

Sept. 29, 1942.

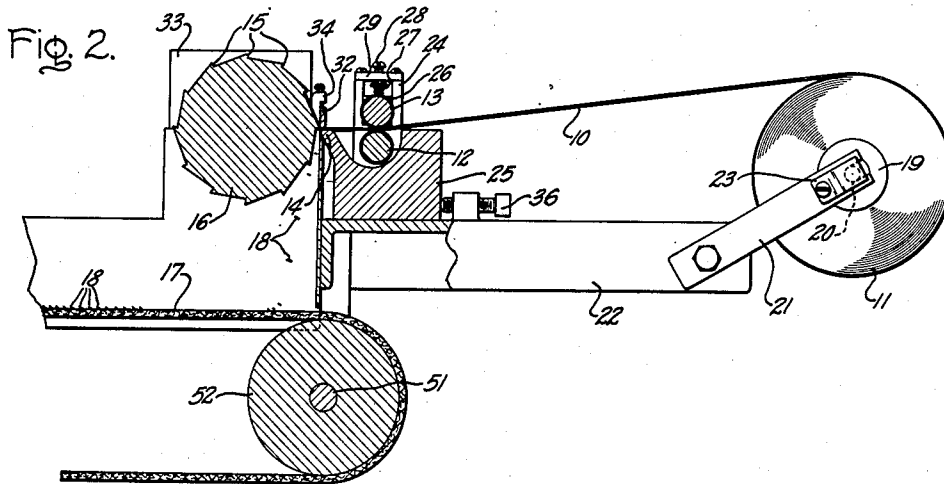
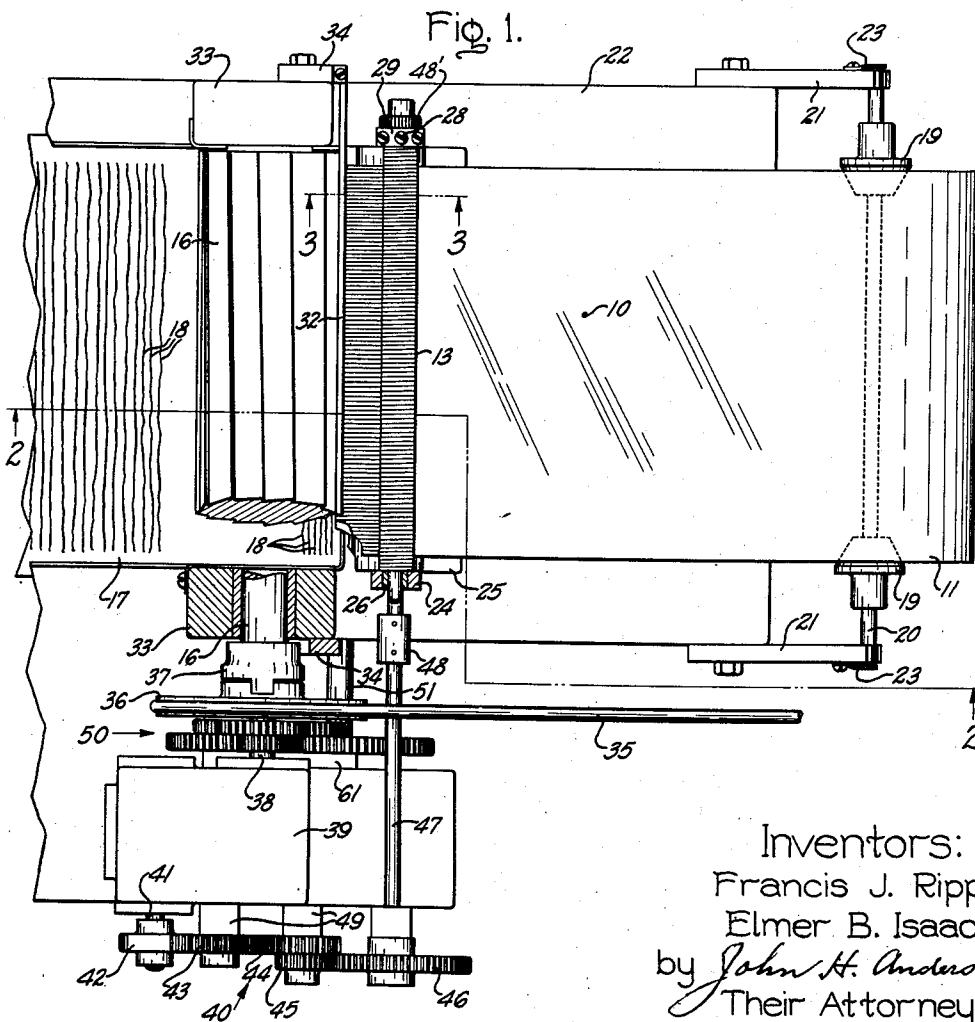
F. J. RIPPL ET AL

