

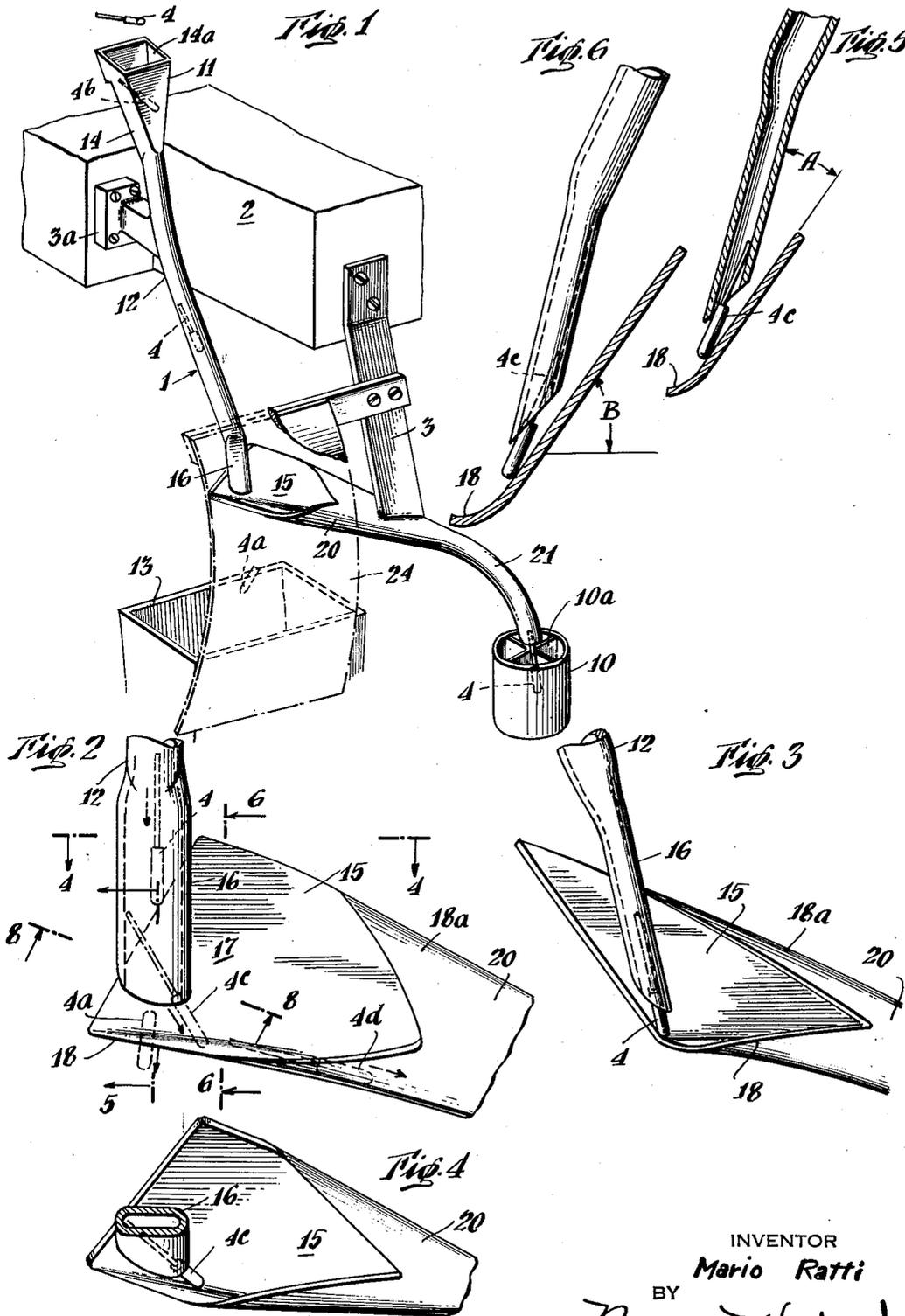
Feb. 28, 1956

M. RATTI
PIN SORTER

2,736,430

Filed Aug. 10, 1954

2 Sheets-Sheet 1



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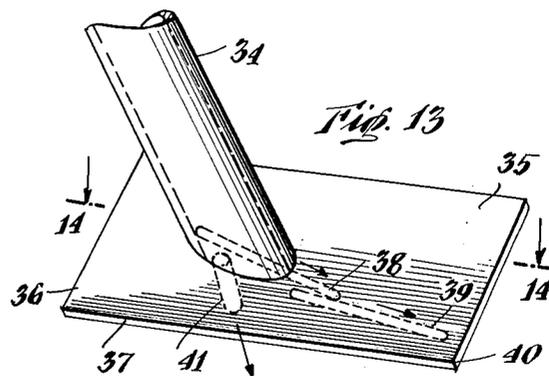
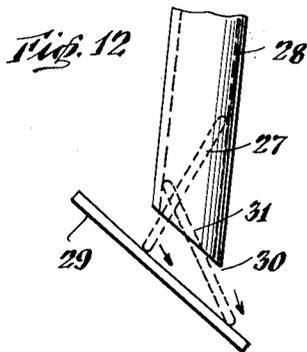
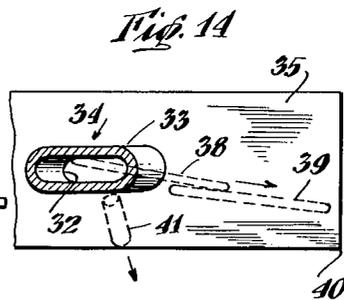
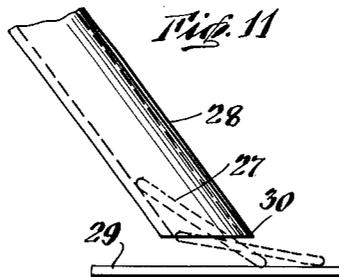
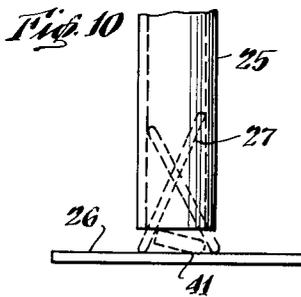
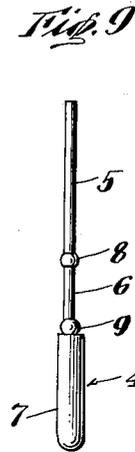
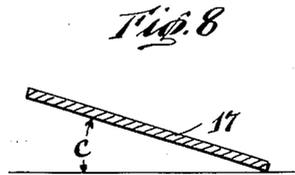
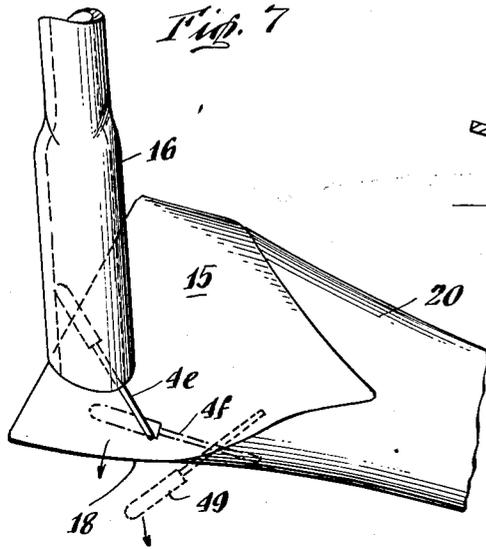
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PIN SORTER

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10 Claims. (Cl. 209—82)

The present invention relates generally to sorting or selecting apparatus and more particularly to apparatus for sorting pinlike articles to separate those which are defective in that they are of the wrong length or wrongly oriented.

My invention has particular reference to apparatus for sorting lead wires such as those which are used in electron tube devices, although it is useful for sorting other types of pinlike or rodlike articles or any length and cross section and either straight or having crimped, bent or threaded portions.

Lead wires are used in great quantities in the bases of electron tubes and transistor envelopes for plugging them into sockets. Typical lead wires are made up from two or more pieces of wire or pinlike portions which are welded together to form the finished lead wire. These welds are made on high-speed lead-wire welding machines and the completed lead wires emerge from these machines in an almost steady flow.

Occasionally a defective weld will be made and the lead wire will emerge from the welding machine in pieces. It is necessary to sort these pieces out from the correctly welded lead wires. The present invention provides a device which will separate these pieces from the correctly welded lead wires as they emerge from the welding machine.

Typical lead wires also have the pieces forming one end of greater diameter and weight than the pieces forming the other end. In packing the lead wires as they emerge from the welding machine it is desirable that the lead wires have all the ends of one diameter together. The device of the present invention orients the lead wires so that they may be easily packed with all the ends of a given diameter together.

An object of my invention is to provide apparatus for separating short pinlike articles of improper length from longer ones of a correct length.

Another object of my invention is to provide apparatus for selecting, orienting and packing lead wires.

Another object of my invention is to provide simple, efficient and inexpensive apparatus to sort lead wires of different lengths.

Another object of my invention is to provide a pin sorting device without moving parts.

Another object of my invention is to provide a pin sorting device of small size which may be conveniently attached to a lead wire welding machine.

Another object of my invention is to provide a fast acting pin sorting device.

Other and further objects of the invention will be obvious upon an understanding of the illustrated embodiment about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and

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is shown in the accompanying drawings forming part of the specification wherein:

Fig. 1 is a perspective view showing a preferred embodiment of the present invention;

5 Fig. 2 is an enlarged fragmentary perspective view of portions of the inclined tube and the rejection plate of the device of Fig. 1 showing lead wires passing there-through with their socket portions foremost;

10 Fig. 3 is an enlarged fragmentary end elevational view of portions of the inclined tube and the rejection plate of the device of Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2;

15 Fig. 5 is a sectional view taken along the line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 2;

20 Fig. 7 is an enlarged fragmentary perspective view similar to Fig. 2 except that the lead wires have their mounting portions foremost;

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 2;

Fig. 9 is a front elevational view of a lead wire;

25 Fig. 10 is a diagrammatic view showing an improperly spaced tube and plate;

Fig. 11 is a diagrammatic view showing a properly spaced tube and plate;

Fig. 12 is a diagrammatic view showing a properly spaced tube and sloped plate;

30 Fig. 13 is a diagrammatic perspective view of a properly spaced tube and sloped plate; and

Fig. 14 is a sectional view taken along the line 14—14 of Fig. 13.

The pin sorting device will be described generally with respect to Fig. 1 which shows a preferred embodiment of the invention. The pin sorting device 1 is mounted by suitable mounting struts 3 and 3a on a pin forming machine such as lead wire welding machine 2 which is making the lead wires 4 by welding together three separate lead wire parts. The completed lead wires 4 fall from the welding machine 2 into funnel 11 at the top of pin sorting device 1. As will be more fully described below, the perfect lead wires 4 pass down tube 12, along ejection plate 15, and through tube 21 to container 10. The pieces of the imperfectly welded lead wires 4a pass down tube 12 and slide over the edge of plate 15 to a rejection container 13.

A typical lead wire is shown in Fig. 9 in its completed form. This wire has three sections welded together. These consist of a mounting portion 5, a connection portion 6, and a socket pin portion 7. The socket pin portion 7 is of greater diameter and weight than the portions 5 and 6. The welding machine 2 completes lead pin 4 by making welds 8 and 9 between portions 5, 6 and 7. Occasionally a welding operation fails and the lead wire 4 is dropped from the machine 2 in either two or three pieces. These pieces of the imperfect lead wires must be rejected from the perfect lead wires before they are loaded into automatic electron device manufacturing machines. Pin sorting device 1 rejects the imperfect lead wires and it also orients the lead wires so that they are arranged in container 10 with the socket portions 7 all at the bottom of the container 10.

The pin sorter 1 will now be described in greater detail with particular reference to Figs 1, 2 and 7. Pin sorter 1 has a funnel portion 11 at its upper end. As the completed lead wires 4 are dropped from welding machine 2, they fall into funnel 11 which guides the lead wire to tube 12 of the pin sorter. In the preferred embodiment funnel 11 is designed with a sloping surface 14 beneath the mounting portion 5 of the lead pins 4.

