Aug. 22, 1944. E. H. BIRDSALL 2,356,203

SORTING DEVICE

Filed Sept. 10, 1942 2 Sheets-Sheet 1

Fig. 1

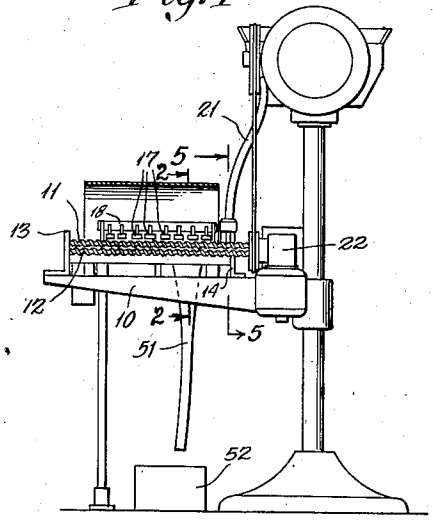


Fig. 2

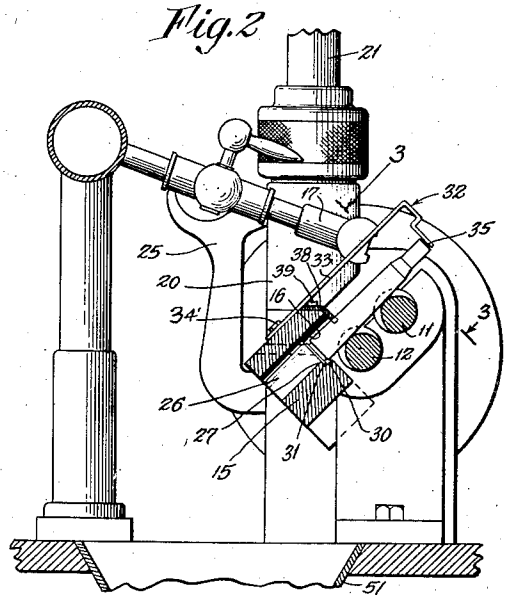


Fig. 3

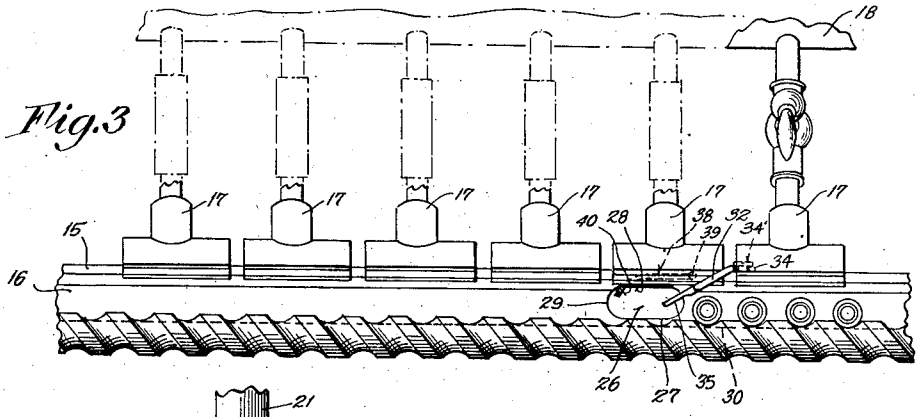


Fig. 5

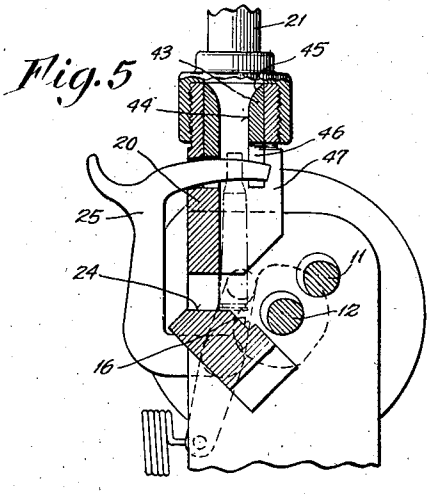
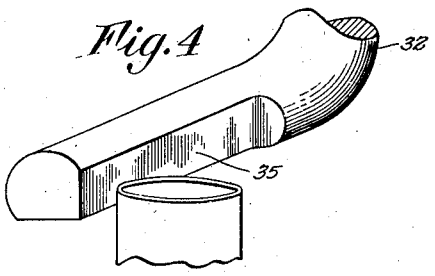