2,297,368

STRIP OR RIBBON MAKING METHOD AND APPARATUS

Filed Aug. 22, 1940

2 Sheets-Sheet 1



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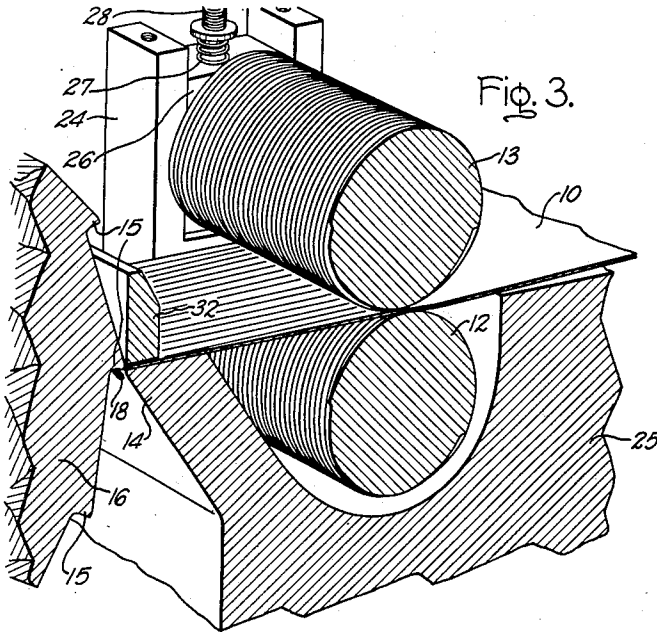
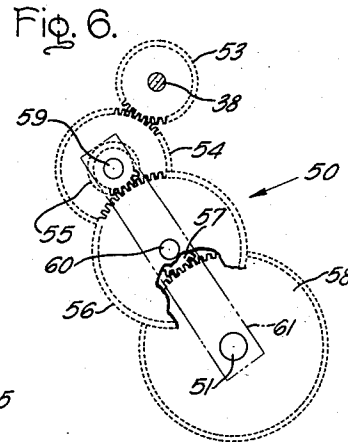
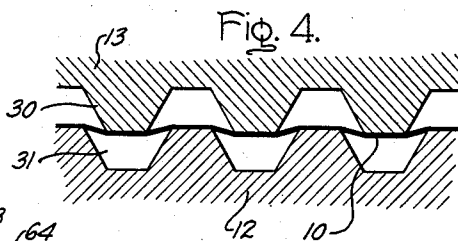
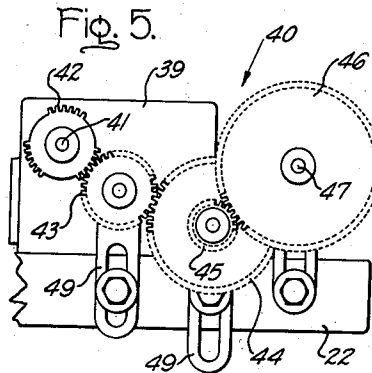
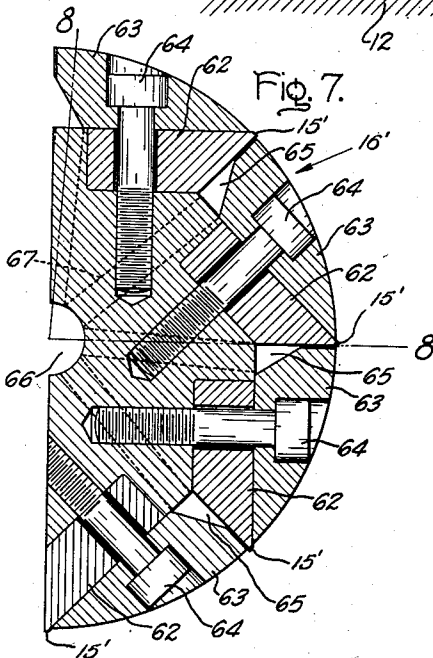
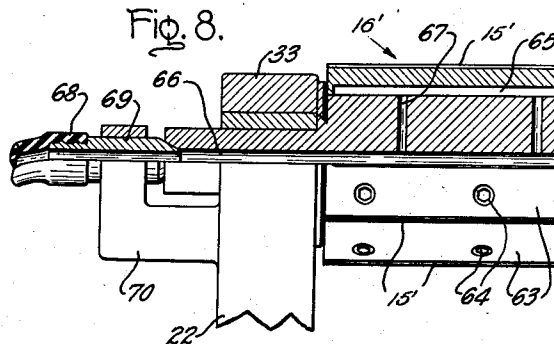
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STRIP OR RIBBON MAKING METHOD AND APPARATUS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,297,368

STRIP OR RIBBON MAKING METHOD AND APPARATUS

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Application August 22, 1940, Serial No. 353,650

13 Claims. (Cl. 164—68)

Our invention relates to a method of providing the combustible filling material for flash lamps, and more particularly to a method and apparatus for cutting uniform strips or ribbons from a thin sheet of the combustible material to produce such filling material. A flash lamp containing such material is disclosed in our application Serial No. 322,520, filed March 6, 1940.

Prior to our invention, the only commercially successful flash lamps contained a combustion supporting gas and a very loosely distributed metal foil or wire which, upon ignition, burns extremely rapidly to produce an intense flash of light. The speed with which the burning takes place makes it possible to receive the full benefit of the light photographically, however, the light flash must occur within a very definite interval after the lamp is set off in order that the photographic apparatus may be properly synchronized therewith. Heretofore the desired rate of burning could only be obtained by the use of extremely thin metal foils or fine wires as the combustible materials. However, the manufacture of such materials is relatively costly and difficult. The interval or lag between the moment the flash lamp is set off and the moment it reaches a usable brightness is also somewhat difficult to control when such materials are used, and it necessitates costly procedures and tests during the manufacture of the flash lamp to maintain uniformity of the said interval.

One object of our invention is to provide a more economical method and apparatus for supplying the combustible filling material for flash lamps. According to our invention, narrow strips or ribbons of a combustible material are formed by repeated cutting or trimming operations on a thin sheet thereof which is readily and economically procurable, and a number of such strips or ribbons are introduced into the bulb of the flash lamp in a manner causing them to be distributed uniformly about the interior thereof. The apparatus for forming the strips or ribbons comprises means for feeding the sheet of combustible material at a very definitely established rate, and means for cutting extremely narrow strips or ribbons from said sheet in accordance with the feeding motion. Means are also preferably provided for separating certain numbers of said strips or ribbons and for effecting the removal of the separate strips or ribbons from the cutting apparatus.

Another object of our invention is to provide apparatus for automatically feeding the sheet of combustible material in a very precise manner

so that strips or ribbons of very definite width are separated therefrom by the cutting apparatus. The feeding operation is very difficult to accomplish satisfactorily in that the sheet is of the order of .001 inch in thickness and usually of considerable length so that it must be kept as a roll. The strength of the sheet, which is preferably of aluminum, magnesium or an alloy thereof, is therefore relatively slight and it could be readily bent or stretched out of shape so that the feeding and cutting operations would be improperly performed. The metal sheet also presents a smooth surface which is difficult to grip and feed properly.

Another object of our invention is to provide apparatus for cutting extremely narrow and uniformly shaped strips or ribbons from the metal sheet in a very precise and rapid manner. Ordinary cutting apparatus is not satisfactory for this purpose, since it tends to tear the sheet into strips because of the thinness thereof and does not produce strips of sufficient uniformity. Torn or non-uniform strips do not have a definite size and therefore impart indefinite or uncontrollable characteristics to the flash lamp. Ordinary cutting apparatus can not produce strips with sufficient rapidity to permit said strips to replace present foil and wire fillings in flash lamps and it often becomes entirely inoperative after short periods of use.

