors as in claim 2 in which the second ear is provided with a relief adjacent the notch so as to reduce the surface of the notch in engagement with the leads of the transistor.

4. An automatic feeding mechanism for transferring oriented transistors as in claim 1 in which the means for moving the transport die is a cycling mechanism disposed to be reciprocably moved with a linear motion, the cycling mechanism having means for providing a time delay at each end of the linear motion.

5. An automatic feeding mechanism for transferring oriented transistors as in claim 4 in which the cycling mechanism is moved by a connecting arm having one end carried and driven by an eccentrically moved crankpin and with the other end of the connecting arm attached to a header block carried on a linear guide means, the header block adapted to move a die support member disposed to removably retain the transport die.

6. An automatic feeding mechanism for transferring oriented transistors as in claim 5 in which the linear guide means includes a pair of parallel rods carried in retainers positioned on a support plate, the header block is also carried on these rods; and in which the die support member is a die frame movable to-and-fro on these same rods and to selected positions and limits.

7. An automatic feeding mechanism for transferring oriented transistors as in claim 6 in which the means for providing a time delay is at least one resilient member disposed on each side of the header block and to be moved by the header block to in turn cause the die frame to be moved to a stop whereupon the header block continues to move and additional distance toward and away from the die frame, the time necessary for the header block to travel this additional distance providing a determined time delay.

8. An automatic feeding mechanism for transferring oriented transistors as in claim 7 in which the connecting arm is made adjustable in length so that the time delays provided at the ends of the stroke of the header block may be increased and decreased in accordance with a said adjustment.

9. An automatic feeding mechanism for transferring oriented transistors, each of which has a plurality of leads, the transitor, as it is automatically fed by the mechanism, is moved from a receiving position to a discharge position at a transport mechanism of a transistor processing apparatus, the automatic feeding mechanism including: (a) means for feeding an oriented array of transistors to and through an orienting guide means; (b) an transport die adapted to receive and retain an oriented transistor from the orienting guide means; (c) a transistor transport mechanism having a sequence of transistor receiving means, each adapted to receive at least one transistor; (d) a reciprocating member disposed to carry the transport die in a linear stroke pattern from in way of the guide means to the transport mechanism and back to the guide means; (e) a power transmitting drive means for providing a synchronism of movement between and extending from the transistor transport mechanism to means for moving the reciprocating member; and (f) means for providing a delay time of the transport die at each end of the linear stroke.

10. An automatic feeding mechanism for transferring oriented transistors as in claim 9 in which there is provided a chute adapted to receive a supply of transistors in a single file array and to deliver them to a discharge position above the transport die and in which the reciprocating member is a die frame carried on a linear slide means with a time delay provided at each end of the reciprocation.

11. An automatic feeding mechanism for transferring oriented transistors as in claim 10 in which the linear slide means includes a pair of parallel rods carried in retainers positioned on a support plate, the die frame and a header block disposed to engage and move said die frame, the block and die frame both slidably carried on the parallel rods.

12. An automatic feeding mechanism for transferring oriented transistors as in claim 11 in which the power-transmitting means includes a driven shaft and a crankpin eccentrically carried thereon, a connecting arm extending from the crankpin to the header block and resilient means on each side of the header block and disposed to engage the die frame to move the die frame and to provide overtravel of the header block for the time delay of the transport die.

13. An automatic feeding mechanism for transferring oriented transistors as in claim 12 in which the connecting arm is made adjustable in length so that the time delays provided by the overtravel of the header block may motion increased in accordance with said adjustment.

14. An automatic feeding mechanism for transferring oriented transistors as in claim 13 in which the resilient means is a compression spring and in which the retainers for the parallel rods provide positive limits for the to-and-fro motion of the die frame on the rods.

15. An automatic feeding mechanism for transferring oriented transistors as in claim 9 in which there is provided means for engaging and supporting the next above transistor in the chute as the transport die is cycled from the guide means to the transport mechanism and back to the guide means.

16. An automatic feeding mechanism for transferring oriented transistors as in claim 15 in which the means for engaging and supporting the next above transistor is a body portion of the transport die sized to engage and slide beneath the next above transistor.

17. The method of automatically feeding and transferring oriented transistors from a delivery chute to a transport mechanism of a transistor processing apparatus, the method including the steps of of: (a) feeding an oriented array of

transistors in a single file array to and through a gravity chute; (b) orienting the lowermost transistor in the chute so that the axis of the transistor is disposed in a substantially horizontal condition; (c) positioning an open-topped pocket of a transport die in way of the discharge end of said chute; (d) receiving an oriented transistor in said pocket of the transport die; (e) moving the transport die from in way of the chute to a transport mechanism of a transistor processing apparatus; (f) seating the transistor in a retaining notch in the transport mechanism; (g) advancing the transport mechanism so as to lift upwardly the transistor from the pocket of the transport die; and (h) returning the transport die to position the open-topped pocket in way of the discharge end of the chute.

**18**. The method of automatically fed feeding and transferring oriented transistors as in claim **17** in which there is provided the additional step of restraining any cycling movement of the transport die during the period of advancing movement of the transport mechanism necessary to left upwardly the transistor from the open-topped pocket of the transport die.

**19**. The method of automatically feeding and transferring oriented transistors as in claim **18** in which there is provided the additional step of engaging the transistor next above the transistor in the open-topped pocket of the transport die during that period of time the pocket is not in way of the end of the chute.

**20**. The method of automatically feeding and transferring oriented transistors as in claim **18** in which there is provided the additional step of moving a support upper surface of the transport die in way of the end of the chute during the period of time the open-topped pocket of the die is not in way of the end of the chute.

**21**. The method of automatically feeding and transferring oriented transistors as in claim **17** in which the moving of the transport die includes the step of retaining the open-topped pocket of the transport die in way of the chute for a determined extent of time necessary for the transistor to fall from the chute into the open-topped pocket.

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# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

**Patent No.** 3,548,998 **Dated** December 22nd, 1970

**Inventor(s)** Martin G. Heller

**It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:**

Col. 1, line 26, "of" , first occurrence, should read -- to
1, line 29, "NO." should be -- No. --;
1, line 39, "Pat." should be -- Patent --;
1, line 52, "Pat." should be -- Patent --;

Col. 2, line 56, "b" should be --6--;

Col. 3, line 60, "crank pin" should be --crankpin--;

Col. 4, line 3, period should be a comma, and "As" should b
-- as --;
Col. 4, line 31, period after "compression";
4, line 36, "ductouts" should be deleted;
4, line 47, "for" should be deleted;

Col. 5, line 75, after " FIG." insert -- 10 --;

Col. 7, line 3, "and" second occurrence should be -- are --
Col. 7, line 32, "turn" should be deleted;
Col. 7, line 75, "and" should be -- an --;

Col. 8, line 8, "a" should be deleted;
8, line 16, "an" first occurrence should be -- a --;
8, line 53, "motion" should be -- be -- and after "increased" should be inserted -- and decr
--;

Col. 9, line 14, delete "fed";
Col. 9, line 18, "left" should read -- lift--;

Signed and sealed this 20th day of April 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents