July 7, 1964 S. GINDOFF 3,139,777

WIRE STRIPPING TOOL HAVING HEATED FILAMENTS WHICH OPEN WHEN JAWS ARE CLOSED

Filed July 27, 1961

Fig. 1

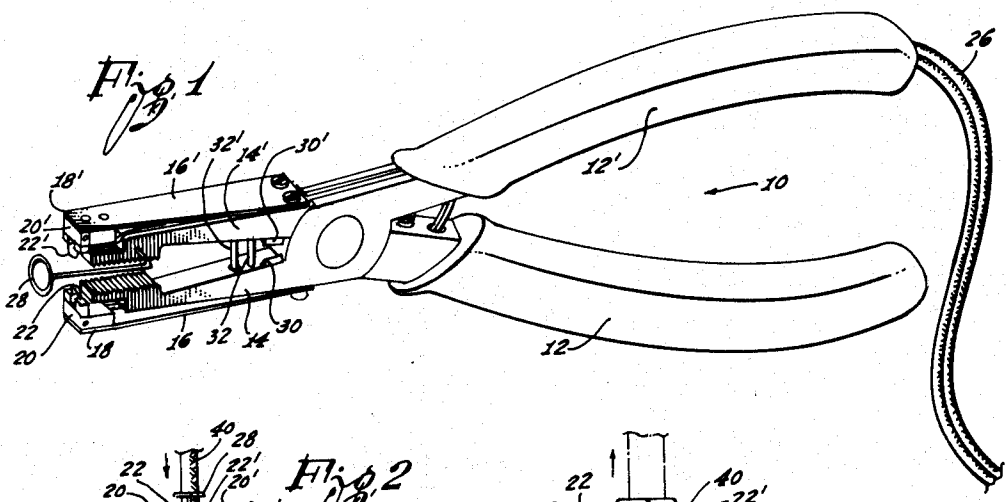


Fig. 2

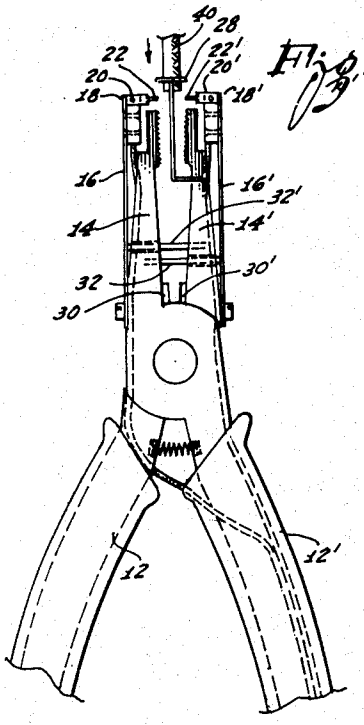


Fig. 3

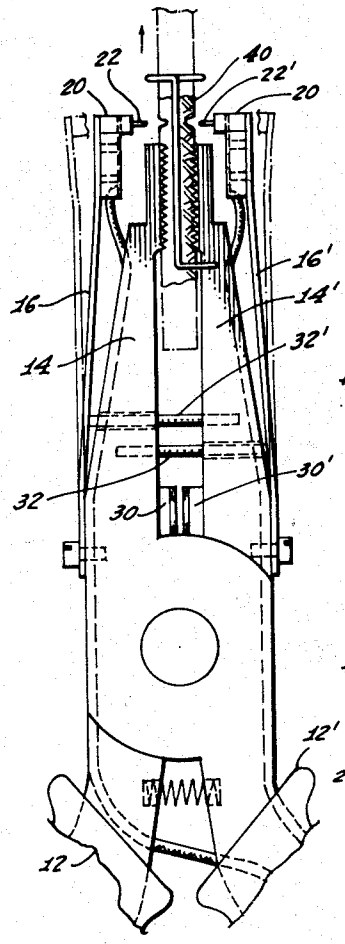


Fig. 4

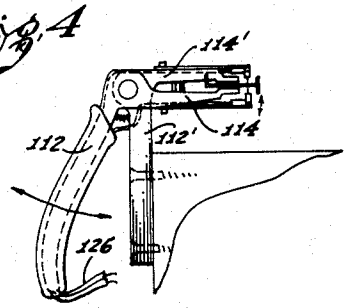
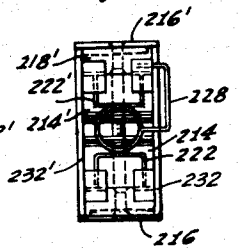