Fig. 4



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Fig. 6

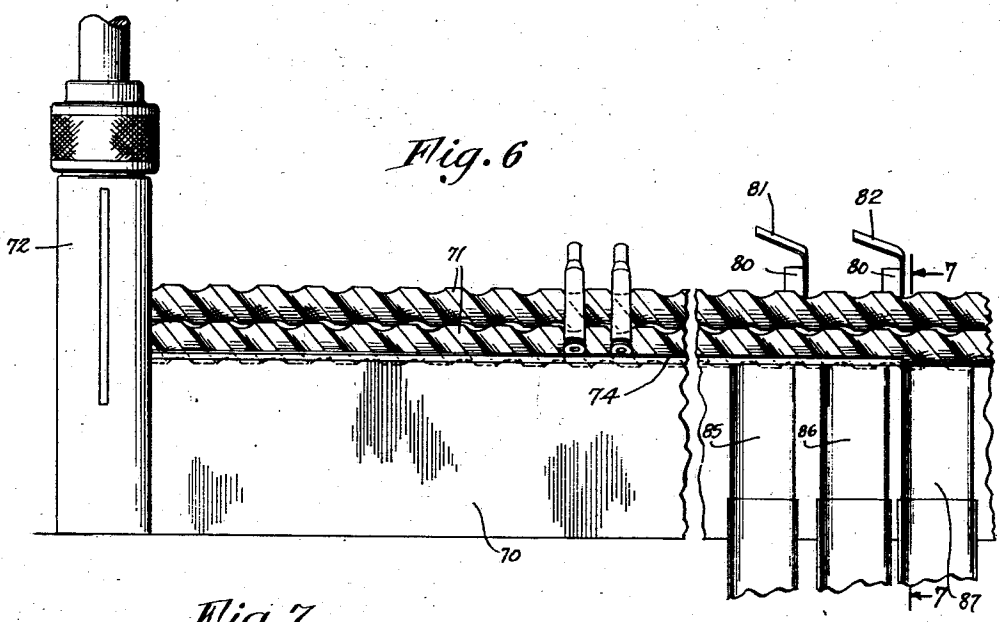


Fig. 7

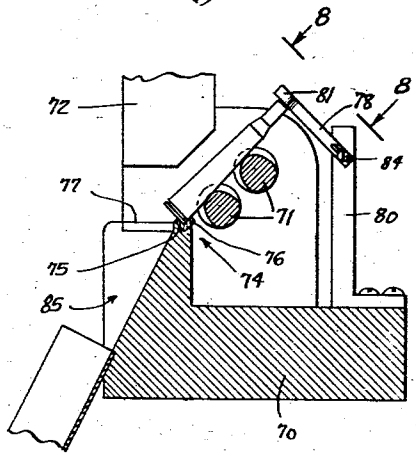
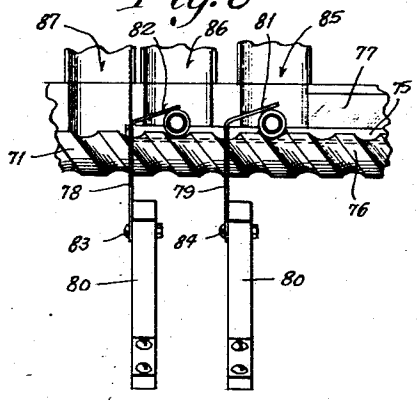


Fig. 8



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UNITED STATES PATENT OFFICE

2,356,203

SORTING DEVICE

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Application September 10, 1942, Serial No. 457,837

8 Claims. (Cl. 209—90)

The present invention relates to a machine for gauging elongated articles of curvilinear cross section, and, more particularly, to a machine having means for separating gauged articles of different lengths.

The following description and drawings disclose the invention as embodied in machines for processing metallic tubular articles having one closed end such as used in the manufacture of cartridge cases, but it will be understood that these are only for the purpose of illustrating the invention and that other applications of the invention may be made without departing from the scope thereof as defined in the appended claims.

It is an object of this invention to provide improved means for automatically gauging tubular articles. A further object is to automatically separate gauged tubular articles of different lengths. A further object is to automatically separate overlong cases from cases of normal length while the cases are being traversed through a case annealing machine, the overlong cases being ejected from the machine prior to being annealed. A still further object is to automatically gauge and separate overlong, standard and short cases while being traversed by a screw conveyor inspection machine.

Other objects, features and advantages of the invention will be made manifest in the following description.

