

May 28, 1968

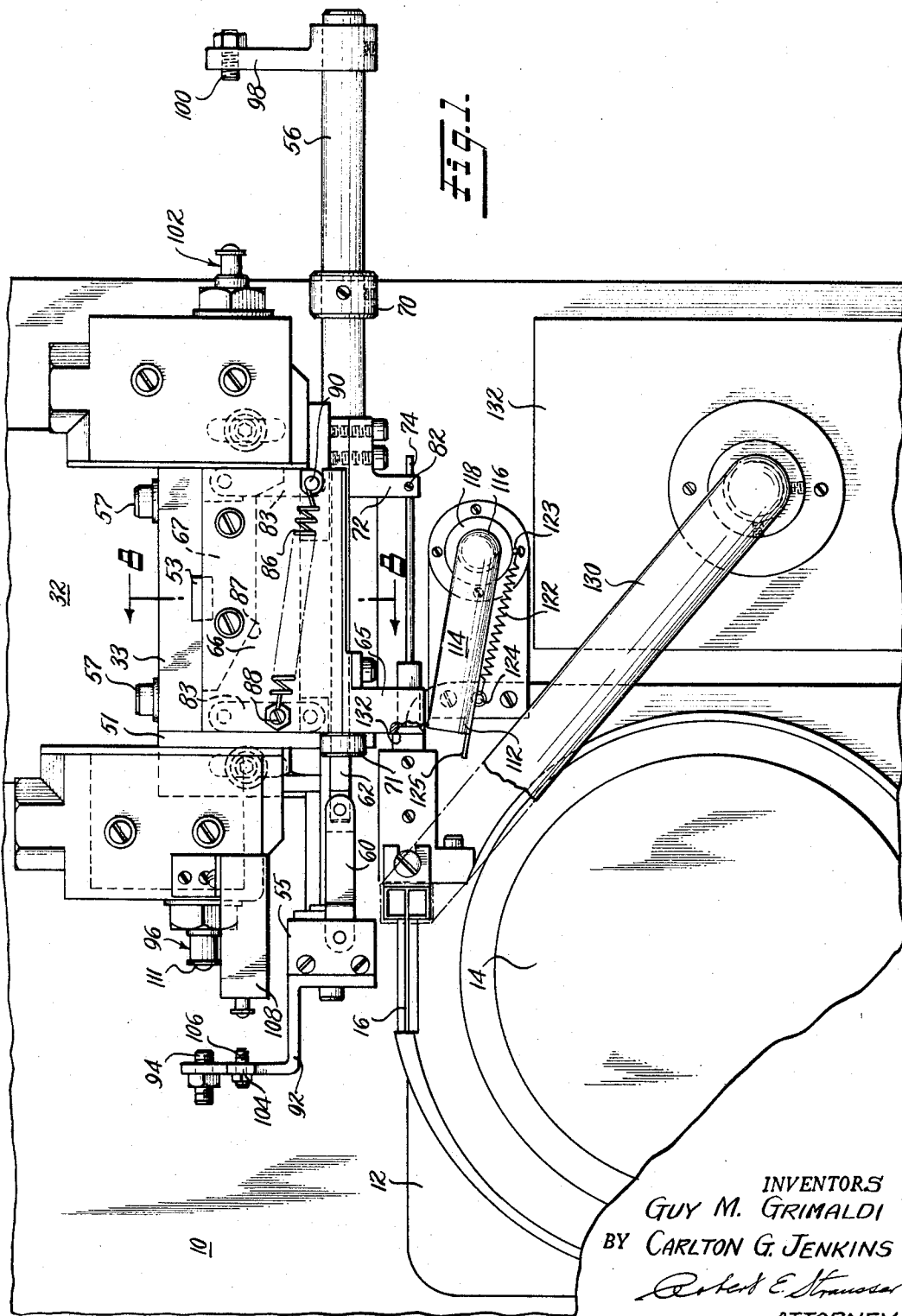
G. M. GRIMALDI ETAL

3,385,433

PIN SORTING DEVICE

Filed Oct. 31, 1966

4 Sheets-Sheet 1



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PIN SORTING DEVICE

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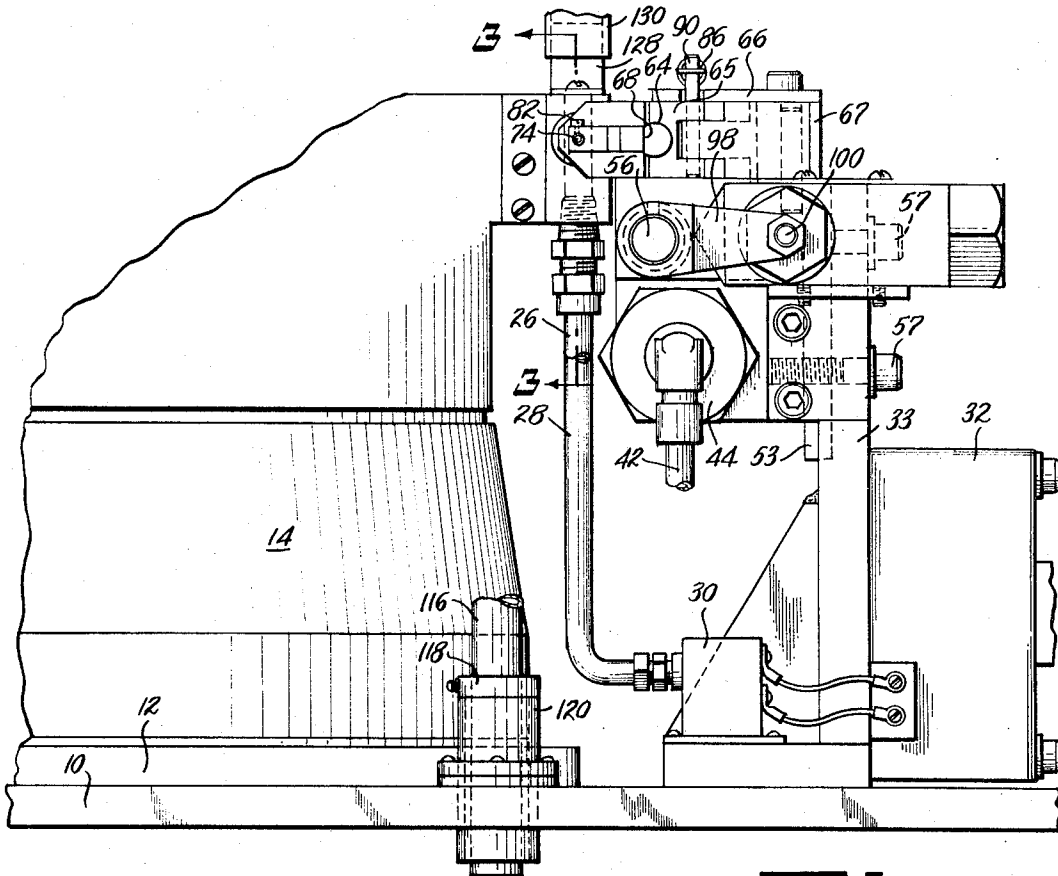


Fig. 2.

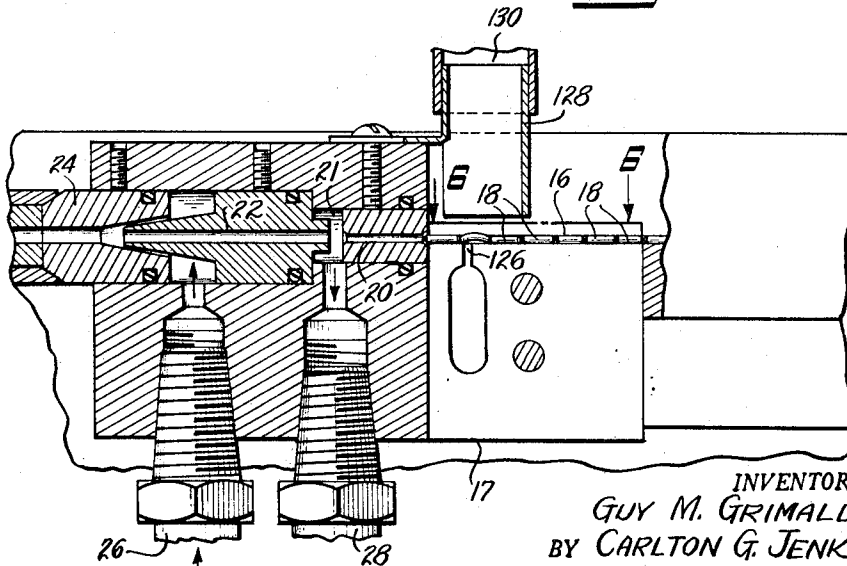


Fig. 3.

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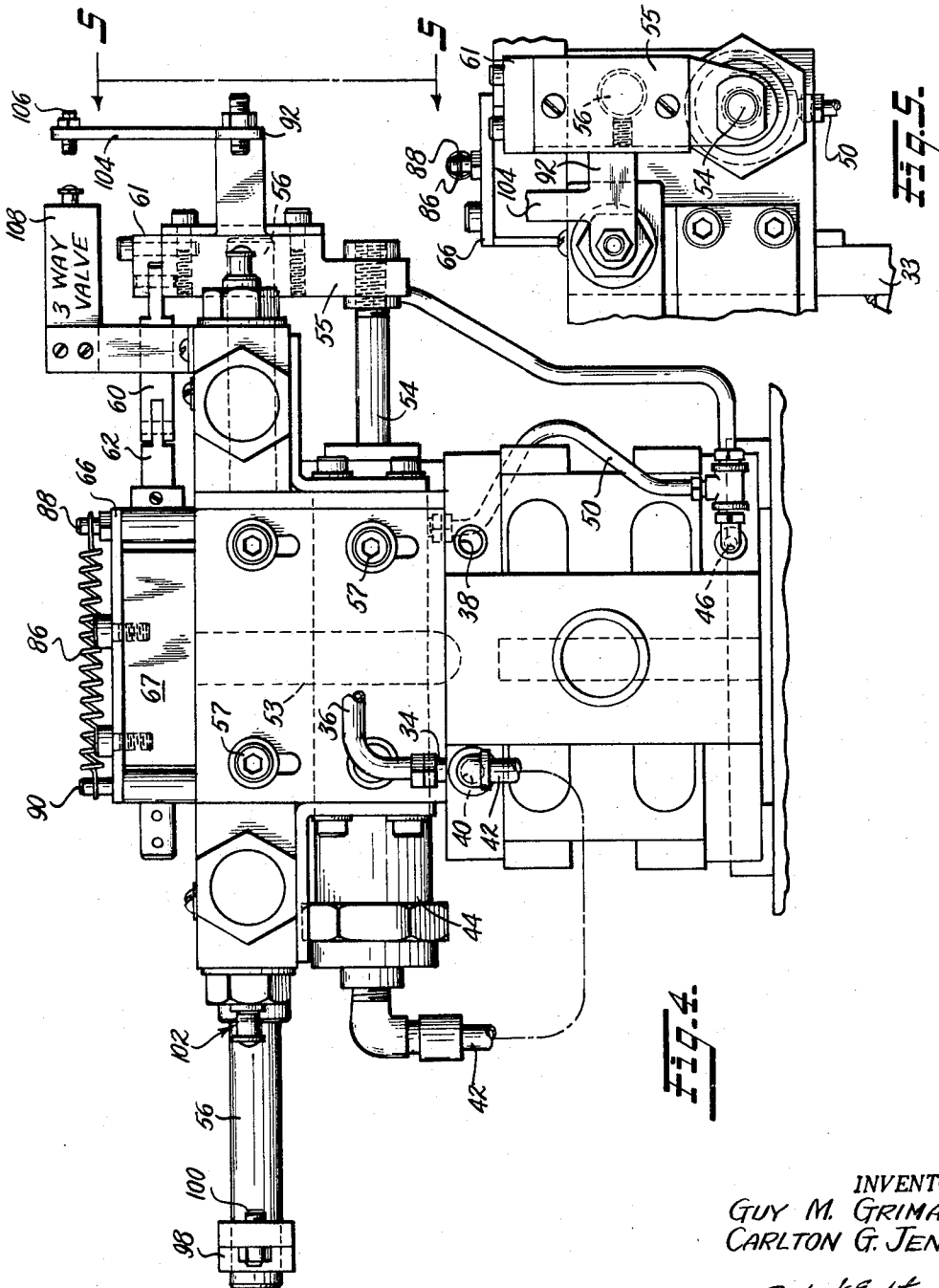
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Fig. 6.

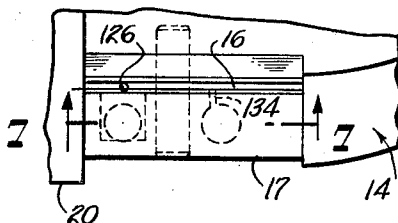


Fig. 7.

