

Dec. 8, 1931.

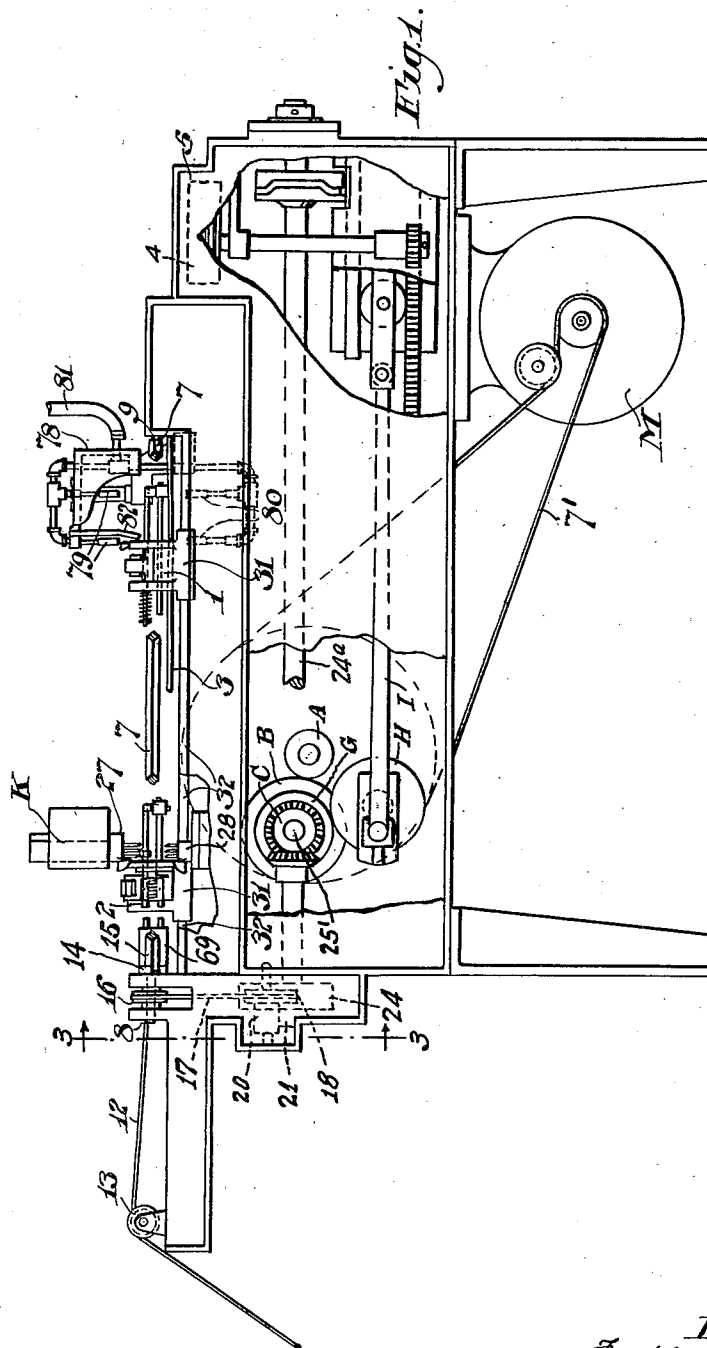
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1,835,801

METHOD OF AND APPARATUS FOR FORMING LEADS

Filed Dec. 18, 1929

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

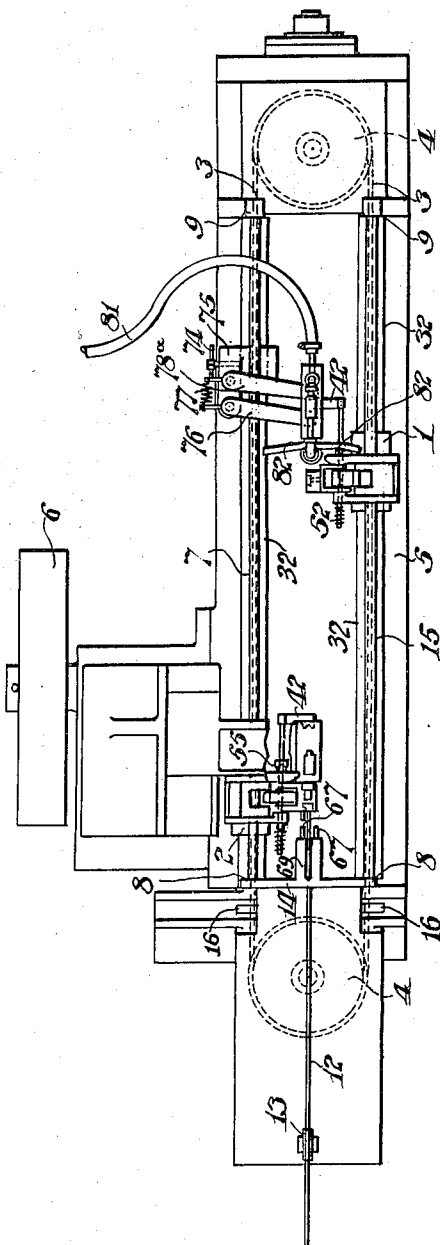


Fig. 2.

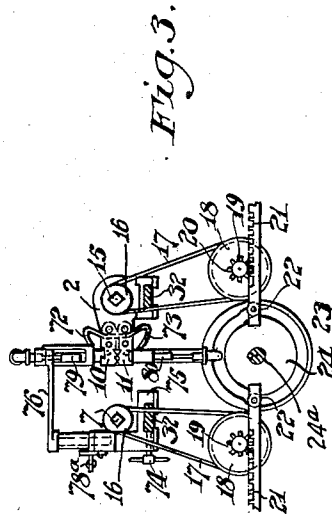


Fig. 3.

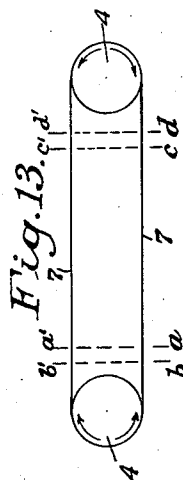


Fig. 13.

Fig. 14.

CARRIAGE #1, a-b-c-d-a-b etc
CARRIAGE #2, c'-d'-a'-b'-c'-d' etc

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5 Sheets-Sheet 3

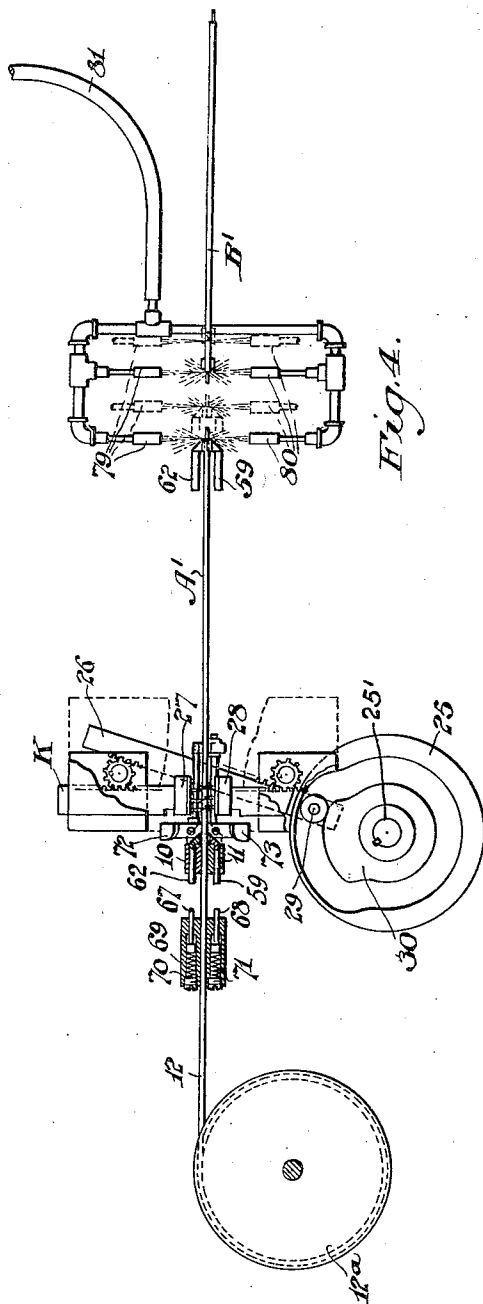


Fig. 4.