A cartridge case, in the intial stages of its manufacture, is formed as a metallic tube having a closed base, its open end being trimmed off so that each case will have a predetermined uniform length. Not infrequently, however, cases are formed of off-standard length, that is to say, either too long or too short.

Those cases which are overlong may be retrimmed so as to have standard dimensions but it is imperative that this shall take place before the cases have undergone any further processing as, for instance, mouth annealing, for it has been discovered that once the cases have been annealed they cannot thereafter be satisfactorily retrimmed. Further, if overlong cases are fed to some operating machine, the feeding mechanism will be jammed causing the destruction of the case and a loss in production time. Those cases which are short or undersize must necessarily be discarded as scrap and it is desirable to accomplish this before any additional time or processing has been expended upon these undersize cases.

Although the trimmed cases are at present subjected to visual inspection, the tolerances between standard and off-standard cases being of the order of .0088 of an inch or so small that is extremely difficult for inspectors to consistently detect and separate the cases. It is desirable, therefore, to provide automatic means for gauging and separating trimmed cases, and, in particular, to provide means for rejecting overlong cases before they are annealed in the mouth annealing machines and for rejecting short cases before they are subjected to further processing.

In the drawings:

Fig. 1 is a front elevation of an annealing machine.

Fig. 2 is an enlarged end elevation partly in section on line 2—2 of Fig. 1 showing the case separating cam.

Fig. 3 is a fragmentary view looking in the direction of the arrows 3—3 of Fig. 2.

Fig. 4 is an enlarged fragmentary perspective view of the end of the separating cam.

Fig. 5 is a sectional end elevation, the section being taken on line 5—5 of Fig. 1 showing the cartridge feeding tube and chamber insert.

Fig. 6 is a fragmentary plan view of a twin screw inspection machine.

Fig. 7 is a sectional end elevation, the section being taken on line 7—7 of Fig. 6.

Fig. 8 is a fragmentary view looking in the direction of the arrows 8—8 of Fig. 7.

The cartridge case annealing machine chosen to illustrate the gauging and separating means of the present invention is one which is in common use, and, as shown in Fig. 1, may be briefly described as comprising a pair of cartridge case conveyor screws 11 and 12 rotatably mounted in suitable bearing posts 13 and 14 respectively bolted or otherwise secured to a table 10. The conveyor screws are positioned parallel to each other with screw 11 above the screw 12 and offset forwardly with respect thereto so that a plane passing through the longitudinal axes of the screws makes an angle of substantially 45 degrees with respect to the vertical, see Fig. 2.

Below the lower screw 12 and rearwardly thereof, is a cartridge case supporting member which comprises a substantially rectangular block 15 substantially equal in length to the conveyor screws and having a longitudinal trough or groove 16 adapted to support and guide the base portions of the cartridge cases while the cases are being traversed along the groove. In order to support the cases in engagement with the convolutions of the screws, the block 15 is positioned on the table 10 substantially parallel to the screws and is tipped forwardly about its

longitudinal axis through an angle of 45 degrees so that the base of the groove 16 lies in a plane substantially perpendicular to the plane through the longitudinal axes of the conveyor screws. Thus, the cases in the trough 16 tend to tip forwardly and, as shown in Fig. 2, are supported in this inclined position in engagement with the convolutions of the conveyor screws.

A plurality of burners 17 are positioned above the upper edge of the block 15 and are supplied with gas from a pipe 18, the burners being adapted to direct flames against the neck portions of the cartridge cases as the latter are traversed and simultaneously rotated along the trough 16 by the screws.

Suitable drive means for the conveyor screws is indicated at 22, the lower screw 12 being driven directly by the drive means 22 and the upper screw 11 being driven from the screw 12 by a suitable gear not shown.

20 is a cartridge feed chamber supported adjacent the right hand end of the conveyor screws for feeding cases into the trough 16. As indicated in Fig. 5, the chamber comprises a substantially vertical sleeve fixed to the table 10 and adapted to deposit the cases base down on a substantially horizontal platform or case stop 24 adjacent the open end of the trough 16. Cases are fed to the chamber 20 by a feed tube 21. Suitable means for displacing the cases from the case stop 24 into the trough 16 are indicated at 25 and comprise a shuttle or oscillating finger actuated by a suitable cam (not shown) driven by the drive means 22. Other details of the case feeding means are hereinafter described.

The means for gauging and separating the overlong cases from cases of normal length comprises a cam means hereinafter described and an oblong aperture or slot 26 milled in the bottom of the trough 16 adjacent that end thereof which is nearest the feed chamber 20. This slot has substantially parallel edges 27 and 28 and curvilinear ends 29, as shown in Figs. 1 and 3, the edge 27 of the slot being located slightly to the rear of the front edge 30 of the trough 16 so as to form a narrow ledge 31.