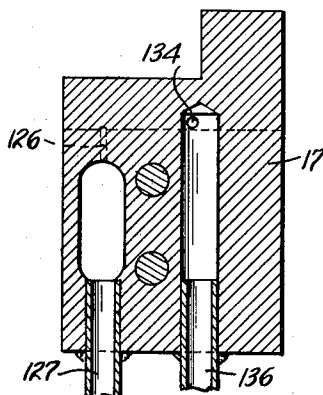
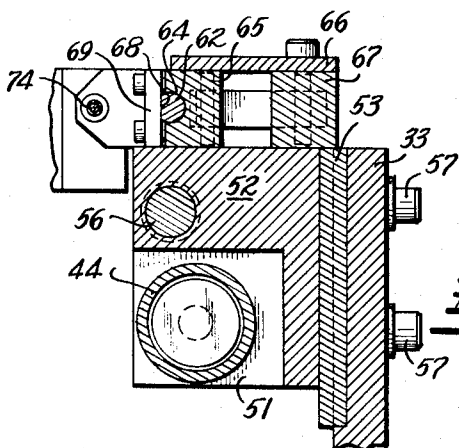


Fig. 8.

Fig. 9.

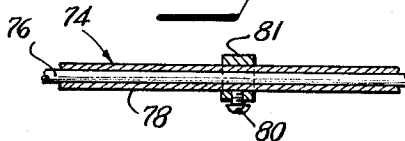
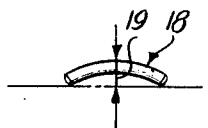


Fig. 10.



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PIN SORTING DEVICE

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Filed Oct. 31, 1966, Ser. No. 590,998

10 Claims. (Cl. 209-73)

This invention relates to means for gauging and segregating items that differ in a slight manner for numerous related items and more particularly to a machine for sorting from a group of pins those pins which have been bent longitudinally of their lengths.

In general, the machine comprises a means for feeding pins along a track of a gauging device which gauges the bent characteristics of the length of a pin as it is transported along the track and rejects those pins which are bent beyond a predetermined tolerance and cannot pass through the gauging device.

It is an object of this invention to provide a machine for quickly and accurately gauging pins for their degree of being out of straightness and to reject those pins which do not have the tolerance prescribed.

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following specification and appended claims in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary top plan view of the pin sorting device of the present invention.

FIG. 2 is a fragmentary side elevational view of the apparatus of FIG. 1 as viewed from the right hand thereof.

FIG. 3 is an enlarged fragmentary vertical sectional view taken on the line 3-3 of FIG. 2.

FIG. 4 is a rear elevation view of the apparatus of FIG. 1.

FIG. 5 is a fragmentary end elevational view taken on the line 5-5 of FIG. 4.

FIG. 6 is a fragmentary horizontal plan view of the pin ejecting station taken on the line 6-6 of FIG. 3.

FIG. 7 is a fragmentary vertical sectional view taken on the line 7-7 of FIG. 6.

FIG. 8 is a fragmentary vertical section view taken on the line 8-8 of FIG. 1.

FIG. 9 is an enlarged fragmentary sectional view of an alternate method of securing an ejector rod wire within an ejecting tube; and

FIG. 10 is an enlarged side elevation of a bent pin which is gauged and ejected from the apparatus, the pins ejected from the machine normally having an out of straightness very much less than that shown herein.

Referring to the drawings in greater detail, at 10 is a base on which is mounted a square plate 12 supporting a Syntron 14. A Syntron is the trade name of an inverted hollow cone device having a spiral track on the inside of the cone wall on which articles will travel upward, one by one, upon proper vibratory movements being imparted to the cone, the individual articles being then fed, along the track to whatever is to receive the articles. This device is manufactured by Syntron Company, Homer City, Pa. Into the Syntron are fed the pins to be sorted. These pins, for example, may be of gold plated steel each .290 inch long and .020 inch in diameter, and to the tolerance of bend or camber for the entire length of pin may be in the order of .005 inch. The pins are fed from the Syntron, see FIGS. 1 and 6, to a track 16 in a block 17. The track has an open top and the length of the track is preferably much greater than the length of the pins being gauged and of a width at least greater than the diameter of the pins plus the tolerance permitted in overall lateral bend of the pin. Thus a pin 18 (FIG. 10) bowed up-

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wardly intermediate its ends would be gauged between the outer face of the bow or camber at its greatest deviation from a straight line and the line which contacts the ends of the pin on the side of the pin opposite the bow, as for example indicated by the line 19 between the arrow-heads.