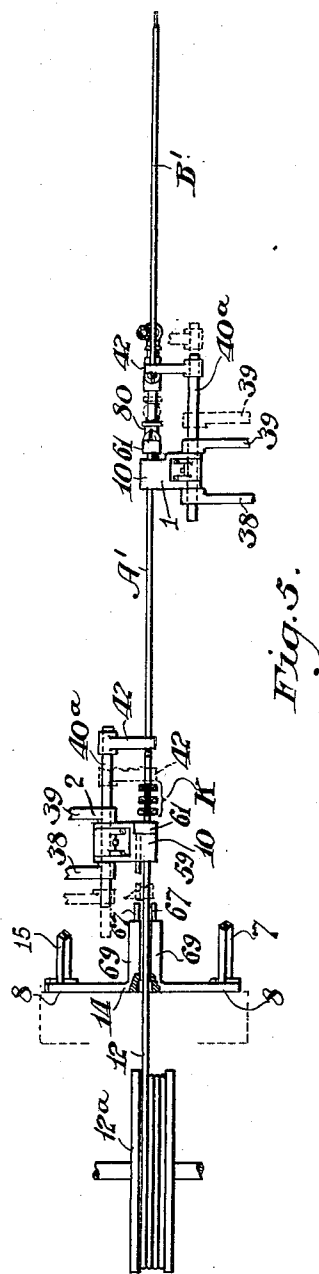


Fig. 5.

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5 Sheets-Sheet 4

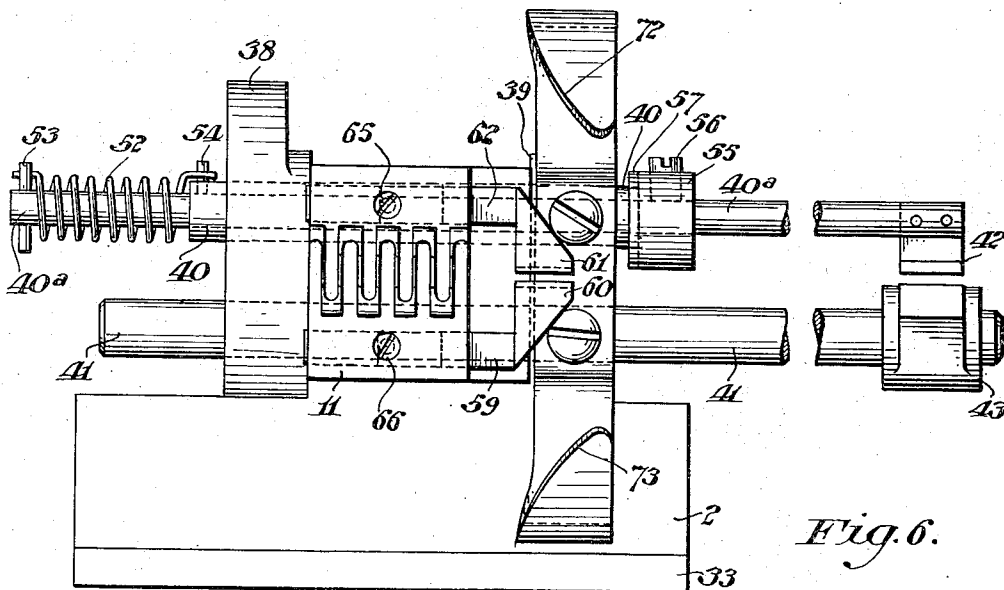


Fig. 6.

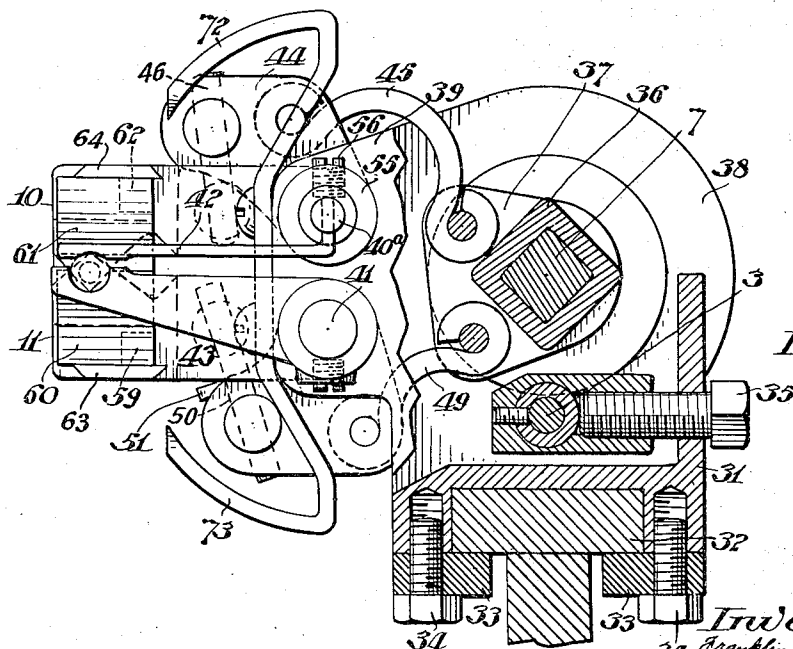


Fig. 7.