When lead wire 4 is released by machine 2, mounting portion 5 of the lead wire is located so that it will strike surface 14 of funnel 11 before the socket portion 7 strikes the opposite funnel surface 14a. Thus the lead wire 4 is tipped into tube 12 with the socket portion 7 foremost as lead wire 4b in Fig. 1. The lead wires will thus all be oriented in the same direction as they slide down tube 12.

Inclined tube 12 carries the lead wires 4 downward towards a rejection plate 15. In the preferred embodiment tube 12 is curved to carry the lead wires 4 around the welding machinery 2 to a suitable location for rejection plate 15. The curvature of the inclined tube 12 may be varied or tube 12 may be a straight tube set-up in a vertical or an inclined position.

The lower end of tube 12 has a crimped portion 16 at its lower end as seen in Figs. 2 and 4. This portion 16 of tube 12 is bent or otherwise shaped to have an oval or rounded rectangular shape (Fig. 4). This crimped section 16 of tube 12 performs an important part in the rejection process, as will be described below in connection with an explanation of the shape and spacing of the tube 12 and ejector plate 15.

Ejector plate 15 is located a short distance below the lower end of tube 12. The left-hand end (Fig. 2) of plate 15 is preferably a substantially flat area 17. The lower edge of area 17 has a curved lip 18 which is shaped concavely upward in a gradual curve (Figs. 5 and 6). The height of lip 18 increases gradually towards the right-hand side of plate 15 until it meets a similarly curved lip 18a which curves inward in the opposite sense from the top of plate 15. Lips 18 and 18a meet to form funnel portion 20. This funnel portion 20 leads into a curved hollow tube 21.

The shaping and spacing of tube portion 16, plate 15, and lip 18 will be more fully described below.

As a normal lead wire 4 reaches the bottom of tube 12, it is guided first by the relative positions of tube 12 and plate 15 to the position of lead wire 4c (Fig. 2). The pin next slides completely out of tube 12 into the position of lead wire 4d approximately parallel to the lip 18 and moving in a direction parallel to lip 18. Lead wire 4 slides against lip 18 and is guided progressively by lip 18, funneled portion 20 and tube 21 to the container 10.

The short portions 4a of the incompletely welded pins which must be rejected similarly fall through tube 12. As will be more fully discussed when the shape and spacing of the tube and ejector plate are discussed, the shorter pieces pass readily through the lower end of tube 12 without any turning or slowing action and slip over the edge of lip 18. A rejector guide 24 (Fig. 1) is suitably shaped to direct portions 4a to a rejection container 13.

As was discussed above, the funnel 11 is used in the preferred embodiment to direct the lead wires down tube 12 with their socket portion 7 lowermost. Other means than the funnel may be used such as an air stream directed at the one end to turn the lead wire in the desired direction.

Occasionally a lead wire will fall or bounce into tube 12 with the mounting portion 5 lowermost.

It is desirable to reject these lead wires, since all the lead wires in container 10 must be oriented in the same direction before the lead wires are loaded into an automatic tube manufacturing machine.

The rejection of these wrongly oriented lead wires 4 will be described with particular reference to Fig. 7. The wrongly oriented lead wire 4 will pass downwardly through tube 12 until it reaches the position of lead wire 4e. The lead wire will now be slowed and turned in a manner similar to that of the lead wire 4c discussed above to the position of lead wire 4f. The lead wire 4f is now positioned similarly to correctly oriented wire 4d of Fig. 2 in a position approximately parallel to lip 18. Instead of sliding along lip 18 as was the case of lead

wire 4d, the momentum of the heavier socket portion 7 of lead wire 4f tends to continue the turning action given lead wire 4f as it turned from the position of lead wire 4e. This turning causes socket portion 7 to jump over the lip 18 and to carry the lead wire to the position of lead wire 4g. From this position the lead wire falls against rejection guide 24 and is directed to the rejection container 13.