Beyond the track in the direction of movement of the pins and carried thereby, see FIG. 3, is a venturi arrangement for advancing such pins as are satisfactory and can continue to pass along the track but blocking the entrance of pins which are excessively bent, i.e., bent to a greater degree than the tolerance permitted. The venturi arrangement comprises a gauging channel section 20 and, spaced therefrom, as indicated by the space at 21, a second larger channel section 22, as well as a pin and air exit mount section 24 whose channel is also larger than the channel in section 20. The section 22 has a nose extended into the mouth section and is spaced therefrom so that when air fed by a pipe 26 is blown into the space between the sections 22 and 24, it will flow out of the mouth section creating a venturi effect. The suction created in the channel of section 22 will draw the pins toward and beyond the mouth of the venturi and also will be transmitted to the space 21 creating a suction effect therein; also, under normal conditions, with unbent pins in the track section 16, adjacent section 20, some air will be sucked via channel 20 into the space 21. However, an excessively bent pin, hereafter for the sake of brevity termed a bent pin, will block the channel in section 20 and lower the pressure in the space 21. When such a condition occurs, the pressure in a pipe 28 communicating with the space is decreased. When the pressure is lowered, see FIG. 2, a pressure responsive switch 30 is closed, which closes the circuit to an electromagnetically operated 4-way valve 32 supported on a standard 33, this valve having air inlet port 34 (FIG. 4), connected to a pipe 36 to an air line, an exhaust port 38, open to the atmosphere, and a port 40 connected by a pipe 42 to one end of a pneumatic motor cylinder 44 whose piston, as will be described, is connected to means to drive a bent pin back onto track section 16 to be blown away. The valve 32 also has a port 46 connected to the opposite end of the cylinder by a second pipe 50. The left hand end of the cylinder is supported by a back plate 51, see FIG. 8, fastened to an L-shaped support block 52, keyed, as at 53, for vertical adjustment of the block 52 and held in adjusted position with reference to the support 33 by suitable bolts 57 riding in vertical slots in the support 33.

The piston rod 54 of the cylinder is connected at the left hand end, FIG. 1 (at the right in FIG. 4 and FIG. 5) by a vertical connector arm 55 to a slide shaft 56 guided for longitudinal movement in the support block 52, see FIG. 8, and to a link 60 pivotally connected to the arm 55, by the use of a pivot cap 61, see FIG. 4, the link being connected to a pitman 62 riding in a groove 64 in an L-shaped carrier 65 movably carried in a space between a cover plate 66 and the top of support block 52. A spacer 67 provides for the support of cover plate 66, the cover plate and spacer being bolted to the block 52. The groove 64 is arcuate in cross section and the pitman has a contour to correspondingly fit in the arcuate portion. However, the pitman has a flat face 68 substantially coplanar with the front face of the carrier, and a strap 69 bridges the groove and slidably confines the pitman in the groove but prevents its rotation. Adjustably positioned on a portion of the slide shaft 56 adjacent the right hand end thereof, see FIG. 1, is a stop collar 70 engaging a fixed part carried by support 33 to limit the displacement of the piston in the cylinder toward the left hand, bent pin, ejecting position of the mechanism, the right hand movement of the piston being limited by abutment of a collar 71 on pitman 62 with an end face of the L-shaped carrier 65, the

collar moving the carrier to its limit of motion, as will be described.

The pitman has fastened to the flat face thereof, close to its right hand end, FIG. 1, an angle support 72 carrying the bent pin ejector rod 74. This ejector rod, see FIG. 9, is comprised of a stiff piece of piano wire 76 of a size to fit within the gauging channel and reinforced by a tube 78 of metal closely fitting about the wire, with the ends of the wire extending a sufficient distance beyond both ends of the tube to interchangeably be used for entering the channel a sufficient distance to ensure displacement of a bent pin to clear the gauging channel portion 20.

The two parts of the ejector rod are held together by the screw 80 threaded through a collar 81 surrounding the tube 78, the screw slightly deforming or mashing the tube against the piano wire to secure the parts together. If desired, a screw 82 (FIG. 1) which clamps the ejector rod to the angle support 72 may be relied upon to mash and thereby secure the tube onto the piano wire and hold all three parts 72, 76 and 78, immovable with respect to each other.