In the embodiment shown, a slot substantially one and one-quarter inches long and five-eighths of an inch wide is cut through the trough leaving the ledge 31 substantially one-eighth of an inch wide. This relatively narrow ledge, in conjunction with the adjacent surfaces of the conveyor screws 11 and 12, constitutes the only supporting means for the cartridge cases while they traverse the slot 26. Inasmuch as the center of gravity of the cases falls between the ledge 31 and the conveyor screws, the cases will be supported upright in normal equilibrium.

A cam-gauge means is provided which is adapted to engage the upper ends of the cases and thus deflect overlong cases out of their normal upright position as they are being traversed over the aperture or slot 26.

The cam-gauge means comprises a wire 32 preferably formed of a material of reasonably high heat conductivity so as to be resistant to heat and bent in the shape shown in Fig. 2. The wire 32 has a standard portion 33 which is provided at its lower end with an elongated loop 34 whereby the standard may be secured to the rear wall of the block 15 by a screw bolt 34'. The wire is relatively stiff and longitudinal adjustments thereof may be made by loosening the bolt 34' in the loop 34. The opposite end of the wire is bent over substantially at right angles to the standard 33 and has a cam-gauge surface 35 formed at the extreme outer end thereof by dressing off the wire to reasonable squareness and flatness on two sides as indicated in Fig. 4 so as to present a sharp clean lower edge for gauging within close tolerances and for obviating any binding between the cam and the cases.

Referring to Fig. 3, it will be seen that the wire is bent so that the cam surface 35 is disposed at an angle with respect to the longitudinal axis of the trough and is suitably positioned adjacent the right hand end of the slot 26.

In the embodiment shown, the cam 35 makes an angle of substantially 30 degrees with the longitudinal axis of the trough 16 in the direction of travel of the cases and terminates with respect to the right hand edge of the slot 26 in approximately the position shown in order that the cam will properly eject an overlong case without disturbing the adjacent cases.

The length of the wire standard 33 is such that the cam surface 35 stands above the area of the burner flames so as to prevent overheating of the cam surface. Further, the standard is constructed and arranged so as to permit the lower edge or gauge portion of the cam surface to be positioned slightly above the upper edge of a case of normal length but low enough to engage overlong cases. A wire standard substantially three and one-half inches long has been found suitable for these purposes.

Deflecting means are provided adjacent the left hand end of the slot for camming back or returning any cases to the conveyor screws which may be accidentally dislodged from the screws while passing along the narrow ledge 31. To this end, a wire spring 38, which may be piano wire and shaped as shown in Fig. 3, is secured at one by a screw bolt 39 to the block 15, its opposite end being disposed adjacent the left hand curved edge 29 of the slot. This end of the wire spring 38 may be formed either as a curvilinear or substantially flat cam surface 40, its outermost end terminating adjacent the path traversed by the cases.

Cases both normal and over length are fed to one end of the trough through the sleeve-like chamber 20 which is supplied with cases by the hopper feed tube 21. The chamber is shown provided with a feed chamber insert 43, as shown in Fig. 5, which comprises a bushing substantially one and one-half inches long and an inch in diameter longitudinally disposed within the lower end of the chamber 20. The upper end of the bore 44 of the bushing is flared outwardly as indicated at 45 so as to facilitate entry of the cases while the lower end of the bushing is provided with a transverse slot 46 milled out to a depth sufficient to provide the clearance necessary to pass the overlong cases, the slot 46 being arranged to coincide with a transverse slot 47 in the lower end of the chamber 20.

Suitably positioned adjacent the end of the chamber 20 is the cartridge feeding shuttle or finger 25 which is of well known construction and adapted to be oscillated in and out of the coinciding slots 46 and 47 to engage and remove a cartridge case from the chamber. Thus, as a cartridge case drops down through the chamber onto the platform or case stop 24, the finger 25 moves into the slots and displaces the case from the platform 24 into the trough 16.

Referring to Fig. 2, suitable means for discharging the overlong cases from the machine may comprise a chute having a funnel portion 51 secured in an aperture in the table 10 of the machine immediately below the slot 26 of the trough 16. The lower end of the chute is shown positioned opposite a suitable receptacle 52 for receiving the overlong cases.

