METHOD OF AND APPARATUS FOR FEEDING FILAMENTS

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INVENTOR:
RUDOLF KUNATH,

BY Charles Shull

HIS ATTORNEY.
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My invention relates to apparatus for feeding wires from a source of supply to a machine in which they are mounted or otherwise treated. My invention is particularly adapted to the feeding of coiled filaments for electric incandescent lamps and is especially adapted for use in connection with a machine for mounting said filaments. The object of my invention is to produce an apparatus which will be automatic in its operation and which will present the filaments uniformly in the proper positions. According to my invention I provide a receptacle or trough in which the filaments are piled up and a pair of pliers is mounted so that it can be moved into and out of the receptacle to remove the filaments one by one, the jaws of the pliers being so shaped that they will take but one filament at a time. My invention is particularly adapted to the feeding of coiled filaments which are used to a large extent in incandescent lamps. Various other features and advantages of my invention will appear from the following description of a specific thereof and from the accompanying drawings.

In the drawings Figs. 1 and 2 are elevations partially in section showing the apparatus with the parts in two different positions; Fig. 3 is an end elevation; Fig. 4 is a top plan view; Figs. 5 and 6 are detail elevation views, the latter being partially in section, showing the pliers; Figs. 7 and 8 are detail plan views showing the plier operating mechanism; and Figs. 9 and 10 are elevations showing modifications of the pliers and controlling mechanism.

The device comprises the table 1 upon which is supported a trough 2 which is inclined vertically. The coiled filaments 3 are carried in the bottom of the trough and are arranged so that they are straight and extend horizontally and transversely of the trough. An endless belt 4 is mounted so as to supply filaments to the trough from time to time. Above the trough 2 a pair of pliers is mounted so that it can move up and down and also sideways. The said pliers comprise a stationary jaw 6 which is supported by a cross arm 5 and a movable jaw 7 which is pivoted in a bearing 8 carried by the stationary jaw. Between the top ends of the jaws is located a spring 9 which tends to keep the bottom ends of the jaws together and the pliers closed. At the lower end of the stationary jaw 6 there is a pocket-shaped recess 10 which corresponds in width to the cross section of the coiled filament which is to be handled but has a somewhat smaller depth than the diameter of the filament so that when the pliers close only a single coiled filament can be seized by the pliers, and moreover, enough of the filament projects so that it is compressed in the said recess and prevents it from sliding sideways out of the said recess. At the top end of the movable plier jaw 7 a plate 11 is fastened which has hinged at 12 a catch 13. The catch 13 is pressed by a spring 14 and tends to hold the top ends of the two plier jaws 6 and 7 together and therefore to keep the plier jaws open. The opening of the plier jaws is caused when the plate 11 of the movable plier jaw 7 strikes against a stop 15. The locking of the plier jaws results when the plate 11 of the movable plier jaw 7 strikes against a stop 15 as the plate 11 is then near to the top part of the jaw 6 and the catch 13 can then snap in and lock. The unlocking of the plier jaws is caused by a plunger 16 which moves against the catch 13.

The plier jaws 6 and 7 which grip and lift the coiled filaments are operated from a shaft 17 which is constantly rotated by means of a driving disc 18. Three cam wheels 19, 20, and 21 are fastened on this shaft 17; cam wheel 19 serving for raising and lowering the pliers 6 and 7, wheel 20 for moving the pliers 6 and 7 sideways, and wheel 21 for actuating the plunger 16 which releases the locking catch 13.

A roller 22 slides on the cam wheel 19, which roller is fastened to the bottom end of a bar 23 which is connected to the cross arm 5. The bar 23 can move up and down in a bearing block 24 which, in turn, can move in guiding rails 25 (Fig. 3) perpendicular to the bar 23. Between a collar 26 of the bar 23 and the top flange 27 of the block 24 a spring 28 is provided which presses the bar 23, the cross arm 5 and the pliers 6 and 7 downwardly and simultaneously keeps the roller 22 in continuous contact with the cam wheel 19. When the elevated part of the cam wheel 19 runs under the roller 22, the pliers 6 and 7 are lifted perpendicularly out of the trough 2 against the action of the spring 28. However, when the lower part of the cam wheel runs under the roller 22, the pliers 6 and 7 are lowered through the action of the spring 28 so that the mouth of the pliers penetrates into the pile of filaments.

To the table plate 1 an angle lever 29 is pivoted at 30. The angle lever 29 is provided on the bottom with a roller 31 which runs over the cam wheel 20, and on top with a slot 32, through which extends a guide stud 33 perpendicularly to the bearing block 24. Between the angle lever 29 and the arm 34 extending from the stationary table plate 1 a tension spring 35 is provided...
which holds the roller 31 to the cam wheel 20. An angle arm 36 is fastened to the bottom of the table plate 1, the horizontal part of this angle arm reaching close to the elevated part 35 of cam wheel 20. When the roller 31 runs on the elevated part of the cam 30, the angle lever 29 is swung out and the bearing block 34, together with the bar 23, cross arm 5 and pliers 6 and 7, is moved from left to right. The return movement from right to left is taken care of by the action of spring 33 as soon as the elevated part of cam wheel 20 has passed under the roller 31. When the pliers 6 and 7 move from left to right, roller 22 runs off its cam wheel 19 and on to the top surface of the angular arm 36 which serves as guiding track.

The plunger 16 which serves for unlocking the jaws of the pliers is movably mounted in a support 37 fastened to the table plate 1. On one end of the plunger 16 a spring 38 is mounted, one end of which is fastened to the support 37 and the other end to a collar 39 of the plunger 16. The rounded head 40, at the end of the plunger 16, is, through the action of this spring 38, kept in constant contact with a curved plate 41 of a lever 42 which bears on a stud 43 of the table plate 1 so that it can rock. The lever 42 carries a roller 44 which is kept in continuous contact with the cam wheel 21 on account of the action of a spring 45 which is fastened to the lever 42. If the roller 44 is lifted by the elevated part of the cam wheel 21, the curved plate 41 presses against the rounded head 40 and shoves the plunger 16, against the action of the spring 38, into the unlocking position. As soon as the elevated part of the curved disc 21 has again moved from under the roller 44, the plunger 16 and the swinging lever 42 are again brought to their original positions through the action of the springs 38 and 45.

Below the trough 2 are located a slide plate 46 which slopes downwardly and is fastened to the table plate 1 and a form 47—48 consisting of two parts, the top 47 of which has a sloping slide plane 49 which forms a straight extension of the slide plate 46. The bottom part 48 of the form has a groove 50 which serves to take the coiled filament 3 when it is located in a trough 7 and down the slide plate 46. By means of a perpendicularly movable gate 51 with sloping bottom 52, the groove 50 which takes the coiled filament may be closed so that a channel is formed which can be connected to a source of compressed air or vacuum.

In operation, at first the pliers 6 and 7 are located with open jaws above the trough 2 which is filled with straightened coiled filaments. The pliers 6 and 7 are lowered by the action of the spring 28 and of the roller 22 which rides on the lower part of the cam wheel 19 so that the open jaws of the pliers penetrate the pile of filaments. The stroke of the pliers is such that the jaws of the pliers do not penetrate to the bottom of the trough but stop within the pile. Shortly before the pliers reach the lowest position or at the moment they are stopped, the plunger 16 is moved forward by the action of the cam wheel 21 and the catch 13 which holds the pliers in open position is released so that the pliers are then closed by the action of the spring 9 and a coiled filament of the pile is clamped between the jaws or enclosed in the pocket-shaped recess 10. In the meantime the cam wheel 19 has rotated so far that its elevated part again moves under the roller

22. This causes a lifting of the closed pliers taking with them the gripped coiled filament. As soon as the pliers reach the top position, the elevated part of the cam wheel 20 causes a movement of the cam 30 and, consequently, also of the bar 23, the cross arm 5 and the pliers 6 and 7 to the right so that the pliers 6 and 7 pass over the edge of the trough 2 and are then above the slide plate 46. At the end of this movement to the right, the plate 11 of the movable plier jaw 7 strikes against the solid stop 15 which causes the top ends of the pliers to approach each other and the jaws of the pliers to open, discharging a coiled filament 3. The coiled filament then slides over the surface 42 into the groove 50 of the bottom plate 48 of the form which is then immediately closed by the dropping gate 51. The compressed air which is supplied to the closed channel 30 (or the vacuum) then moves the coiled filament, for instance, to push or pull it through the eyestile of a filament support where it will, finally, be pressed or welded to the current supply wires of the said support. The pliers remain open when the coiled filament 3 is released as the spring catch 13 snaps in immediately after the top end of the plate 11 has reached the stop 15. Further rotation of the cam wheel 20 and the action of the spring 33 causes the pliers which remain open to move again from right to left and are ready for the repetition of the cycle. By placing the trough 2 in a sloping position, a conically-shaped bottom part is formed in which the coiled filaments are gathered. This is important for a positive gripping of the coiled filaments as the coiled filaments which remain after one has been gripped by the pliers and has been lifted will again accumulate in the narrowest part of the space. It is sufficient if only the bottom part of the trough which takes the coiled filaments has a conical shape. The gripping of the coiled filaments is helped by the fact that the pliers swing back and forth within the pile of filaments and agitate them.