The carrier is mounted for parallel link motion on a pair of links 83 (FIG. 1) pivoted for motion within the space between cover plate 66 and block 52. A spring 86 stretched between a pin 88 mounted on the plate 66 and a pin 90 on right hand link 83 tends to maintain the carrier in pin ejecting position when the collar 71 on the pitman is moved to the left, FIG. 1, away from the carrier.

The slide shaft 56 also carried at the left hand end, FIG. 1, a switch operating arm 92 having an adjustable screw 94 adapted to control the operation of a normally closed switch 96, and at its right hand end a second switch operating arm 98 having an adjustable screw 100 adapted to operate a normally open switch 102.

Switch 96, when opened, breaks the current flow to the Syntron and stops its operation. When in normal pin accepting position of parts, screw 94 engages the switch 96, thereby closing the same and activating operation of the Syntron. An upright extension 104 on the arm 92, FIG. 4, has an adjustable screw 106 at its upper end adapted to engage the stem of a three-way valve 108, said valve (with the slide shaft 56 positioned at the right hand end of its throw, FIG. 1, and the pins being transported thru the venturi) allowing compressed air to be fed to the venturi and shutting off ejection air from a to-be-described bent pin ejection port. When the slide shaft 56 is moving to the right in FIG. 4, these conditions are reversed.

Normally open switch 102 when closed by movement of shaft 56 to the left, FIG. 1, transmits current to a relay with a box, not shown, which closes a circuit to electromagnetic 4-way valve 32 causing the piston rod and connected parts to reverse their movement and therefore to move to the right, as viewed in FIG. 1.

In the normal position of parts with unbent pins being expelled from the mouth of the venturi, the slide shaft 56 is at the extreme right hand position, FIG. 1, with switch 102 open and switch 96 closed by reason of abutment of screw 94 against the pushbutton 111 of the switch. The collar 71 on pitman 62 is against the carrier 65 and has thrust it, aided by the parallel links 83, to a position to the right and rearward, against the action spring 86 with the left hand link 83 stopped by engagement with an inclined surface 87 on spacer 67 and so that the ejector rod 74 is out of the path of the acceptable pins being ejected from the venturi mouth. Also at this time a horizontal arm 112 of an L-shaped pipe 114, adapted to receive the accepted pins, is held against the carrier 65 so as to be in alinement with the venturi, the vertical leg 116 of this pipe having a collar 118, see FIGS. 1 and 2, fastened thereto resting on the upper face of a journal bearing 120 fixed to the bottom plate of the machine, the vertical leg of the pipe rotating in the bearing. A spring 122 is stressed between a projection 123 on the collar and a pin 124 extending up from the base 10. The spring serves to yieldingly hold the pipe against the carrier 65

and is turned to the position where it is opposite the venturi so that acceptable pins can be delivered via a pipe to a suitable receiver below the vertical leg of the pipe. A stop arm extension 125 on pipe 114 engages the venturi nozzle when the carrier 65 is retracted and nested in the space between the plate 166 and block 52. When the carrier 65 is permitted to move by action of spring 86 to the position where the ejector rod is opposite the venturi, its engagement with the horizontal leg of the pipe causes the pipe to be rotated away from and out of alinement with the venturi.

At the time that the abutment screw 106 contacts the three way valve 108, air is admitted to the venturi via pipe 26 (FIGURE 3) and the bent pin blow-off air from a port 126 via a pipe 127 is shut off.

Above the port 126 is a blown out pin receiving chute 128, the chute allowing pins to be delivered to a U-shaped tube 130 leading to a bent pin receiving receptacle 132 (FIG. 1). Intermediate the Syntron 14 and the gauging section 20 of the venturi and a little above the level of the track 16 is a port 130 (FIGS. 6 and 7) through which air is blown when the Syntron is in operation to blow off any pin that may be superimposed on another pin in the channel. Air to this port is fed by a pipe 136.