In operation, the cartridge cases are fed to the supporting trough 16 from the chamber 20 as above described. The cartridges are then moved along the trough and simultaneously rotated by the conveyor screws 11 and 12. As an overlong case is traversed into the flame of the second burner, its base moves over the aperture 26 and is supported thereover by the narrow ledge 31. Simultaneously, the upper end or mouth of the case engages the substantially rigid cam-gauge 35 and is deflected outwardly or clockwise as seen in Fig. 2, thereby swinging the base of the case upwardly and dislodging the rim of the case head from the narrow ledge 31. The case immediately falls by gravity through the slot 23 and is discharged out of the machine through the chute 50 into the receptacle 52.

Although the overlong case passes through the annealing flame of the first burner before the case is ejected, experiment has shown that this relatively short heating period is insufficient to bring the case to the critical annealing temperature. Consequently, the case may be retrimmed with the same smoothness as that of a normal case.

As already pointed out, any normal cases which may have been accidentally displaced from engagement with the conveyor screws will be deflected back into engagement with the screw convolutions by the camming surface 40.

A suitable discharge chute (not shown) at the left hand end of the trough receives the annealed cases as they drop out of the trough and conducts them into a suitable receptacle.

A modification of the invention is illustrated in Figs. 6, 7 and 8 which show cartridge gauging and separating elements associated with a well known type of twin screw inspection machine.

The latter comprises a suitable frame 70 having spaced parallel screw conveyors 71 rotatably supported on the frame in a manner similar to that of the annealing machine described above. Suitable cartridge feeding means 72 are secured to the frame adjacent one end of the screws for delivering the cases thereon.

Referring to Fig. 7, the inspection machine is shown provided with a cartridge case supporting means indicated generally at 74 which is fixedly secured to the frame parallel to the conveyor screws 71 and comprises an angle bar or V-shaped trough, the side or ledge 75 of which lies in a plane substantially at right angles to a plane through the axis of the conveyor screws, the other side or ledge 76 being disposed substantially parallel thereto. The base or head of the cartridge case is adapted to be supported by and to be moved along these respective supporting ledges by the conveyor screws. Adjacent to the trough and secured in a horizontal groove in the frame 70 is the usual type of mirror 77 for reflecting the images of the bases of the cases as the latter are rotatingly traversed along the ledge 75.

Suitable means for automatically gauging and separating the cases as they are being conveyed along the trough comprise, in part, the cam gauge elements indicated generally at 78 and 79. Each element comprises a piece of relatively thin, stiff, flat stock suitably secured at one end to the upper end of a post or standard 80 which, in turn, is fastened to the frame 70 as shown in Figs. 7 and 8. The opposite end of each element is bent over to form a cam surface 81 and 82 respectively, which projects forwardly in the line of travel of the cases and at an angle of substantially 20 degrees with respect thereto. Suitable adjusting means comprising slots in the cam element adapted to accommodate bolts 83 and 84 in the upper ends of the standards 80 are provided for adjusting the height of the respective cam surfaces 81 and 82 so that the lower edges or gauging portions thereof, as shown in Fig. 7, may be properly adjusted with respect to the ledge 75 of the trough.

The embodiment shown is particularly adapted for gauging and separating .30 caliber cartridge cases, and the cam surface 81 is adjusted to just clear a case of standard length, and to deflect and reject overlong cases. The second cam surface 82 is adjusted to engage and deflect cases of standard length and is positioned accordingly.

Opposite each cam element is a slot 85 and 86, respectively, milled or otherwise cut through the frame 70 which constitutes a chute. Thus, cases which are overlong will be automatically gauged by the first cam surface 81 and deflected thereby, in the manner described above, from the inspection trough 74 into the chute 85. It will be understood that these overlong cases may be returned to the trimming machine for retrimming to standard length. Cases which are of standard length will pass beneath the first gauge means 81 and be automatically deflected into the chute 86 by the second gauge means 82.

Short cases will, of course, pass below both gauging surfaces 81 and 82 and hence will travel along the trough beyond the chutes 85 and 86. As indicated in Fig. 6, the trough 74 is discontinued or cut off sharply at a point immediately beyond the chute 86, a third chute 87 being formed in the frame 70 opposite this end of the trough, and hence when the short cases reach the end of the trough they will fall down, by gravity, into the chute 87 and will be discharged from the machine as scrap.

It will be clear, therefore, that the automatic cartridge case gauging and separating means described above will greatly relieve the cartridge case inspector of the exhausting strain of trying to effect visual separation of standard and off-standard cartridge cases.