Fig. 5



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WIRE STRIPPING TOOL HAVING HEATED FILAMENTS WHICH OPEN WHEN JAWS ARE CLOSED

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This invention relates to apparatus for removing insulation from wires and more particularly to a stripper which removes insulation without damaging the wire strand.

Whenever electronic circuits are built to satisfy military specifications, great care must be exercised in the preparing and dressing of wires for interconnection. The slightest nick or scratch in a connecting wire can result in the rejection as unacceptable of a complete electronic circuit board, which invariably contains many interconnected components and which requires considerable assembling time and effort.

Devices for removing insulation from wires are generally known as wire strippers, and may be broadly divided into two types. The first is a strictly mechanical device and grips the wire at two places, cuts the insulation between the two with a pair of opposed semicircular cutting edges selected for the gauge of the wire, and pulls the cut insulation off of the wire by laterally separating the two grip points. This mode of operation requires that a relatively long length of the insulated wire be available, which usually precludes its use with either short lengths of wire or in places where access is limited.

Even though the cutting blades are provided with a plurality of mated, circular notches which are accurately sized to the different gauges of wire, even the most skilled assemblers must exercise great care to avoid damaging wires during a wire-stripping operation. This stripper, therefore, is not entirely satisfactory as a tool in the assembly of circuits which must meet rigid inspection standards.

A second type of wire stripper has been developed to avoid the danger of nicking or cutting wires and is known as a "hot-wire" stripper. Th hot-wire stripper uses heat instead of a cutting blade to sever insulation. Usually, a single, heated filament is used to melt through the insulation. In some embodiments, the insulation is not fully severed but is cut part way through. The actual stripping operation is frequently done with small pliers or even with the finger nails, of the operator. The hot-wire must be handled with great caution to avoid damage to heat-sensitive components and to prevent injury to the operator. Moreover, it is clumsy or impossible to use where space is limited or a short length of wire is to be stripped.

What has been needed, and what is provided by the present invention is a wire stripper that both severs the insulation and strips off the insulation in a single smooth, hand operation without danger of nicking, scratching or otherwise damaging the bare wire. The "hot-wire" stripper of the present invention can work with lengths of wire that are not much longer than the portion to be bared.

According to the present invention, a pair of gripping pliers are specially modified pliers by the addition of a leaf spring member, carrying a "hot-wire" filament to each jaw member. The filaments are held in front of the pliers and extend at right angles from the leaf spring members. Interposing pins mounted through apertures in the jaw members maintain a predetermined spacing between the upper leaf spring member and the lower jaw, and between the upper jaw and the lower leaf spring member. A centering guide may be mounted on the jaw members to aid in positioning the wire to be stripped.

In operation, the filaments are heated and an insulated wire is inserted through the guide between the jaw members and the point at which the insulation is to be severed is located between the filaments. The handle is grasped and squeezed, bringing the jaws and the heated filaments together. The filaments first contact the insulation, melting it through, and with continued pressure on the handle, the jaws close upon the insulation but the filaments retreat from each other after having reached the predetermined distance from the opposing jaw. With larger gauge wires, they may rest upon the wire without damage. Further closure of the jaws effects a separation of the filaments. When the severed portion of the insulation is firmly grasped, the filaments are completely clear and away from the wire so that the severed insulation can be stripped easily from the wire but also avoids melting and charring of severed insulation and does not leave smudges of melted insulation on the wire which is to be soldered.

Accordingly, it is an object of the present invention to provide an improved, hot-wire stripper for removing insulation.

It is a further object of invention to provide an improved wire stripper that cuts and strips insulation with a single smooth motion.

It is still another object of invention to provide a stripper that does not nick or cut the wire in the stripping process.

It is yet another object of invention to provide an insulation stripper, combining the advantages of hot wire strippers and insulation cutters, for severing insulation without nicking or cutting the wire.