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5 Sheets-Sheet 5

Fig. 8.

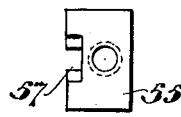
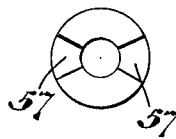
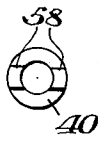
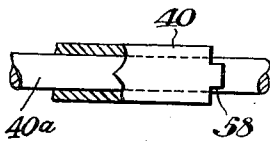
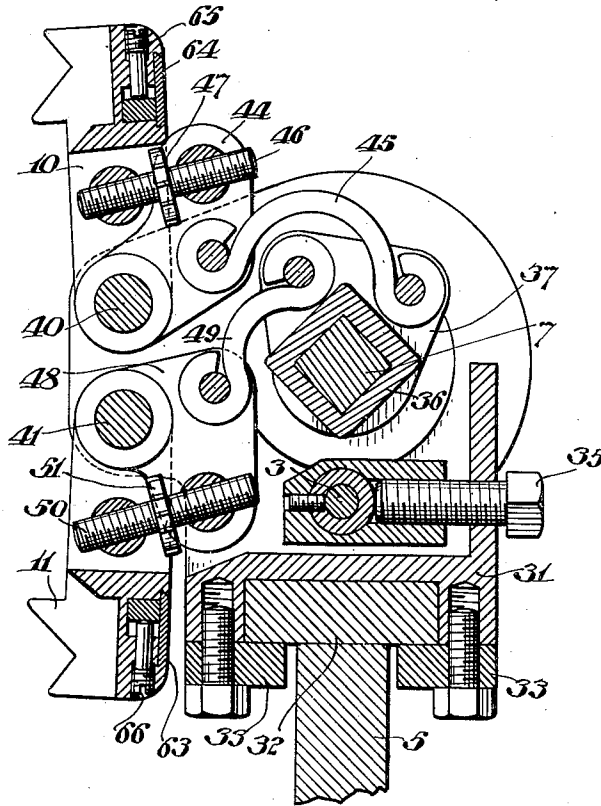


Fig. 9. Fig. 10. Fig. 11. Fig. 12.

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METHOD OF AND APPARATUS FOR FORMING LEADS

Application filed December 18, 1929. Serial No. 415,047.

Our invention relates to the removal of insulation from the ends of leads cut from insulated conductor to facilitate connection, as by soldering, to electrical apparatus, instrument terminals, binding posts, or the like.

Hitherto, leads have been automatically cut by suitable mechanism to correct length from conductor fed from a roll or other supply and the insulation was imperfectly stripped from the ends of the leads by the same mechanism to expose suitable length of bare conductor. There usually remained however loose ends of fibres of insulation not severed or incompletely so, which prevented solder from adhering to the ends of the wire during a subsequent operation. To insure low resistance connections, it was necessary, laboriously and at relatively great expense, to complete the stripping operation manually which was usually done by rolling each end of each lead between two heated resistance wires. This operation to be satisfactorily effective consumed an inordinate amount of time. In short, the method and apparatus was unsuited to modern high-speed production.

In accordance with our invention, substantially immediately subsequent to the imperfect stripping of the ends of the leads, they are transported in succession to an apparatus, preferably included or embodied in the cutting and stripping machine, which completes the stripping by a supplemental operation preferably by completely burning the loose ends or threads; specifically, carriage structure holding the leads during the cutting and stripping operations transports them to a position in which the stripped ends are disposed in a gas flame to burn off the remnant insulation so that the leads as delivered by the machine are ready for immediate use after their ends have been dipped into hot solder.

Our invention further resides in the apparatus hereinafter described and claimed.

For an understanding of our invention, reference is to be had to the accompanying drawings, in which:

Fig. 1 is a side elevational view with parts

broken away for clarity, of a lead stripping and burning mechanism.

Fig. 2 is a plan view of the machine of Fig. 1.

Fig. 3 is a detail view on enlarged scale, of operating mechanism for the lead-clamping jaws of structure shown in Fig. 1.

Figs. 4 and 5 diagrammatically, and in plan and elevation respectively, illustrate significant and novel parts of the mechanism in Fig. 1.

Fig. 6 is a front elevational view, on enlarged scale, of one of the lead clamping and transporting structures of Fig. 1.