The parts shown in FIG. 1 are depicted just after a bent pin has been detected, the pressure responsive switch 39 at the bottom of suction tube 28 has been closed, and the relay in the box operated to reverse the 4-way valve 32 and, as a consequence, the slide bar 56 has been moved partially to the left. The Syntron controlling switch 96 is open. The collar 71 on the pitman 62 had been receding allowing the spring 86 to swing the carrier 65 in a manner to bring the rod 74 opposite the mouth of the venturi. To assist in centering the rod with respect to the channels in the venturi, the forward end of the venturi has a conical nose and a conical recess 132 is provided in the left hand face of the carrier to pilot the carrier into position. Continued movement of slide bar 56 to the left moves collar 71 away from carrier 65 but the pitman 62 continues to shift the angle 72 to the left to push the piano wire into the venturi channels, the parts being so adjusted that the bent pin is thrust out of channel parts 20, 22 and 24 and back to the track 16 into the path of the blow out port 124. Air which is now blowing out of port 124 will blow the pin up through the chute 128 into the U-shaped pipe 130.

When the left hand stroke of the slide bar 56 has been completed, switch 102 is operated to again, via the relay in the box and the 4-way valve, reverse the movement of the slide bar, this causing collar 71 to come into engagement with and swing carrier 65 out of the way to thereby permit spring 122 to place the entrance to pipe 114 opposite the venturi mouth. As the slide bar reaches its ultimate right hand position, FIG. 1, the switch 96 is closed to start the Syntron into operation and the contact screw 106 operates the valve 108 to cut off the bent pin blow off fluid through port 126, and to turn on the fluid to furnish air to the venturi.

Thus, there is provided an improved pin sorting device for rapidly and accurately gauging pins relative to degree of camber and segregating or rejecting those pins which do not meet the prescribed tolerances. The mechanical and fluid linkages within the device provide high speed production operation while still maintaining gauging accuracy and rejection efficiency.

While there has been shown and described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. A pin sorting machine comprising a member providing a channel, fluid pressure means for transporting pins to be sorted along said channel, means sensitive to

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a variation of pressure of the fluid in said channel caused by a bent pin therein for ejecting said bent pin from said channel.

2. The structure of claim 1 wherein said means sensitive to the variation in pressure includes a switch and fluid operated motor with piston and valve mechanism responsive to the operation of said switch for causing a complete cycle of reciprocation of said piston.

3. The structure of claim 2 wherein said piston is connected with a slide shaft, said slide shaft having means to displace a parallel link supported carrier in which a pin ejector rod is slidable, said displacement being from in front of said channel, additional means to position the pin ejector rod in alinement with said channel and means connecting the slide shaft with the ejector rod to reciprocate the same.

4. The structure of claim 3 wherein the connecting means includes a link and pitman connected to each other, the link being pivotally connected to a part movable with the slide shaft and the pitman to the carrier.

5. A pin sorting machine comprising:
a channel along which pins may be fed,
means for passing a fluid current thru said channel and creating a fluid pressure differential between the fluid entering the channel and that leaving the channel, a fluid pressure sensitive switch in communication with the air flowing thru the channel, the pressure of said flowing air being insufficient to operate the switch with acceptable pins passing thru the channel but sufficient to operate the switch when a bent pin is impeding the flow fluid thru said channel, and means responsive to operation of said switch to remove the bent pin from the channel and

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out of blocking position with respect to other oncoming pins to be sorted.

6. The structure of claim 5 wherein the channel is part of a venturi with the pressure sensed being that of the suction fluid flowing thru the channel.

7. The structure of claim 6 wherein the means to remove the bent pins includes an ejector rod movable from a position out of alinement with the channel to a position in alinement therewith and including means to cause the rod to enter the channel and thrust the bent pin backwardly along the channel for removal thereof.

8. The structure of claim 7 wherein further means are provided to blow the thrust back pin out of the path of movement of other oncoming pins to be sorted.

9. The structure of claim 7 wherein a pipe is provided for conducting pins issuing from the mouth of the venturi to a collecting receptacle and wherein said pipe is movable concomitantly with the ejector rod for alternative positioning at the mouth of the venturi.

10. A structure as set forth in claim 7 wherein the ejector rod is operated by movement of a reciprocable carrier.

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ALLEN N. KNOWLES, *Primary Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,385,433

May 28, 1968

Guy M. Grimaldi et al.

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

Column 1, line 15, "of" should read -- to --; line 31, "elevavtional" should read -- elevational --. Column 3, line 35, "braeks" should read -- breaks --. Column 4, line 6, "166" should read -- 66 --; line 21, "130" should read -- 134 --.

Signed and sealed this 14th day of October 1969.

(SEAL)

Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents