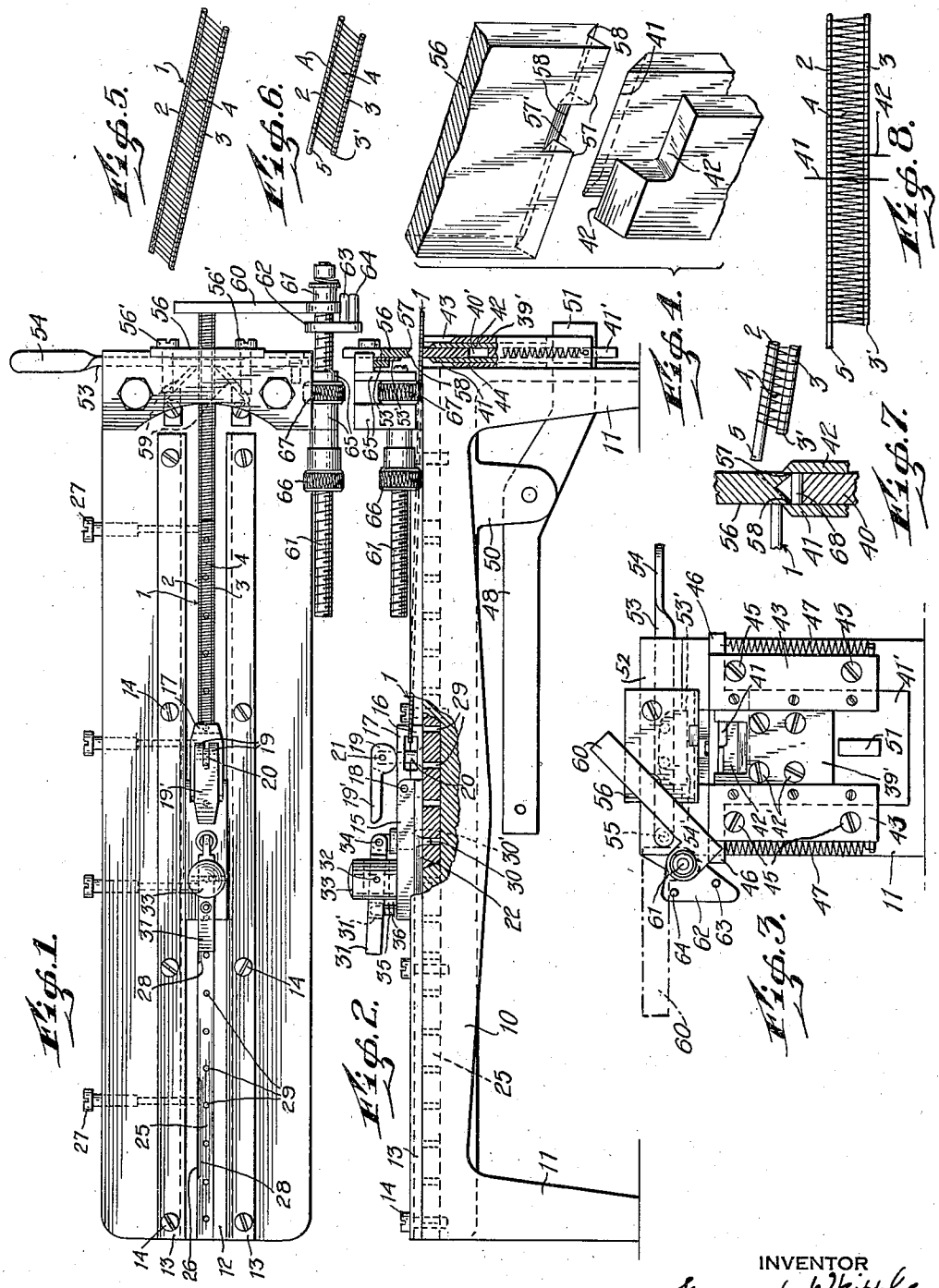
Jan. 15, 1946. G. L. WHIPPLE 2,392,870

METHOD AND APPARATUS FOR SEVERING GRID STRIPS INTO PREDETERMINED GRID LENGTHS

Filed June 1, 1944 2 Sheets-Sheet 1



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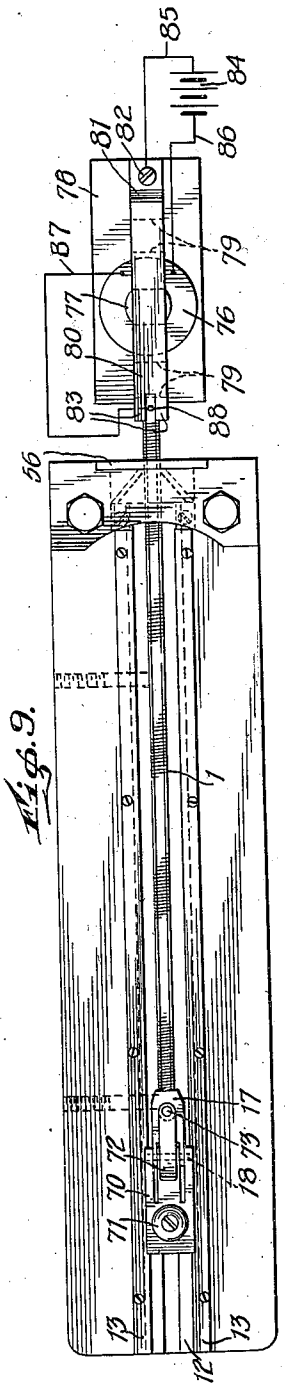


Fig. 9.

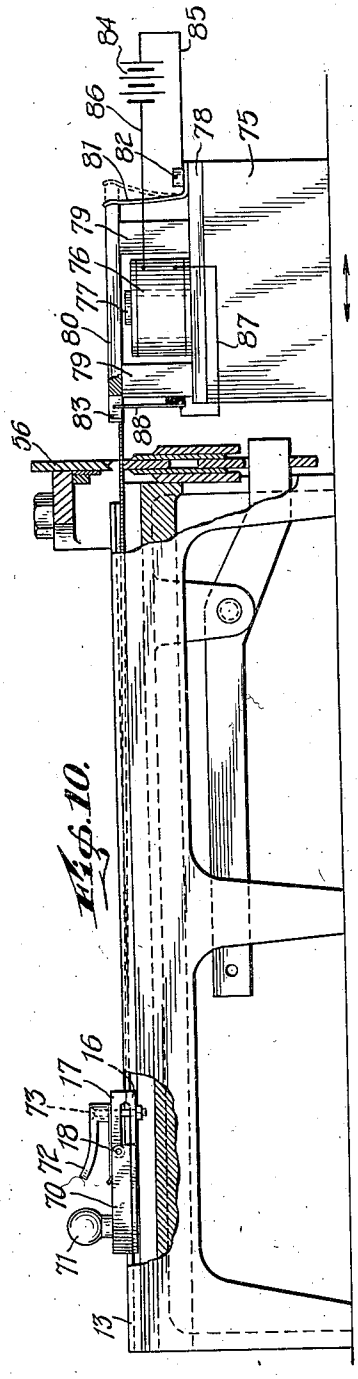


Fig. 10.

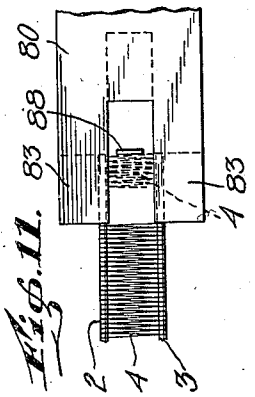


Fig. 11.

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METHOD AND APPARATUS FOR SEVERING GRID STRIPS INTO PREDETERMINED GRID LENGTHS

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17 Claims. (Cl. 164—47)

This invention relates to the severing of grid strips into grids of predetermined length for use in radio tubes and the like.

One object of the invention is a novel and improved method and means for severing grid strips into predetermined grid lengths.

A further object of the invention is a novel and improved method and means for severing grid strips into grid lengths of a form and length ready for assembly.

A further object of the invention is a novel and improved apparatus of the above indicated character which is characterized by its accuracy in operation, its simplicity and ease of operation and the economy with which it may be manufactured.

Further objects of the invention will hereinafter appear.

For a better understanding of the invention reference may be had to the accompanying drawings forming a part of this application, wherein

Fig. 1 is a plan view of one embodiment of the invention;

Fig. 2 is a side view partly in section thereof;

Fig. 3 is an end view thereof;

Fig. 4 is a perspective view of the severing knives;

Fig. 5 is a perspective view of a grid strip;

Fig. 6 is a perspective view of one form of a grid ready for assembly;

Fig. 7 is a section through the knives at the time of severing;

Fig. 8 is a plan view of a grid strip further illustrating diagrammatically the severing operation;

Fig. 9 is a plan view of a modified apparatus;

Fig. 10 is a side view thereof partly in section; and

Fig. 11 is an enlarged plan view of a part of the mechanism.

Referring to Fig. 5, I have illustrated a conventional grid strip 1 having the supporting wires 2 and 3 and the cross or lateral wires 4 wound thereabout. In Fig. 6 I have illustrated a grid length ready for assembly in a radio tube or the like which is omitted from the drawing for convenience in illustration. This grid length A has the support wires 2 and 3 severed at one end so as to be of the same length but severed at the other end so as to have one end 5 projecting out beyond the end of the other support wire.

Referring to Figs. 1 to 4, I have illustrated an apparatus for forming the grid lengths A of predetermined length from the grid strip 1 in accordance with this invention. This apparatus comprises a frame 10 having supporting end or leg parts 11. The frame 10 is of rectangular shape in plan and of a length greater than that of the grid strip 1. A longitudinally extending guide groove or channel 12 is provided on the top of the frame 10, in this particular embodiment being formed by spaced strips or bars 13 fastened to the top of the frame 10 in any suitable manner as for example by the screws 14. The guide groove or channel 12 and side bars 13 form a track on which is movably mounted a slide block or carriage 15. This carriage 15 has at its righthand end a pair of clamps 16 and 17 for clamping and holding the end of a grid strip 1 with the grid strip disposed within the channel 12. The two clamping jaws 16 and 17 are relatively movable to receive and release the ends of the grid strips and in the particular embodiment shown the clamp 17 is pivoted at 18 to the carriage 15 while the jaw 16 is fixed with respect to the carriage 15. The clamp 17 is held in clamping engagement with the strip 1 by means of a forked cam structure 19 straddling a pin 20 which is rigidly fastened to the carriage 15. The forked cam 19 is pivotally mounted at 21 to the upper end of the pin 20 and is provided with an operating handle 19' for operating the cam and causing it to engage and disengage the strip 1. The carriage 15 is held within the guide channel or track in any suitable manner, as for example, by providing the carriage 15 on each side thereof with a guide edge or ledge 22 which fits under the laterally projecting edge 23 formed in the bars 13. The ledge 22 may be formed by milling the top edge of the carriage 15 and the edge or flange 23 may be formed by making a bar 13 of two strips with the upper strip projecting beyond the lower one.

An index bar 25 underlies the carriage 15, being disposed in the particular embodiment shown in a groove 26 formed in the frame 10 midway the bars 13. This indexing bar is adjustably but rigidly fastened within the groove 26 to the frame in any suitable manner, as for example by the screw bolts 27 whose inner ends engage the side of the indexing bar 25. In the particular embodiment shown the side of the bar 25 is provided with elongated recesses 28 which recessed parts are engaged by the bolts 27. The indexing bar 25 is provided with recesses 29 spaced from each other a distance equal to the length of the grid A and in the particular embodiment shown, the grid A for purposes of illustration is exaggerated in length. The carriage 15 is locked against movement by a means engaging successively these recesses 29 and in the particular embodiment shown this means com-

prises a pin 30. The pin 30 may be removed from the recesses 29 by pressing down on a lever 31 which is pivotally fastened at 32 to a knob or pin 33 fastened to the upper side of the carriage 15, the other end of the lever 31 being pivotally fastened at 34 to the upper end of the pin 30. The lever 31 passes through a transverse opening or recess formed in the knob 33 and the lever is biased to locking position by means of a spring 35 surrounding a pin 36 fastened to the upper side of the carriage 15 and projecting up into an opening 31' formed in the lever 31, the spring 36 engaging at one end the upper side of the carriage 15 and engaging at its upper end the lever 31. The pin 30 is enlarged at 30' and is guided in its up and down movements through the carriage 15 in an opening provided therein.

The apparatus is provided with a severing means illustrated at the righthand end of the frame 10. A movable rest or support 40 over which the grid strip 1 slides as it is fed forward by the carriage 15 is mounted in any suitable manner for upward movement toward a fixed cutter 56, the latter being fixed to the frame 10 by means of bolts 56'.

On each side of the support 40 moves a cutting knife, a knife 41 on the left hand side of the support 40, looking at Fig. 2, and a knife 42 on the right side of the support 40. These knives are guided in a frame having right and left plates 43 and 44 which are spaced from each other a distance equal to the thickness of the support 40 plus the sum of the thicknesses of the severing knives 41 and 42. These plates 43 and 44 may be secured to the frame 10, 11 in any suitable manner, as for example, by securing bolts 45. Means are provided for moving the severing knives 41 and 42 upwardly and this comprises a lever 48 pivoted at 49 to a bracket 50 downwardly depending from the frame 10 and the lever 48 has a part 51 which extends underneath the severing knives 41 and 42 so as to move them as a unit when the other end of the lever 48 is pressed downwardly, either manually or otherwise. In the particular embodiment shown the knives 41 and 42 are rigidly fastened to the opposite sides of a plate 41' and the latter is engaged by the lever part 51 to actuate the knives.

Also disposed at the righthand end of the machine is a supporting plate or bracket member 52 and a manually operated lever 53 having a handle 54 is pivotally fastened to the bracket 52 at 55. This lever 53 carries a holding member 53' having a holding edge 54' (see Fig. 3), which is adapted to be brought down against the upper side of the grid strip 1 to hold it tightly against the grid strip resting on the support 40. The fixed cutting knife 56 is provided with cutting edges 57 and 58 for cooperatively functioning with the movable knives 41 and 42 to sever the grid. It is of the same thickness as the support plate 40 and is supported in alinement therewith so that when the knives 41 and 42 are moved upwardly they telescope in close sliding relation with the fixed cutter 56. The severing knife 41 cooperates with the cooperating severing edge 58 of the cutter 56 to sever both of the supporting wires 2 and 3 at points even with each other. The severing knife 42 cooperatively functions with the fixed cutting edge 57 to sever one of the supporting wires 2 or 3, as for example, the wire 3 at a point further inward, namely at the point 3' so as to make the supporting wire 3 shorter than the supporting wire 2, or to provide the supporting wire 2 with the projecting end 5. For this purpose the severing knife 42 is provided with a gap 42' for the accommodation of the projecting end 5 of the wire 2 and to thereby avoid severing this projecting end 5 from the support wire. The severing edge 57 is provided with a corresponding gap 57' which cooperates with the gap 42' so as to clear the projecting end 5 of the support wire 2.

A gate formed by converging walls 59, guides the strip 1 onto the support 40. The rest or support plate 40 is provided at its upper ends with outwardly extending lugs 46 for the attachment of the upper ends of tension springs 47, the lower ends of the springs 47 being attached to the fixed guide frame. The springs 47 bias the supporting plate 40 to the position shown in Fig. 2, the plate being arrested in that position against further movement under the tension of the springs. The upper edge of the plate 41' in its lowermost position is spaced from the support plate 40 as indicated at 40' in Fig. 2 but when the plate 41' with the knives 41 and 42 is moved upwardly by the lever 48 the upper edge of the spacing plate 41' engages the lower edge of the support plate 40 and moves it up to the position shown in Fig. 7 against the tension of the springs.

The apparatus is provided with a measuring device or arm 60 for measuring the length of the first grid length A to be severed from an end of a strip 1. This arm 60 is carried on an adjustable shaft or rod 61 and may be brought down to a position in line with the strip 1 or it may be shifted over out of alinement with the grid strip as for example to the position shown in dot and dash line in Fig. 3. A plate 62 is carried by the rod 61 and this plate carries a lower pin 63 for engaging the end or heel of the arm 60 when the latter is brought down to a position in alinement with the grid strip. This plate is also provided with a pin 64 for engaging the underside of the arm 60 when the latter is shifted over to the left. The rod 61 is externally screw threaded and mounted for longitudinal adjustment on the frame 10. In the particular embodiment shown this rod 61 is journaled in alined forked bearings 65 carried by a bracket mounted on the frame 10. Adjusting nuts 66 and 67 are provided for adjusting the rod longitudinally. By adjusting these nuts 66 and 67 the arm 60 may be brought closer to or farther away from the severing block 40. The nut 67 is disposed between the bearings 65 for moving the rod and adjusting it to the desired position and the nut 66 is a locking nut. This arm 60 is adjusted to a position such that the distance from the supporting plate 40 is equal to the spacing between adjacent recesses 29 of the indexing bar 25.

The operation is as follows. A grid strip 1 is placed in position with one end firmly clamped between the jaws 16 and 17 of the clamp of the carrier. As before indicated, the arm 60 is adjusted to position such that its distance from the support 40 is equal to the spacing between the centers of adjacent recesses 29 of the indexing bar. With this adjustment made the carriage 15 is moved forward until the ends of the support wires 2 and 3 engage the measuring or stop arm 60. With the grid strip in this position the indexing bar 25 is moved longitudinally until the locking pin 30 enters into a recess 29 and in this position the bar 25 is fastened by the bolts 27. The arm 60 is then moved out of the path of

the grid strip. The severing knives 41 and 42 are then actuated to sever the grid length A and then the carriage 15 is released by withdrawing the pin 30 from the recesses 29 and is moved forward to the next indexing position with the pin 30 automatically entering the next recess. The knives are again actuated to sever the grid length A and this is continued until the strip is completely severed into the parts. The first movement of the actuating lever 48, 51 results in the sliding of the knives 41, 42 along the sides of the support plate 40 until the cutting edges of the knives are disposed beyond the upper part of the supporting plate 40 a predetermined distance, and further movement of the lever 48 results in the movement in unison of the knives 41 and 42 and the support plate 40 against the tension of the springs 47, the final severing position being shown in Fig. 7 wherein the cutting edges of the knives 41 and 42 have slid past the cutting edges of the fixed cutting knife 56.

Figs. 7 and 8 show the severing operation, it being observed that the wire 2 is severed only once each time while the wire 3 is severed at two points spaced the distance between the knives 41 and 42, a section 68 of the wire 3 being removed from the end 3' of the wire 3. By this mechanism the grid lengths A are of the exact predetermined form and lengths required for precision work on small or miniature radio tubes, the lengths of the sections being identical. For radio tubes having grids of lengths differing from that of grid A, an indexing bar 25 is used having the required spacing of the indexing notches 29.

In the embodiment of Figs. 9, 10 and 11, the specific indexing means of Figures 1 to 3 is omitted and an electrical measuring and indexing means is provided. The frame is provided with the guide channel 12 and the guide rails 13 as in the first embodiment and a carriage 70 is guided therein having a knob 71 for facilitating the moving of the same manually longitudinally of the device. The carriage 70 is provided with clamping jaws 16 and 17 similar generally to the clamping jaws of the carriage above described with the clamping jaws 17 pivoted to the carriage at 18. The jaws 16 and 17 may be opened to release the end of a grid strip 1 or may be brought together to grip the same by means of a handle 72 having a cam 73 for engaging the jaw 17. The severing mechanism is similar to that described above but the measuring arm 60 is omitted.

The measuring and indexing means of this embodiment comprises a support 75 supporting an electromagnetic coil 76 having a core 77. The magnetic circuit for this magnet comprises a lower bar 78, cross end bars 79, all of which are fixed, and a movable bar 80, all of magnetic material. The bar 80 is biased toward the left by means of a spring 81 fastened at 82 to the bar 78. The bar 80 is slotted at its lefthand end so as to provide a pair of spaced fingers or abutments 83 against which the ends of the support wires 2 and 3 engage as the carriage 70 is moved forward. The solenoid 76 is energized by any suitable source of electric current, such as a battery 84 which is illustrated as having one side connected through a wire 85 to the frame or bar 78 and the other side connected through a wire 86 with one terminal of the coil. The other terminal of the coil is connected through a wire 87 with a vertical cat whisker terminal 88. This cat whisker terminal projects up into the slot between the fingers or abutment lugs 83 in a position to be engaged by the lateral wire 4 of the grid strip. The electromagnet and its frame are adjustable toward and away from the severing block 40 to obtain the length of grid A desired.

The operation is as follows. With the grid strip 1 clamped in the clamps 16 and 17 the carriage 70 is moved forward until the wires 2 and 3 of the end of the strip engage the abutments 83. Sufficient pressure continues to be exerted on the carriage 70 to move the bar 80 against the spring 81 until the contact 88 engages the end strand of lateral wire 4. When this happens the electromagnet is energized and magnetically locks the metal bar 80 firmly in the position in which it was at the time the contact 88 makes the contact with lateral wire. The forward movement of the carriage is therefore arrested and in this position the grid length A is severed. When the grid length A is severed or chopped off it automatically falls down and the circuit through the electromagnet is automatically broken. The spring 81 thereupon returns the bar 80 to the initial position whereupon the grid strip may be then advanced again for repeating the operation. These operations are repeated until all of the grid strip has been chopped into individual lengths.

I claim:

1. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested.

2. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising a locking mechanism for locking the carriage to the frame after each advance of a predetermined length.

3. A means for severing grid strips into grids of predetermined lengths for use in thermionic tubes comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an electromagnet energized after each predetermined advance of the carriage.

4. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed and severing

means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an index bar having spaced perforations therein and a locking pin carried by the carriage and biased to enter said perforations as the carriage is advanced step by step.

5. A means for severing grid strips into grids of predetermined lengths for use in thermionic tubes comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an index bar having spaced perforations therein and a locking pin carried by the carriage and biased to enter said perforations as the carriage is advanced step by step, said indexing bar being adjustable longitudinally of the frame.

6. A means for severing grid strips into grids of predetermined lengths for use in thermionic tubes comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an index bar having spaced perforations therein and a locking pin carried by the carriage and biased to enter said perforations as the carriage is advanced step by step, said indexing bar being adjustable longitudinally of the frame, and a measuring arm disposed on the opposite side of the severing mechanism from the carriage and adapted to engage the free end of a grid strip.

7. A means for severing grid strips into grids of predetermined lengths for use in thermionic tubes comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an index bar having spaced perforations therein and a locking pin carried by the carriage and biased to enter said perforations as the carriage is advanced step by step, said indexing bar being adjustable longitudinally of the frame, and a measuring arm disposed on the opposite side of the severing mechanism from the carriage and adapted to engage the free end of a grid strip, said measuring arm being adjustably mounted to assume different positions with respect to the severing means.

8. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said severing means comprising a severing block, a pair of severing knives mounted on the opposite sides of the severing block, a holder which is movable into engagement with a grid strip to hold it firmly upon the severing block and means for actuating the severing knives to sever the grid.

9. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track porportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said severing means comprising a severing block, a pair of severing knives mounted on the opposite sides of the severing block, a holder which is movable into engagement with a grid strip to hold it firmly upon the severing block and means for actuating the severing knives to sever the grid, said holder having severing edges cooperatively functioning with the severing knives and one cooperating pair of knives having gaps therein to clear one of the longitudinal wires.

10. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an index bar having spaced perforations therein and a locking pin carried by the carriage and biased to enter said perforations as the carriage is advanced step by step, the indexing bar being removable.

11. A means for severing grid strips into grids of predetermined lengths for use in thermionic tubes comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arresting means comprising an electromagnet energized after each predetermined advance of the carriage and said electromagnet being disposed on the opposite side of the severing means from the carriage and comprising a spring biased movable magnetic bar in line with the track, said magnetic bar being engaged by a support wire of the grid strip to move the bar against its bias and a contact disposed in the path of the lateral wire of the grid strip for energizing the magnet upon contact therewith and locking the magnetic bar against further movement.

12. A means for severing grid strips of two longitudinal wires connected together with cross wires into grids of predetermined lengths comprising a frame, a guide track thereon, a carriage movable on said track and having a clamp for clamping a grid strip, means for arresting the movement of the carriage after its advance a distance along the track proportional to the length of the grid to be severed, and severing means in alinement with the track for severing from the grid strip a grid while thus arrested, said arrest-

ing means comprising an electromagnet energized after each predetermined advance of the carriage and said electromagnet being disposed on the opposite side of the severing means from the carriage and comprising a spring biased magnetic bar in line with the track, said magnetic bar being engaged by a longitudinal wire of the grip strip to move the bar against its bias and a contact disposed in the path of the cross wire of the grid strip for energizing the magnet upon contact therewith and locking the magnetic bar against further movement and said bar being slotted at its end to have a pair of spring abutments for engagement with the longitudinal wires of the grid strip and said contact extending up into said slot and in the path of the advancing cross wires of the grid.

13. A severing means for grid strips comprising relatively movable severing knives, a biased arresting member disposed in the path of the grid strip and adapted to be engaged by the same, an electromagnet, and a circuit for said electromagnet comprising a contact disposed in the path of the grid strip and closed upon movement of said arresting member to lock the latter against further movement.

14. A means for measuring a grid length on a grid strip comprising an electromagnet and magnetic circuit, a movable member which is locked against movement by the electromagnet, and means controlled by the engagement of the strip with said member for controlling the circuit to the magnet.

15. Severing means for severing the two longitudinal wires of a grid strip comprising a fixed knife having a cutting edge and a movable knife adapted to be brought to a telescoping position with respect to the fixed knife to sever a grid from a strip by simultaneously severing both wires thereof.

16. A severing means for a grid comprising a fixed knife having a pair of spaced cutting edges, a pair of movable spaced knives adapted to be brought into telescopic relation with the cutting edges of the fixed knife, a movable supporting member for a grid strip disposed between said pair of movable knives and movable relatively thereto, said supporting member being biased to a definite position, means for bringing the pair of knives and the supporting member against the biasing means into severing relation with respect to the fixed knife edges, and movable holding means adapted to be brought into engagement with a grid resting upon the support member.

17. A severing means for a grid comprising a fixed knife having a pair of spaced cutting edges, a pair of movable spaced knives adapted to be brought into telescopic relation with the cutting edges of the fixed knife, a movable supporting member for a grid strip disposed between said pair of movable knives and movable relatively thereto, said supporting member being biased to a definite position, means for bringing the pair of knives and the supporting member against the biasing means into severing relation with respect to the fixed knife edges, and movable holding means adapted to be brought into engagement with a grid resting upon the support member, the grid strip having two wires and the cooperating knife edges on one side being adapted to sever both support wires of a grid on a line at right angles to the wires, and the other cooperating knife edges being adapted to sever only one of the wires.

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