Figs. 7 and 8 are end sectional views of the structure shown in Fig. 6, as viewed from the right-hand end thereof, with the lead clamping jaws in closed and open position respectively.

Figs. 9 to 12 are detail views of parts shown in Fig. 6.

Fig. 13 is an explanatory diagram referred to in the description of the operation of the mechanism.

Fig. 14 is a chart of the operating cycle of the mechanism.

Referring particularly to Figs. 1 and 2 the carriages 1 and 2, of substantially identical construction more fully hereinafter described, are suitably fastened or clamped to a cable 3 which passes over the drums 4, 4 mounted at opposite ends of the bed 5 of the machine. Through suitable mechanism, the drums 4 are rotated alternately in opposite directions to suitable extent and at predetermined times by a motor M or equivalent, driving the pulley 6 through belt 7' or the like. Briefly, the shaft 24a driven from pulley 6 by gear train A, B, C, D, rotates a cam E which in association with mechanism generally indicated at F, driven from pulley 6 by gear train A, B, G, H, and crank arm I, effects movement of carriages 1 and 2 alternately to the right and left by cable 3, carriage 1 moving to the left while carriage 2 is moving to the right, and vice versa. This mechanism shown in Fig. 1, is per se, not my invention.

It is therefore to be understood that both carriages 1 and 2 are alternately moved from

a position to the left of cutter K to a position adjacent the burners 79 and 80 subsequently described.

When the carriage structure 1, for example, approaches the left extreme of its travel, as viewed in Figs. 1 and 2, a shaft 7 rotatably supported at 8 and 9 and freely passing through the carriage is rocked to close the jaws 10, 11 of the carriage 1 upon insulated conductor 12 removed from a spool or roll 12a and passing over an idler pulley 13 mounted upon the frame 5 and through a guiding plate 14 adjacent the knife structure K.

As shown most clearly in Fig. 3, the shaft 7 and the similar shaft 15 on the opposite side of the machine are each provided with a pulley 16 connected by a belt or chain 17 to a second pulley 18 keyed or otherwise suitably attached to a shaft 19 upon which a gear 20 is mounted. Each of the reciprocating racks 21 having a cam follower 22 engaging a groove 23 in a cam 24 engages a gear 20. The cam 24 is driven in timed relation to the drums 4 and the knife structure K to operate the carriage jaws as hereinafter set forth.

For the purpose of explanation of the old or known machine (see U. S. Patent No. 1,787,658) and of the structure thus far described, it will be assumed that the carriage 1 is in the position indicated in Fig. 5 and that the shaft 15 of carriage structure 2 has been actuated by cam 24 to close the lead holding jaws, Fig. 4. While the drums 4, 4 are stationary, the cam 25, (which is fastened to shaft 25') Fig. 4, through the rack structure 26 effects movement toward each other of the upper and lower blade mountings 27, 28 of the knife structure K. The middle blades cut through the insulation and conductor while the outer pair of blades cut through the insulation only. While the blades remain in their closed position, the cam follower 29 riding on the dwell portion 30 of cam 25, the drums 4, 4 are rotated in counter-clockwise direction, Fig. 2, effecting movement of carriage structure 2 a short distance to the left and carriage structure 1 to the right, Fig. 2. During this movement the outer pairs of blades strip the insulation from the cut ends of the leads.

Prior to our invention; at this point or immediately subsequent thereto the jaws of the carriage structure 1 were opened permitting the lead whose trailing end had just been stripped to fall into a collecting receptacle, whereupon the carriage structure 2 moved to the right, the carriage 1 moving to the left clamping the lead after it passed the separated blade mountings 27, 28 to repeat the cutting and stripping of a second lead, etc. It was found extremely difficult to set the outside blades so that all insulation was removed from the stripped ends; or if the blades were so set the adjustment was not maintained

but for a short time because of dulling of the blades.

The loose ends of insulation remaining because of imperfect stripping caused trouble when it was attempted to apply solder to the ends of the wires prior to soldering them to component parts of radio receiving apparatus, for example. It was necessary to supplement the stripping of the machine manually which was done by rolling each of the individual leads between heated resistance wires. At least five persons were necessary to complete the stripping of leads delivered by a single machine.

In accordance with our invention the leads do not leave the machine after the imperfect stripping effected by the knives but are retained and transported to an adjacent flame which burns the remnant insulation from the ends.

Referring to Figs. 6, 7 and 8 the carriage structure 2 has a main or body portion 31 the under side of which is provided with a recess slidably to receive the guide-way 32 of bed 5 of the machine, the plates 33, 33 clamped to the under side of main body portion 31 of the carriage 2 by suitable means as bolts or machine screws 34 bearing against the under surface of the guide-way 32. The screw 35 clamps the carriage structure to the cable 3 extending therethrough in order that reciprocation of the carriage structure along the guide-way 32 may be effected by alternate rotation of drums 4, as above described. The shaft 7 of polygonal, as square, cross-section freely passes through an opening of similar shape in hub portion 36 of a lever member 37 supported by the uprights 38 and 39 of the carriage structure. The upper jaws 10 and lower jaws 11 are loosely mounted upon shafts 40 and 41 respectively which extend through uprights 38 and 39 parallel to shaft 7.

A second pair of jaws 42, 43 are mounted respectively upon a shaft 40a passing through shaft 40, and upon shaft 41. To the upper shaft 40 is secured a lever 44 connected by a spring link 45 to the lever structure 37. A screw 46, Fig. 8, having an adjusting knob 47 threadably engages abutments extending from lever 44 and upper jaws 10. To the lower shaft 41 is secured a lever 48 connected by spring link 49 to lever structure 37. The lower jaw 11 is maintained in adjusted position with respect to the lever structure 48 by the screw 50 engaging abutments extending from the lower jaw and the lever 48. Rotation of the adjusting knob 51 of the screw 50 and of the like adjusting knob or portion 47 of the upper screw 46 permits adjustment of the clamping jaws with respect to the actuating levers for different diameters of conductor 12, one end of each screw having a left-hand thread and the opposite end a right-hand thread.

As shown most clearly in Fig. 6, shaft 40a

is connected to the shaft 40 through which it passes, by a spring 52 whose opposite ends engage pins 53 and 54 projecting from the left hand ends of shafts 40a and 40 respectively. A collar 55, Figs. 6, 9 to 12, secured to shaft 40a by set screw 56 has a face portion provided with a recess 57 for receiving the projecting portions 58 of the other end of shaft 40 to limit relative movement of the shafts 40 and 40a.

The lower face of jaw 11 is recessed to receive the shank portion 59 of a flame guard whose forward portion 60 co-operates with the corresponding portion 61 of the upper flame guard closely to surround conductor 12. The shank portion 62 of the upper flame guard is received within a recess of the upper jaw 10, the plates 63, 64 being secured to the upper and lower jaws respectively to retain the shanks of the flame guards within their respective recesses. The inner ends of stop pins 65, 66 engage the ends of grooves of the shanks 59, 62 of the flame guards to limit their travel as hereinafter described.

Carriage structure 1 is of similar construction and need not be separately described.

After the conductor has been cut as before described and the carriage structure 2 for example, moves to the left slightly beyond its dotted line position to effect stripping of the forward end of the cut conductor, the ends of shanks 59 and 62 of the flame guards projecting to the left of the upper and lower jaws are pushed to the position shown in Fig. 6 by the stop pins 67, 68, see Fig. 4, supported within the housing 69 and resiliently urged to forward position by springs 70, 71 within the housing. The extent of travel of the flame guards is such that when in their forward or extended position their front ends are substantially flush with the end of the insulation of the conductor, the stripped or exposed end of wire projecting therebeyond. When the jaws 10, 11 are moved to open position by shaft 7 when the carriage is at the extreme right of its movement, the upper surface of flame guard 61 and lower surface of flame guard 60 engage respectively the cams 72 and 73 which restore the guards to their original, retracted position, Figs. 4 and 5.

To one of the guide-ways 32 is adjustably clamped by screw 74, see Fig. 2, a base member 75 having a pair of upstanding pins supporting the horizontally extending levers 76, 77 upon the free ends of which is mounted the burner bracket 78 supporting an upper pair of burners 79 and a lower pair of burners 80 supplied from a suitable source, as a gas mixer, by the flexible tubing 81. A spring 78a biases the burner bracket to its forward position.

At its forward end, bracket 78 is provided with a yoke 82 whose oppositely extending arms are in the path of movement of the

carriage structures 1 and 2 respectively. While the carriage structure 1 is moving to the left subsequent to operation of the knife structure K, the carriage 2 in engagement with one arm of yoke 82 is moving to the right carrying with it the bracket 78 and the burners 79, 80 carried thereby and similarly when carriage structure 2 is moving to the left subsequent to operation of the cutter K, the carriage 1 in engagement with the other assembly of yoke 82 is moving to the right carrying with it the burner-supporting bracket 78.

To describe the operation of the machine, and referring particularly to Figs. 4 and 5, it will be assumed that carriage structures 1 and 2 are momentarily stationary in the full line positions indicated. In Fig. 5, the upper burners have been omitted for clarity. The blade mountings 27 and 28 are moved together as previously described to cut a lead A' from the conductor 12. Carriage 2 whose jaws 10, 11 are tightly clamping conductor 12 adjacent its severed end moves to the left to effect stripping of the forward end of the conductor by one pair of outer blades of knife structure K. At the same time the carriage structure 1 whose jaws 10, 11 firmly clamp the leading end of lead A moves to the right to substantially the dotted position of Figs. 4 and 5, the trailing end of the lead A sliding between the loosely engaging jaws 42, 43 of carriage 2 to effect stripping of the trailing end of lead A by the other outer pair of blades. During the stripping movement of the forward or leading end of lead A', and the trailing end of a previously cut lead B' held by jaws 42, 43 of carriage 1 are held in flames from the upper and lower burners, 79, 80; the burner bracket 78 moving with the carriage structure during the stripping period to maintain the flame in its proper position with respect to the ends of leads A' and B' for suitable length of time. When the carriage 1 reaches its extreme position to the right, the cam 24, Fig. 3, through rack 21, belt 17, etc., effects rotation of shaft 7 in clockwise direction, to open both pairs of jaws of carriage 1 releasing the lead B' and the forward end of lead A'. The carriage structure 1 is then moved to the left by cable 3 the jaws remaining open, and carriage 2 holding the forward end of conductor 12 and the trailing end of lead A' in proper spaced relation effected during the prior stripping operation moves to the right toward the burners. During a pause in the movement of the carriages the jaws 10, 11 of structure 1 are closed to clamp the conductor 12 whereupon the knife structure is actuated to cut the conductor to form another lead.

Referring to Figs. 13 and 14 for supplemental and simplified description of the operating cycle, each carriage may be considered as having four determining positions,

or stations, the carriage 1 having the positions *a*, *b*, *c*, and *d*, and the carriage 2 having similar positions *a'*, *b'*, *c'*, and *d'*. With the carriage 1 at station *a*, the conductor is cut as previously described, and carriage 2, at station *c'*, is holding the adjacent ends of two leads in the Bunsen flame for burning off remnant insulation, as previously described. Upon clockwise rotation of drums 4, 4, carriage 1 moves to the left to station *b*, the knife structure stripping the insulation from the forward end of the conductor. At the same time, the carriage 2 moves to the right to station *d'*, pulling the lead just cut to effect stripping of its trailing end, as previously described. During this movement of carriage 2, the forward end of the lead just cut and the trailing end of a previously cut lead are held in the flame, the burner bracket moving with carriage 2, as previously explained, to hold the ends in the flame for sufficient time to completely burn off the remnant insulation.

At the conclusion of this movement, both sets of jaws of carriage 2 are opened, releasing the previously cut lead which drops from the machine, and the forward end of the lead just cut whose trailing end is held by jaws 42, 43 of carriage 1.

Thereupon the drums 4, 4 rotate in counter-clockwise position, moving the carriage 1 to the right to station *c*, pulling the conductor 12 by jaws 10, 11 and supporting the trailing end of the lead just cut by jaws 42, 43. Simultaneously, the carriage 2 moves to the left to station *a'* and there its jaws close on the conductor. The knife cuts the conductor to form a lead whose forward end is held by jaws 10, 11 of carriage 1 and whose trailing end is loosely clamped by jaws 42, 43 of carriage 2.

The drums 4, 4 again move in counter-clockwise direction to move the carriage 2 to the left to station *b'* to strip the forward end of the conductor. At the same time, the carriage 1 moves to the right to station *d* to strip the trailing end of the lead loosely held by jaws 42, 43 of carriage 2. During this movement of carriage 2 the forward end of that lead, held by jaws 10, 11 of carriage 1 and the trailing end of the previously cut lead held by jaws 42, 43 of carriage 1 is held in the burner flame, the burner bracket moving with the carriage 1.

After this movement is completed, both sets of jaws of carriage 1 open releasing the completed lead from jaws 42, 43 and the forward end of the lead whose trailing end is held by jaws 42, 43 of carriage 2. The drums 4, 4 move clockwise to bring carriage 1 to the starting position, station *a*, where the jaws close upon the conductor which in the meantime has been pulled by carriage 2 in its movement to station *c'*, and the cycle is repeated.