The shape and spacing of the crimped portion 16 of tube 12 and of rejection plate 15 which slow and turn the lead wires 4 will now be described with particular reference to Figs. 10 through 14. The end of tube 12 and rejection plate 15 are so shaped and spaced that the lead wire 4 falling lengthwise through tube 12 is slowed by striking plate 15 and is turned on emergence from portion 16 of tube 12 so that it slides out onto plate 15 in the general position of lead wires 4d and 4f of Figs. 2 and 7. As previously stated, a lead wire that has its heavier socket end 7 foremost will then be guided by lip 18 whereas a lead wire having its end 7 hindermost will be flipped over the lip 18 by the momentum of the heavier end 7.

The tube 12 and plate 15 are also spaced so that any combination of one or two of the pieces 5, 6 or 7 of an imperfectly welded pin will not be slowed or turned but will drop to plate 15 at a relatively high speed and will thus pass over the lower left-hand edge (Fig. 2) of lip 18.

The shape and spacing of tube 12 and plate 15 will now be more fully described. When a hollow tube is located above a relatively flat plate such as tube 25 and plate 26 of Fig. 10, the tube may be spaced close enough as shown so that a wire 27 dropping down tube 25 will not be able to slide out onto plate 26. Shorter piece 41 will fall freely to plate 26. If the tube is now arranged to meet the plate at an angle such as tube 28 and plate 29 of Fig. 11, the wire 27 will slide out of side 30 at the right-hand side. By inclining the plate as well as the tube the end of the wire 27 first striking the plate may be directed toward side 30 to insure that pin 27 emerges out of the tube onto plate 29. Thus as in Fig. 12 the wire 27 may be caused to slide out in the position of wire 31. Tube 12 may have a square or round cross section, but by making the cross section of the tube generally rectangular the direction of the emerging wire 31 may be more closely controlled and the wire may be caused to slide onto plate 29 in a direction parallel to the longer side of the rectangle.

Fig. 13 shows a tube 34 and a plate 35 arranged generally similar to tube 28 and plate 29 of Fig. 12, except that plate 35 has both edges 36 and 37 sloped from the horizontal so that a corner 40 is the lowest portion of plate 35. The longer side of the rectangular tube 34 is arranged as shown in Fig. 13.

The longer pins will now be directed to a position similar to pin 38 and will be carried to the position of pin 39 by their momentum and the slope of plate 35. Since lead wires do not pass out of the rearward edges 32 and 33 (Fig. 14) of tube 34, these edges may be extended to plate 15 in an alternate embodiment.

Shorter lengths of pins will fall freely to the plate 35 and, not being long enough to be held by the tube edges, will pass out in the position of pin 41 due to the slope of plate 35. Shorter pins 41 are thus not subjected to the turning that the longer pin 38 is and thus emerge from the tube 34 with a higher speed and different direction, allowing the above described rejection process to occur.

The shaping and spacing of the tube 12 and the rejection plate 15 follow these general principles. Thus the longer side of the crimped portion 16 of tube 12 is made generally parallel to lip 18. The crimped portion has a generally rounded rectangular shape and the plate 15 is sloped from the horizontal to place the right-hand end of lip 18 (Fig. 2) lower than the rest of plate 15. The tube 12 is spaced far enough from plate 15 to allow lead wires 4 to slide out only in a direction generally parallel to lip 18 but to

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allow shorter sections such as 4a to slide readily out.

The following proportions have proven satisfactory for a pin sorter having the general shape shown in Figs. 1 through 6 for sorting lead wires such as shown in Fig. 9 with a length of about seven-eighths of an inch. Portion 7 of lead wire 4 has a length of about a quarter of an inch and a diameter of one thirty-second of an inch and portions 5 and 6 have diameters of about a thirty-second of an inch and lengths of five-eighths and one-eighth of an inch, respectively.

Crimped portion 16 of tube 12 has a wall thickness of about a thirty-second of an inch and the long edge of the rounded rectangle is approximately seven-sixteenths of an inch while the shorter side is about three-sixteenths of an inch. Angle A (Fig. 5) between tube 12 and plate 15 is approximately thirty degrees and tube 12 is located about a sixteenth of an inch above plate 15 and about one-quarter of an inch from lip 18 at their nearest points.