It is still a further object of invention to provide a hot wire stripper that provides both closing and opening of the heated filaments in a single action.

It is a still further object of invention to provide a hot wire stripper that severs the insulation and grips the severed portion of the insulation for easy removal.

It is yet another object of the invention to provide an improved hot wire stripper combined with pliers which provide a closing and opening of the heated filaments as the plier jaws approach each other.

The novel features which are believed to be characteristic of the invention both as to its organization and method of operation together with further objects and advantages thereof will be better understood from the following description considered with the accompanying drawings which several embodiments are illustrated by way of example. It is specifically understood however that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention.

FIG. 1 is a perspective view of a wire stripper according to the present invention;

FIG. 2 is a side view of the stripper of FIG. 1 preparatory to removing insulation from a wire;

FIG. 3 is an enlarged side view of the wire stripper of FIG. 2 after the heated filaments have completed their advance and retract cycle, and the jaws of the stripper are gripping insulation;

FIG. 4 is a side view of an alternative embodiment of the wire stripper of FIG. 1 adapted for bench mounting; and

FIG. 5 is an end view of the front of another, alternative embodiment of a wire stripper according to the present invention having externally mounted interposing members between the jaw members and the opposite leaf spring members.

Turning now to FIG. 1, there is shown a wire stripper **10** according to the present invention. In appearance, the stripper resembles a pair of pliers having a pair of handle members, **12, 12'** pivotably joined to form opposing jaw members **14, 14'**. Fastened upon each jaw member **14, 14'** and near the pivot point, is a leaf spring member **16, 16'**. Other embodiments may employ a

flexible, insulative member which is biased toward the jaw by a resilient spring element. The leaf spring members **16**, **16'** each have a free end **18**, **18'** to which is fastened a block of insulating material **20**, **20'** in which the replaceable heating filaments **22**, **22'** are mounted. Alternatively, a pair of posts may be mounted on the insulating material **20** to which the filaments may be affixed. In the embodiment of FIG. 1, the electrical connections to the filaments **22**, **22'** are each made with a pair of insulated wires **24**, **24'** that fit in a groove of the jaw members **14**, **14'** under the leaf spring members **16**, **16'**. The pairs of wires **24**, **24'** are connected in series (or parallel) to a main cord **26**, which runs through a groove in one of the handle members **12'** and then to a source of power.

Affixed to a jaw member **14'** is a guide member **28** which not only aids in aligning a wire to be stripped, but serves as a safe, steady rest for the fingers holding the wire. The guide member **28** centers the wire with respect to the heated filaments **22**, **22'**. For convenience, a pair of cutter blades **30**, **30'** are opposingly mounted on the jaw members so that the stripper may be used as a wire cutter as well.

A pair of interposing pins **32**, **32'** are respectively positioned between the lower jaw member **14** and the upper leaf spring member **16'**, and between the upper jaw member **14'** and the lower leaf spring member **16**. The interposing pins **32**, **32'** permit the filaments **22**, **22'** to approach each other to a predetermined separation distance which is a fixed minimum distance from the opposing jaw members **14**, **14'**. The placement of the pins **32**, **32'** near the attachment point of the leaf spring members **16**, **16'** provides a mechanical advantage so that the amount of separation of the filaments **22**, **22'** corresponding to the closure of the jaws **14**, **14'** may be in a non-linear relationship. That is, once the interposing pins **32**, **32'** are engaged by both the jaw and leaf spring members, a slight closure of the handle produces substantial separation of the filaments.

The manner of employing the wire stripper of the instant invention may be best explained with reference to FIGS. 2 and 3, which illustrate the relative positions of the various members in a wire-stripping operation. Initially, the cord **26** must be connected to a source of power, such as a transformer or battery so that the filaments **22**, **22'** can be heated. A strand of insulated wire **40** to be stripped is inserted through the guide **28** between the jaw members **14**, **14'** to a depth corresponding to the length of bare wire desired.