As their stripped ends are entirely devoid of insulation, the leads delivered by the machine are ready for use after their ends are dipped in hot solder. The previously required supplemental stripping operation with its attendant expense and delay is not necessary.

What we claim is:

1. In a lead cutting and stripping mechanism, a pair of reciprocating carriages each having a pair of jaws for tightly clamping a lead, and a second pair of jaws operable simultaneously with said first pair of jaws for loosely clamping another lead, and means for simultaneously moving said carriages in opposite directions while both pairs of jaws of said carriages are closed, the first pair of jaws of each carriage in turn pulling a lead through the second pair of jaws of the other carriage.

2. In a lead cutting and stripping mechanism, a pair of reciprocating carriages each having a pair of jaws for tightly clamping a lead, and a second pair of jaws operable simultaneously with said first pair of jaws for loosely clamping another lead, means for simultaneously moving said carriages in opposite directions while both pairs of jaws of said carriages are closed, the first pair of jaws of each carriage in turn pulling a lead through the second pair of jaws of the other carriage, and burner structure in the path of movement of said carriages for burning the insulation from the ends of leads supported by the jaws thereof.

3. In a lead cutting and stripping mechanism, a movable carriage having a pair of jaws for clamping a lead of insulated conductor, movable guard structure supported by said carriage adjacent said jaws, abutment structure in the path of movement of said carriage for actuating said guard structure to protective position, and a burner in the path of movement of said carriage for removing insulation from the end of a lead carried thereby, the guard structure protecting the insulation of the lead adjacent the end.

4. In a lead cutting and stripping mechanism, a movable carriage having a pair of jaws for clamping a lead of insulated conductor, movable guard structure supported by said carriage adjacent said jaws, abutment structure in the path of movement of said carriage for actuating said guard structure to protective position, a burner in the path of movement of said carriage for removing insulation from the end of a lead carried thereby, the guard structure protecting the insulation of the lead adjacent the end, and cam structure effective during opening of said jaws to reset the guard structure to original position.

5. Lead forming mechanism comprising the combination with a conductor severing

means, insulation cutting means, and remnant insulation eliminating means, of a conductor engaging and transporting means that engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the ends of the conductor through said insulation cutting means to strip the ends thereof and presents said ends to said remnant insulation eliminating means.

6. Lead forming mechanism comprising the combination with a conductor severing means, insulation cutting means, and remnant insulation eliminating means, of a conductor engaging and transporting means that engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the ends of the conductor through said insulation cutting means to strip the ends thereof and presents said ends to said remnant insulation eliminating means, said transporting means comprising carriages supporting simultaneously the trailing end of one lead and the leading end of a following lead.

7. Lead forming mechanism comprising the combination with a conductor severing means, insulation cutting means, and remnant insulation eliminating means, of a conductor engaging and transporting means that engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the ends of the conductor through said insulation cutting means to strip the ends thereof and presents said ends to said remnant insulation eliminating means, said transporting means comprising carriages alternately moving toward and from said remnant insulation eliminating means.

8. Lead forming mechanism comprising the combination with a conductor severing means, insulation cutting means, and remnant insulation eliminating means, of a conductor engaging and transporting means that engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the ends of the conductor through said insulation cutting means to strip the ends thereof and presents said ends to said remnant insulation eliminating means, said transporting means comprising a pair of reciprocating carriages alternately moving to positions adjacent the remnant insulation eliminating means, each carriage having means in turn simultaneously supporting the trailing end of one lead and the leading end of a following lead, whose trailing end is supported by the other carriage.

9. Lead forming mechanism comprising the combination with conductor severing means, insulation cutting means, and means for burning remnant insulation, of a conductor engaging and supporting means that

engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the ends of the conductor through said insulation cutting means to strip the ends thereof and presents said ends to said remnant insulation burning means.

10. Lead forming mechanism comprising the combination with conductor severing means, insulation cutting means, of a conductor engaging and supporting means that engages and moves successive lengths of a conductor a predetermined distance past said severing means, pulls the conductor through said insulation cutting means to strip the ends thereof, and burner supporting structure disposed in the path of movement of said transporting means engaged thereby and movable therewith for burning of the remnant insulation from the ends of the leads.

11. In a conductor lead severing and stripping mechanism, a travelling carriage having a pair of jaws, and a second travelling carriage having a pair of jaws; the jaws of one carriage being alignable with the jaws of the other carriage for holding opposite ends of a lead, and means tightly closing the jaws of one carriage and loosely closing the jaws of the other carriage to permit said lead to be drawn therethrough when said one carriage is advanced to pull the lead.

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