The flat portion of rejection plate 15 may be defined by the two intersecting section lines 6-6 and 8-8. Line 6-6 has an angle B of approximately fifty degrees with the horizontal and line 8-8 has an angle C of about twenty degrees with the horizontal.

Lip 18 rises from a point level with the flat portion 17 of plate 15 at its left-hand edge (Fig. 2) to a height of about a sixteenth of an inch at section line 5-5 and to a height of about an eighth of an inch at section line 6-6.

The tube 12 above the crimped portion 16 may have any convenient size and incline to bring the lead wires into the crimped portion. The funnel 11 may be omitted if desired where the pins are oriented in a different manner, as discussed above.

The shape of funnel portion 20 and tube 21 may be varied to suit the location of container 10 and the direction in which it is desired to slide the lead wires.

The particular shapes and sizes of the various parts for a preferred embodiment used with lead wires of approximately seven-eighths of an inch in length have been discussed above. These relative shapes and spacings are interdependent and thus satisfactory operation may be obtained with a different ejection plate sloping, for example, if the shape of lip 18 is changed to compensate for it. For different sizes and weights of pins, the shape and spacing may be varied in accordance with the above general discussion of the shaping and spacing to suit the particular case. Thus for longer pins the tube size and its spacing from the ejection plate is increased and the slope of ejector plate is adjusted so that lip 18 retains pins of the desired length.

The device may be used to sort any type of pinlike article where ones shorter than a given length are to be rejected. A series of the devices thus may be used one after another to segregate a group of mixed length pins into groups in accordance with their length. The device also may be used to orient any pinlike articles which have their center of gravity at a distance from their midpoint.

The device is simple and rugged and requires little attention, since it has no moving parts. Once it has been adjusted it will operate for an indefinite period with little or no attention or maintenance. The device is also small in size and may be fitted easily to existing machinery.

Operation

As noted above, the pin sorting device is used in connection with a machine which is manufacturing a pinlike article. An example of such a machine is a lead wire welding machine which is welding three sections of wire together to form a pinlike lead wire. These lead wires, which have been described more completely above in connection with Fig. 9, are completed at a rate of several hundred lead wires per minute.

As the lead wires are dropped from the welding machine at this rate, it is the function of the pin sorter to sort the lead wires to reject those which are defectively welded and which thus are dropped from the machine in pieces. It is also the function of the pin sorter where

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the pins have their opposite ends dissimilar to arrange the pins in a container with all similar ends together. Thus, as seen in Fig. 1, the pin sorter arranges the lead wires 4 having a heavy end and a light end so that the heavy end is downward in container 10.

The operation of the pin sorter will first be described with relation to a correctly welded lead wire. As the lead wire 4 falls from the welding machine 2, the lighter end 5 of lead wire 4 first strikes the sloping surface of funnel 11. This causes pin 4 to be tipped into inclined tube 12 with its heavy end 7 foremost. Pin 4 now slides down inclined tube 12 until it strikes ejection plate 15. The slope of plate 15 now carries the heavy end 7 of pin 4 towards the right-hand side (Fig. 2) of the crimped portion 16 of tube 12, causing pin 4 to slide out from tube 12 onto plate 15 in a direction generally parallel to the longer side of the crimped portion 16 of tube 12 and also generally parallel to lip 18 on ejection plate 15. The downward slope of ejection plate 15 and lip 18 combine to carry pin 4 toward funnel portion 20. Pin 4 slides downwardly through funnel 20 and tube 21 to container 10 where it is held in a generally erect position by spacers 10a.

When the welding of the sections of the grid wire is defective, the separate sections will fall separately from the welding machine into funnel 11 or the lead wire will break into separate sections when it strikes funnel 11. These separate sections will each slide down tube 12 until they strike the ejection plate 15. After striking the ejection plate, these sections will slide downwardly under the longer side of crimped portion 16 next to lip 18 moving in a path generally at right angles to lip 18. These sections pass freely out of the tube 12 onto plate 15 due to their short length. They thus retain their velocity gained in inclined tube 12 so that when they reach lip 18 they slide over its edge and are guided by rejector guide 24 to a container 13.

Other means than the funnel 11 may be used to direct pins 4 down tube 12 with a given end foremost. Thus a jet of air may be placed to strike one end and to thus turn it downward into tube 12. No matter what method is used for this purpose occasionally a pin may fall or bounce into tube 12 with the wrong end foremost. Pin sorter 1 is designed so that it will reject pins passing through it with their lighter ends foremost. Thus lead wires 4 which pass down tube 12 with section 5 foremost are rejected along with the incorrectly welded sections.

The pin sorter operates the following way with respect to these wrongly oriented pins. A lead wire 4 passing down tube 12 with its section 5 foremost will strike ejection plate 15 and, as described above, for the correctly oriented pin will slide out of the corner of crimped portion 16 adjacent the lowest portion of ejection plate 15. As the pin emerges on plate 15, it will have been turned so that it is generally at right angles to its position as it entered crimped portion 16 and it also will be sliding toward lip 18. As the pin slides toward lip 18, the momentum of the heavier end 7 will continue the turning of pin 4 so that end 7 slides over the edge of lip 18 and carries pin 4 against rejector guide 24 into container 13.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A pin sorting device comprising an inclined hollow tube, a rejection plate having an upwardly curving portion along one edge and being located beneath and spaced from the lower end of said tube and said curving portion having its upper edge spaced horizontally from the lower end of said tube whereby pins dropped into the upper

end of said tube slide downwardly onto said plate and whereby pins of a given length are retained by said curving portion and pins shorter than said given length pass over the edge of said curving portion.

2. A pin sorting device comprising a hollow tube inclined from the horizontal, a rejection plate inclined from the horizontal having a curved edge portion and located beneath and spaced from the lower end of said tube and said curved edge portion sloping downwardly and having its upper end spaced horizontally from and lower than said tube's lower end whereby pins dropped into the upper end of said tube slide downwardly onto said plate and whereby pins of a given length are retained by said curved edge portion and pins shorter than said given length pass over the edge of said curved edge portion.

3. A pin sorting device comprising a hollow tube inclined from the horizontal having an inside diameter smaller than the length of the pins to be sorted and a generally rectangular cross section at its lower end, a rejection plate inclined from the horizontal and located beneath and spaced from the lower end of said tube and having a curved edge portion and said curved edge portion sloping downwardly and having its upper end spaced horizontally from and lower than said tube's lower end whereby pins dropped into the upper end of said tube slide downwardly onto said plate and whereby pins of a given length sliding onto said plate with their heavier ends foremost are retained by said curved edge portion and pins of a given length sliding onto said plate with their lighter end foremost or pins shorter than said given length pass over said curved edge portion.

4. A sorting device for elongated articles comprising a guideway having a maximum effective width less than the normal length of the articles to be sorted, said guideway extending from one level to a lower level so that the articles may travel along it by gravity, and a plate below the lower end of said guideway, said plate being spaced from one portion of the guideway a distance sufficient to permit defective short lengths of articles to pass between the guideway and the plate and to prevent the passage of normal lengths of articles between the plate and the guideway at that point, said plate being spaced from the guideway at another point a distance sufficient to permit passage of normal lengths of the articles and in this way separating the short and normal lengths of articles.

5. A sorting device for elongated articles comprising a guideway having a maximum effective width less than the normal length of the articles to be sorted, said guideway extending from one level to a lower level so that the articles may travel along it by gravity, and a plate below the lower end of said guideway with a curved lip portion, said plate being spaced from one portion of the guideway a distance sufficient to permit defective short lengths of articles to pass between the guideway and the plate in a direction toward said curved lip portion and to prevent the passage of normal lengths of articles between the plate and the guideway at that point, said plate being spaced from a second portion of the guideway a distance sufficient to permit passage of normal lengths of the articles in a direction parallel to said curved lip portion and in this way separating the short and normal lengths of articles.