Other objects and advantages of our invention will appear from the following detailed description of an embodiment thereof and from the accompanying drawings.

In the drawings, Fig. 1 is a plan view of apparatus comprising our invention; Fig. 2 is a vertical section through said apparatus taken along line 2—2 of Fig. 1; Fig. 3 is a perspective view, on a larger scale, of a section through the principal parts of said apparatus taken along line 3—3 of Fig. 1; Fig. 4 is a vertical section through adjacent peripheral portions of feed rolls in engagement with the metal sheet, on a still larger scale; Fig. 5 and Fig. 6 are side elevations of gear trains for the feeding means and the discharge means respectively; Fig. 7 is a vertical section through one half of a modification of the cutter; and Fig. 8 is a side elevation of one end portion of the modified cutter and associated apparatus from which a section corresponding to that shown within line 8—8 of Fig. 7 has been removed.

The combustible material is, in the instance shown in the drawing, in the form of a sheet of aluminum, .001 inch in thickness, which is

of uniform width and of such length that it is wound onto the roll 11. Such material, while it is extremely thin, is insufficiently thin to be effectively ignitable when cut into comparatively wide strips, but the material is effectively ignitable when cut into extremely narrow strips. The free end of the sheet 10 extends between the rolls 12 and 13 of the feeding means which automatically advances it over the upper surface of the stationary knife edge 14 and into the path of movement of cutting edges 15 of the rotating cutter 16. A moving belt 17 carries the strips or ribbons 18 from the cutting means as rapidly as they are formed.

The rolled combustible material 11 is held by the conical plugs 19 which are forced into opposite ends of a central opening therein and is supported by the rod 20 which is held by the arms 21 extending from the frame 22. The ends of the rod 20 are located in open slots in the arms 21 and are engaged by the fingers 23 thereon which prevent lateral movement of said rod 20. This construction permits the roll 11 to be quickly replaced and does not allow the sheet 10 to shift laterally in the apparatus.

The metal sheet 10 is drawn from the roll 11 by the rotative motion of the feeding means which is provided primarily to advance said sheet 10 to the cutting means. The feeding means is comprised of the feeding rolls 12 and 13 which are located relatively near the stationary knife edge 14, and is directly responsible for the width of the strip 18 cut from the sheet 10 since it feeds said sheet 10 over said knife edge 14 and into the path of the cutting edges 15 of the cutter 16. In this instance only .000685 of an inch of movement is required of the sheet 10 between each cutting action since each of the strips or ribbons 18 is to be of this width, and the feed rolls 12 and 13 are turned at a uniform rate producing this movement with no apparent disturbance in said cutting action. The feed roll 12 is mounted in bearings in the uprights 24 at opposite sides of the bed 25 for the knife edge 14 whereas the feed roll 13 is mounted in floating bearing blocks 26 within slots in said uprights 24. Springs 27, which are located between the top of the bearing blocks 26 and the collars on the lower end of the adjusting screws 28, cause the rolls 12 and 13 to engage the sheet 10 with the necessary pressure. The screws 28, in turn, are mounted on the bars 29 over the slotted ends of the uprights 24.

The metal sheet 10 must be fed in a very positive manner in order that uniformly wide strips or ribbons 18 will be cut therefrom and accordingly must be especially constructed so that the smooth surface of said sheet 10 can be gripped and held thereby. It is preferred that the peripheries of the feed rolls 12 and 13 have protuberances and depressions therein which in this instance have a modified screw thread form in that it permits the sheet 10 to be bent during engagement with the feed rolls 12 and 13 which assures positive contact and gripping action across the full width thereof. The feed rolls 12 and 13 are arranged so that the ridges 30 of the threads in one roll are over the grooves 31 of the threads of the second roll in the manner shown in Fig. 4 and the pressure of engagement of said rolls 12 and 13 is such that the sheet 10 is bent to the form shown. Any irregularity in the rolls 12 and 13 is therefore of no consequence.

The metal sheet 10 does not return to its original form after leaving the feed rolls 12 and 13, and in its present corrugated form, is so stiff that it is fed to the cutting means without difficulty. In the instance shown the metal sheet 10 has an effective thickness of .003 of an inch whereas the plane sheet 10 is but .001 of an inch in thickness.