The shape of the groove between the jaws of the pliers may be modified, for instance, by providing it with conical walls. The groove may be made with the stationary jaw 6 or with the movable jaw 7 or with both stationary jaw or half may be located in the stationary and half in the movable jaw. The automatic opening and closing of the pliers may also be accomplished in a different manner.

Pliers of a modified type are shown in Fig. 9 by way of example. On the bottom surface of the stationary plier jaw 6 a movable plier jaw 7 slides which is guided by a cleat 53 of the plier jaw 6. The stationary plier jaw 6 has a wedge-shaped groove 10 for taking a single coiled filament 3. The movable plier jaw 7 is located in the retracted position shown in the drawings before it takes a coiled filament. Both jaws of the pliers 6 and 7, may be movable up and down in an inclined direction by drives (not shown). As soon as the pliers have penetrated into the trough, the movable jaw 7 is moved in the direction of the arrow by means of a drive (not shown) so that it slides over the groove 10 and clamps the coiled filament under a slight pressure therein. The bottom end of the jaw 7 may be pointed or rounded as shown by dotted lines. When the pliers 6 and 7 are raised at an angle the jaw ends move over the edge of the trough, so that when the jaw 7 moves back, the coiled filament may drop on a suitable slide.

The pliers may have several wedge-shaped...
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In this case the stationary jaw 6 is arranged to advantage underneath the movable jaw, as shown, and the pair of pliers is rotated in the direction of the arrow after it has been raised out of the trough. The release of the coiled filaments is secured by a retraction of the movable jaw 7 which is located at the bottom after the rotation.

The filaments which drop out of the pliers may also be taken up by a transporting belt or by a board with grooves which is moved by steps or by a drum which is provided with grooves and which can rotate, and which, in turn, supply the coiled filaments to the place where they are to be used. However, it may also be arranged that the coiled filaments which are released by the pliers fall directly in the proper place.

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

1. In a device of the character described, the combination with a stationary jaw and a movable jaw pivoted thereto of a locking means for said jaws comprising a spring pressed catch pivoted on said movable jaw and means for causing said catch to alternately engage said stationary jaw and to be released therefrom to allow the opening and closing of said jaws.

2. In a device of the character described, the combination of a pair of pliers comprising a stationary jaw and a movable jaw pivoted thereto, supporting means connected to said stationary jaw, cams and arms for raising, lowering and reciprocating said supporting means, a catch pivoted to said movable jaw and adapted to engage said stationary jaw and means for causing said catch to be operated periodically to open or close said jaws.

3. The method of feeding coiled filaments for incandescent lamps and similar devices which consists in arranging in a receptacle a pile of such filaments each in a substantially horizontal position, and then removing one filament at a time by gripping the middle of a filament in the pile, lifting said filament from said receptacle and allowing it to fall upon a flat surface.

4. The method of feeding coiled filaments for incandescent lamps and similar devices which consists in arranging in a receptacle a pile of such filaments each in a substantially horizontal position, and then removing one filament at a time by gripping the middle of a filament in the pile, lifting said filament from said receptacle and allowing it to fall upon a flat inclined surface and to slide down said surface.

5. In an apparatus for feeding filaments, the combination of a hopper adapted to hold a supply of filaments, supporting means comprising a cross arm extending over said hopper, a pair of substantially vertically disposed pliers carried by said cross arm, a cam operating on said support to move said pliers vertically and horizontally and other members acting on said pliers to close and open them to grip a filament and then to release it.

6. In an apparatus for feeding filaments, the combination of a hopper adapted to hold a supply of filaments, a slide plate, supporting means comprising a cross arm extending over said hopper, a pair of substantially vertically disposed pliers carried by said cross arm, a cam operating on said support to move said pliers vertically and horizontally to lower them into said hopper, raise them therefrom and move them to a position over said slide plate and other members acting on said pliers to close and open them to grip a filament and then to release it.

RUDOLF KUNATH.