What is claimed is:

1. A machine for gauging and separating elongated articles, each article having a base portion and a neck portion comprising means for supporting the bases of said article; conveyor means engaging said articles to positively translate said articles along said supporting means, said conveyor means comprising a pair of spaced parallel screws rotatable in a plane slightly inclined to the vertical to hold the articles upright with the bases of said articles on said support; and means for discharging articles from said machine comprising a gauge member to engage articles exceeding a predetermined length and move the bases of said articles off of said support.

2. A machine for gauging and separating elongated articles, each article having a base portion and a neck portion comprising means for supporting the bases of said articles, said supporting means having an aperture to discharge articles by gravity from said machine when the

bases of said articles are moved off of said support; conveyor means engaging said articles to positively translate said articles along said supporting means parallel to said aperture, said conveyor means comprising a screw constructed and arranged to support said articles with the bases thereof on said supporting means when said articles are opposite said aperture; and a gauge member opposite said aperture to engage the neck portions of articles exceeding a predetermined length and pivot said articles about said screw thereby to move the bases of said articles off of said support into said aperture.

3. A machine for gauging and separating elongated articles, each article having a base portion and a neck portion comprising means for supporting the bases of said articles, said supporting means having an aperture to discharge articles by gravity from said machine when the bases of said articles are moved off of said support; conveyor means engaging said articles to positively translate said articles along said supporting means parallel to said aperture, said conveyor means comprising a pair of spaced parallel screws in a plane slightly inclined to the vertical to hold the articles upright with the bases of said articles on said support adjacent said aperture; and a gauge member to engage articles exceeding a predetermined length and move the bases of said articles off of said support.

4. A machine for automatically gauging and separating metallic tubular articles comprising an article supporting trough having an aperture in the bottom thereof; a screw conveyor adjacent said trough adapted to translate and simultaneously rotate said articles along the bottom of said trough; gauge means secured to said trough adjacent one end of said aperture, said gauge means being mounted at an angle to the line of translation of said article to engage and deflect overlong articles out of said trough into said aperture; and article engaging means adjacent the opposite end of said aperture adapted to return articles of normal length back onto said conveyor screw.

5. A machine for automatically gauging and separating metallic tubular articles comprising an article supporting trough having an aperture in the bottom thereof; a screw conveyor adjacent said trough adapted to translate and simultaneously rotate said articles along the bottom of said trough; gauge means secured to said trough adjacent one end of said aperture, said gauge means having a cam surface mounted at an angle to the line of translation of said article to engage and deflect overlong articles out of said trough into said aperture; article engaging means adjacent the opposite end of said aperture adapted to return articles of normal length back onto said conveyor screw; and a chute opposite said aperture for conveying said overlong articles to a receptacle.

6. In a cartridge case annealing machine, a screw conveyor adapted to translate and simultaneously rotate cartridge cases; a feed tube chamber having means constructed and arranged to feed overlong cases to said screw conveyor; a trough for supporting said cases in contact with said conveyor, said trough having an aperture in the bottom thereof adjacent said chamber; and case gauging means at one end of said aperture constructed and arranged to deflect overlong cases from said trough into said aperture.

7. In a cartridge case annealing machine, a screw conveyor adapted to translate and simultaneously rotate cartridge cases; a feed tube having means constructed and arranged to feed overlong cases to said screw conveyor; a trough for supporting said cases in contact with said conveyor, said trough having an aperture in the bottom thereof adjacent said feed tube; case gauging means at one end of said aperture, said gauging means having a cam surface for deflecting overlong cases from said trough into said aperture; and cartridge case engaging means adjacent the opposite end of said aperture to return cases of normal length back into engagement with said conveyor.

8. In a cartridge case annealing machine, a screw conveyor adapted to translate and simultaneously rotate cartridge cases; a feed tube having means constructed and arranged to feed overlong cases to said screw conveyor; a trough for supporting said cases in contact with said conveyor, said trough having an aperture in the bottom thereof adjacent said feed tube; case gauging means at one end of said aperture, said gauging means having a cam surface for deflecting overlong cases from said trough into said aperture; cartridge case engaging means adjacent the opposite end of said aperture to return cases of normal length back into engagement with said conveyor; and a chute opposite said aperture for conveying said overlong cases to a receptacle.

EDWIN H. BIRDSALL.

CERTIFICATE OF CORRECTION.

Patent No. 2,356,203. August 22, 1944.

EDWIN H. BIRDSALL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 46, for "machine" read --machines--; page 2, second column, line 40, after "one" insert --end--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of December, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.