The feeding operation advances the end of the metal sheet 10 over the stationary knife edge 14 and into the path of movement of the edges 15 of the cutter 16 which rotates at a uniform rate of speed in a clock-wise direction. A bar 32 mounted directly over the stationary knife edge 14 engages the upper surface of the sheet 10 at this point and keeps it from shifting about. Both the cutter 16 and the bar 32 are mounted on the bearing blocks 33 at opposite ends thereof, the latter indirectly through the arms 34, and are retained at a fixed position on the frame 22 whereas the knife bed 25 can be adjusted with relation thereto by manual rotation of a plurality of screws 35 located along the back thereof. The twelve edges 15 of the cutter 16 and the bearings in the blocks 33 are manufactured with extreme accuracy so that the cutting action in every instance is exactly alike and the strips or ribbons 18 drop free of both the stationary knife edge 14 and the edges 15 of the cutter 16. The edges 15 of the cutter 16 are diagonally arranged thereon in the instance shown. The strips or ribbons 18 severed from the metal sheet 10 fall onto separate areas of the moving conveyor belt 17, and do not have the corrugated form of said sheet 10 but have an irregular appearance which is believed largely due to a non-uniform twisted condition. The conveyor belt 17 carries the strips or ribbons 18 either to means for storing them in some manner or to manually or mechanically operated means for inserting them into the bulbs of flash lamps.

The cutter 16, the feed rolls 12 and 13 and the belt 17 are the only driven members of the machine and are actuated from a common source, preferably an electric motor (not shown) which engages the cutter 16 through the belt 35, the pulley 36 and the coupling 37. The shaft 38 on which the pulley 36 is mounted extends from one side of speed reducer 39 which, in combination with the train 40 of gears shown in Figs. 1 and 5, provides for the operation of the feed rolls 12 and 13. The particular feeding motion desired in this instance is developed through a speed reduction of 286 to 1 which is divided into a 50 to 1 reduction in the speed reducer 39 and a 5.72 to 1 reduction in the gear train 40. The gear train 40 is driven through the shaft 41 of the speed reducer 39 which provides the support for the gear 42 and comprises gears 42, 43, 44, 45 and 46, the latter of which is connected to the feed roll 12 through the shaft 47 and coupling 48. The feed rolls 12 and 13 turn at the same peripheral speed since they are coupled together by intermeshing gears on each roll (gear 48' on roll 13 is the only gear shown). The intermediate sets of gears 43 and 44—45 are mounted on the arms 49 which are adjustably attached to the frame 22 of the apparatus so that other gears of different sizes may be substituted for those in said train and the width of strips or ribbons 18 cut can be changed at will. Gear 42 is a mutilated gear which is not provided with teeth completely around its periphery but has three

groups thereof which have sufficient length to cause the feeding means to operate for definite periods during which a sufficient number of strips or ribbons 18 are formed to supply one flash lamp. When one of the groups of teeth are not engaged with gear 43, the feeding means is not operated and an interval occurs during which no strips or ribbons 18 are cut. The conveyor belt 17, however, continues to move during these intervals and a space such as shown in Fig. 1 occurs between the strips or ribbons 18 for one flash lamp and those for another. The lengths of the operating and rest periods are, of course, established in accordance with the requirements of the flash lamps and on different occasions when a greater or lesser number of strips or ribbons 18 are required changes can be made in the gear train 40 to produce the desired results. In some instances the counting feature of the apparatus may not be desired and a gear having teeth over its full periphery may be substituted for gear 42. The conveyor belt 17 is preferably moved at a rate of speed which causes the strips or ribbons 18 to be spaced from each other in the manner shown and is actuated from the drive shaft 38 of the speed reducer 39 through the gear train 50 shown in Figs. 1 and 6, the shaft 51 and the roll 52. The shaft 38 supports the gear 53 of the gear train 50 and the motion imparted to it is transferred through the gears 54, 55, 56 and 57 in order to the gear 58 on the shaft 51. Support for the shaft 51 is provided by portions (not shown) of the frame 22 whereas support for the pins 59 and 60 on which the gears 54-55 and 56-57 respectively are mounted is provided by the bar 61 which is attached to the frame 22.