6. A pin sorting device comprising a hollow tube inclined from the horizontal, a rejection plate located beneath and spaced from said tube having a flat portion and a curved lip portion, said flat portion located below the lower end of said tube and being sloped from the horizontal, said curved lip portion being adjacent the lowermost edge of said flat portion, said tube having its lowermost portion adjacent said flat portion inclined with respect to said flat portion and spaced therefrom whereby pins of a given length passing downward through said tube are slowed and guided by said curved lip portion and whereby pins of shorter lengths than said given length

are not slowed but pass over the edge of said curved lip portion.

7. A pin sorting device comprising a hollow tube inclined from the horizontal, a rejection plate located beneath and spaced from the lower end of said tube having a flat portion and a curved lip portion, said flat portion being located beneath the lower end of said tube and being sloped from the horizontal, said curved lip portion being adjacent the lowermost edge of said flat portion, said tube having its lowermost portion inclined with respect to said tube having its lowermost portion inclined with respect to said flat portion and having a generally rectangular cross section at its lower end and being spaced from said flat portion whereby pins passing downward through said tube with their heavy end foremost are turned and guided along said ejection plate by said curved lip portion and whereby pins passing downward through said tube with their lighter ends foremost are turned and jump over the edge of said curved lip portion.

8. A pin sorting device comprising a funnel, an inclined hollow tube with its upper end attached to the narrow end of said funnel, a rejection plate located beneath and spaced from the lower end of said tube having a generally flat portion and a curved lip portion, said flat portion being located beneath the lower end of said tube and being sloped from the horizontal having one edge lower than all others and sloped downwardly, said curved lip portion being adjacent said lower edge of said flat portion and having its lower portion higher than its upper portion, said tube having its lowermost portion inclined with respect to said flat portion and having an elongated cross section, and having two adjacent lower edges generally parallel to and spaced from said flat portion whereby pins of a given length passing downwardly through said tube are slowed and turned generally parallel to said curved lip portion as they pass to said rejection plate and whereby pins shorter than said given length pass freely to said rejection plate without being turned parallel to said curved lip portion so that they slide over the edge thereof.

9. A pin sorting device for use with a lead wire welding machine, which machine releases welded lead wires so that they fall downwardly therefrom comprising a funnel located below the point of release of said wires so that one end of said wires strikes a sloping funnel surface before the other end of said wires, a hollow inclined tube attached to the smaller end of said funnel whereby the wires slide from said funnel into said tube with said other end of the wires foremost, a rejection plate located beneath and spaced from the lower end of said tube having a generally flat portion and a curved lip portion, said flat portion being located beneath the lower end of said tube and being sloped from the horizontal having one edge lower than all other edges and sloped downwardly, said curved lip portion being adjacent said lower edge of said flat portion and having the height of its lip increasing towards its lower end, said tube having its lowermost portion generally straight and inclined with respect to said flat portion and having an elongated cross section and having two adjacent lower edges generally parallel to and spaced from said flat portion whereby wires of a given length passing downwardly through said tube are slowed and turned generally parallel to said curved lip portion as they pass to said rejection plate and whereby wires shorter than said given length pass freely to said rejection plate without being turned parallel to said curved lip portion so that they slide over the edge thereof.

10. A pin sorting device for use with a lead wire welding machine which welds lead wires having one end heavier than the other and which releases the welded wires so that they fall downwardly therefrom comprising a hollow inclined tube located below the point of release whereby the wires drop into said tube and slide downwardly there-through, a rejection plate located beneath and spaced from the lower end of said tube having a flat portion and a curved lip portion, said flat portion being located beneath

the end of said tube and being sloped from the horizontal having one edge lower than all other edges and sloped downwardly, said curved lip portion being formed on said lower edge, said tube having its lowermost portion inclined with respect to said flat portion and having an elongated cross section, one longer lower edge of said tube being spaced from said flat portion and parallel to said lip portion whereby wires having a length shorter than normal pass between the edge and the rejection plate and wires of normal length are prevented from passing under the edge, an adjacent shorter, lower edge of said tube being spaced from said flat portion whereby wires of a normal length pass under said shorter edge and are

turned thereby so that they move in a direction parallel to said curved lip portion and whereby said turning causes wires having their heavy end hindermost to slide over said curved portion.

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