The metal strips or ribbons 18 can be transferred directly to the flash lamps from the conveyor belt 17 but each group thereof must be rumpled during said operation in a manner causing them to be uniformly distributed about the interior of the lamp. A short stick or lead pencil in the hand of an operator can be used to pick up the strips or ribbons 18 and, if agitated back and forth, causes them to be formed into a loosely formed wad or ball which is then inserted into the lamp. The strips or ribbons 18 are sufficiently stiff and irregular in form (although of uniform section) to quickly form the wad or ball desired and, after insertion in the lamp, are sufficiently stiff to retain their position in said lamp. Sudden jarring or rough handling of the lamp does not cause the strips or ribbons to shift materially.

The speed of operation of the cutting apparatus is such that a sufficient number of strips or ribbons 18 for a single lamp can be made in from 2 to 3 seconds which is more rapidly than they can be inserted in flash lamps manually. Mechanical means must then be used to take the strips 18 from the conveyor belt 17. Such mechanical means may provide means for storing the strips 18 and may comprise a supply reel in place of roll 52, a continuous sheet of paper or the like in place of the belt 17, and a driven collecting reel. The collecting reel may be arranged so that the paper is wound upon it before the strips 18 can move from position and may be constructed so as to be readily removed to some other location where the paper may be unwound and the strips released as needed.

The modified apparatus shown in Figs. 7 and 8 comprises a rotary cutter 16' constructed so

that the cutting edges 15' represented by the knives 62 are removable. Means are also provided in said cutter 16' for separating the strips or ribbons 18 from the knives 62 since said strips or ribbons 18 tend to adhere thereto under certain conditions of operation. Each knife 62, of which there are eight in the instance shown, rests in a groove in the cutter 16' which definitely positions it, each knife being held in place by block 63 which is attached to the cutter 16' by the screws 64. Under certain conditions of operation the weight of the strips or ribbons 18 would not be sufficient to cause them to drop from the cutter 16' but a relatively weak or low pressure jet of air is caused to be blown along the faces of the knives 62 and the blocks 63 to separate said strips or ribbons therefrom. The air emerges from a larger opening 65 between the innermost edges of said faces into which it is conducted from a central opening 66 in the cutter 16' through regularly spaced radial passages 67 therein and is conducted to the cutter 16' from a supply source (not shown) through the flexible pipe 68 and the pipe 69 which is held by a portion 70 of the frame 22 and which engages the end of the cutter 12', the terminus of the opening 66. The opposite end of the opening is plugged.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. The method of making combustible metallic filling material for flash lamps which comprises selecting a sheet of the metal which is extremely thin but insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps, said slicing from said sheet extremely narrow strips which are readily ignitable when used as the filling material for flash lamps.

2. The method of making combustible metallic filling material for flash lamps which comprises selecting a sheet of the metal of the order of 0.001 inch thick, such sheet material being insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps, and slicing from said sheet extremely narrow strips which are readily ignitable when used as the filling material for flash lamps.

3. The method of making combustible metallic filling material for flash lamps which comprises selecting a sheet of the metal of the order of 0.001 inch thick, such sheet material being insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps, and slicing from said sheet extremely narrow strips of a width of the order of 0.001 inch which are readily ignitable when used as the filling material for flash lamps.

4. The method of making combustible metallic filling material for flash lamps which comprises selecting a sheet of the metal which is of definite width and is extremely thin but insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps, and slicing from edge to edge of said sheet extremely narrow strips which are readily ignitable when used as the filling material for flash lamps and which are so uniform in size and weight that equal numbers of strips impart precisely equivalent characteristics to different finished lamps.

5. The method of making combustible metallic filling material for flash lamps which comprises selecting a sheet of the metal which is

extremely thin but insufficiently thin to be effectively ignitable when comparatively wide strips are used as the filling material for flash lamps, slicing from said sheet extremely narrow strips which are readily ignitable when used as the filling material for flash lamps, and then distributing a quantity of the strips loosely within the bulb of a flash lamp.

6. Apparatus for making combustible metallic filling material for flash lamps comprising means for cutting extremely narrow strips from the end of a sheet of the combustible material and means for feeding said sheet to the cutting means at the necessary rate of speed, the parts of said apparatus being so constructed and arranged as to cut strips of the order of a thousandth of an inch wide.

7. Apparatus for making combustible metallic filling material for flash lamps comprising a stationary knife edge, means for feeding an end portion of a sheet of the combustible material over the knife edge, a rotatable cutter located in operative relation to the knife edge having a plurality of cutting edges, means for rotating the cutter to bring each of said edges in turn into engagement with the knife edge to cut an extremely narrow strip of said sheet extending beyond said edge and means for operating the feeding means to advance succeeding strips of said sheet into the path of movement of the cutting edges, the parts of said apparatus being so constructed and arranged as to cut strips of the order of a thousandth of an inch wide.

8. Apparatus for making combustible metallic filling material for flash lamps comprising a stationary knife edge, means for feeding an end portion of a sheet of the combustible material over the knife edge, a rotatable cutter located in operative relation to the knife edge having a plurality of cutting edges on the periphery thereof angularly arranged to the axis of rotation, means for rotating the cutter to cause each of said edges to engage and pass the knife edge to cut an extremely narrow strip of said sheet extending beyond said edge and means for operating the feeding means to advance succeeding strips of said sheet into the path of movement of the cutting edges, the parts of said apparatus being so constructed and arranged as to cut strips of the order of a thousandth of an inch wide.

9. Apparatus for making combustible filling material for flash lamps comprising a stationary knife edge, means for feeding an end portion of a sheet of the combustible material over the knife edge, a rotatable cutter located in operative relation to the knife edge having a plurality of cutting edges on the periphery thereof and passages therein leading to said knife edges, means for rotating the cutter to bring each of said edges in turn into engagement with the knife edge to cut an extremely narrow strip of said sheet extending beyond said edge, means for operating the feeding means to advance succeeding strips of said sheet into the path of movement of the cutting edges and means for introducing air into the passage in the cutter to cause jets thereof to be blown against the cutting edges and the strips to be separated therefrom.

10. Apparatus for making combustible metallic filling material for flash lamps comprising means for cutting extremely narrow strips from an end portion of a sheet of the combustible material, a pair of feed rolls located adjacent the cutting means adapted to engage the opposite sides of the sheet and means for rotating the feed rolls and the cutting means in proper synchronization to each other to cause the sheet to be advanced to the cutting means and strips of the desired width to be cut therefrom, the parts of said apparatus being so constructed and arranged as to cut strips of the order of a thousandth of an inch wide.

11. Apparatus for making combustible filling material for flash lamps comprising means for cutting extremely narrow strips from an end portion of a sheet of the combustible material, a pair of feed rolls located adjacent the cutting means adapted to engage the opposite sides of the sheet having matching protuberances and depressions in the peripheries thereof for deforming the sheet during the feeding operation to provide positive engagement with said sheet and prevent slipping of the feed rolls, and means for rotating the feed rolls and the cutting means in proper synchronization to each other to cause the sheet to be advanced to the cutting means and strips of the desired width to be cut therefrom.

12. Apparatus for making combustible filling material for flash lamps comprising means for cutting extremely narrow strips from an end portion of a sheet of the combustible material, a pair of feed rolls located adjacent the cutting means adapted to engage the opposite sides of the sheet having matching helical ridges and grooves in the peripheries thereof for producing corresponding configurations in the sheet to stiffen said sheet and provide positive engagement therewith and means for rotating the feed rolls and the cutting means in proper synchronization to each other to cause the sheet to be advanced to the cutting means and strips of the desired width to be cut therefrom.

13. Apparatus for making combustible material for flash lamps by slicing extremely narrow strips from an extremely thin sheet of metal comprising a stationary knife edge, rotatable feed rolls for gripping said sheet and feeding an end portion thereof over said knife edge, a rotatable cutter located in operative relation to said knife edge, means for continuously rotating said cutter to cut extremely narrow strips from the said end portion of said sheet, a gear train for driving said feed rolls from said cutter, said gear train including a mutilated drive gear having teeth around only a portion of its periphery to effect minute stepping of said feed rolls in accordance with the cutting of strips of very narrow width during the periods when said teeth are in engagement with the teeth of a driven gear in the train and to render said rolls periodically inoperative during the periods when said teeth on said drive gear are out of engagement with said driven gear.

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