The handle members **12**, **12'** are grasped by the operator and are squeezed together. As the jaw members **14**, **14'** approach each other, the leaf spring members **16**, **16'** carrying the heated filaments **22**, **22'** approach each other and will contact the insulation of the wire. The heat of the filaments can be regulated so that filaments can sever different kinds of insulation without undue burning charring, or melting.

As the jaw members **14**, **14'** are brought together, the interposing pins **32**, **32'** begin separating the leaf spring members **16**, **16'** whose movement is now opposite to that of the jaw members **14**, **14'**. Dimensions are adjusted so that the filaments **22**, **22'** are completely clear of the wire when the insulation is firmly grasped in the jaw members **14**, **14'**.

A slight pull on the stripper in the lateral direction (down, as viewed in FIGS. 2 and 3) is usually sufficient to completely shear the insulation and pull it from the wire **40**. At no time is a sharp metallic cutting edge used to sever the insulation to bare the wire so that the possibility of a nick or a scratch along the length of the wire is eliminated.

Turning now to FIG. 4, there is shown an alternative embodiment adapted for bench mounting. The stripper of FIG. 4 is substantially identical to that of FIG. 1 except for the handle members **112**, **112'**, which are at

approximately right angles to their respective jaw members **114'**, **114**. The other elements are substantially similar to their counterparts in FIGS. 1–3 and similar reference members (prefixed by "1") are used for their identification. However, in operation, there is no substantial difference between them.

It will be apparent from FIG. 1 that the interposing pins **32**, **32'**, which operate through holes or apertures in the pin members **14**, **14'**, could easily be replaced by equivalent structures. One such embodiment is shown in FIG. 5 in which L-shaped members **232**, **232'** are fastened to the sides of the jaw members **214**, **214'** respectively. The bent portion of L member **232** is then placed between upper jaw member **214'** and upper leaf spring member **216'** and the bent portion of L member **232'** is placed between lower jaw member **124** and lower leaf spring member **216**.

Other modifications and variations will be evident to those skilled in the art and without departing from the teaching of the instant invention.

What is claimed as new is:

1. Apparatus for removing the insulation portion from conductive wire comprising: holding means including first and second jaw members opposingly mounted for gripping insulation to be removed; a filament; first means for yieldably mounting said filament upon said first jaw member, said filament being adapted to be heated to insulation melting temperatures; interposing means, supported by said first jaw member, and positioned to maintain a predetermined separation between said second jaw member and said first means; and second means for closing said jaw members upon an insulated wire, said filament being positioned to contact the insulation portion before said jaw members fully engage the wire, and to be moved away from the insulation portion, as the jaw members firmly grip the insulation to be removed.

2. An apparatus for removing a portion of insulation from conductive wires comprising the combination of: a pair of opposed jaw members; a pair of opposed filaments; means for yieldably mounting said filaments to corresponding ones of said jaw members, respectively; first interposing means carried by one of said jaw members and positioned to limit the spacing between said one jaw member and the filament opposite thereto; second interposing means carried by the other of said jaw members and positioned to limit the spacing between said other jaw member and the filament opposite thereto whereby said filaments approach each other as said jaws approach each other until said interposing means respectively engage said means for mounting said filaments whereupon said filaments recede from each other as said jaws close.

3. Apparatus for removing a portion of the insulation from an insulated wire comprising: wire gripping means including opposingly mounted upper and lower jaw members; upper and lower flexible members mounted upon said upper and lower jaw members, respectively; upper and lower filaments insulatively fastened to said upper and lower flexible members respectively and positioned to extend beyond the front of said jaw members and aligned opposite each other; motion translating means for converting a closing motion of said jaw members into an approaching and receding motion of said filaments, said motion translating means including first interposing means acting between said lower jaw member and said upper flexible member and second interposing means acting between said upper jaw member and said lower flexible member, said interposing means limiting the approach of said flexible members to the respectively opposite jaw members to a predetermined distance.

4. Apparatus for baring a strand of insulated wire comprising: wire gripping means including pivotably connected upper and lower jaw members; insulation severing means connected to said jaw members including upper and lower filaments adapted to be heated to insulation burning temperatures and flexible upper and lower

filament supports, each cantilevered from the respective jaw members adjacent the pivotal connection thereof; first blocking means interposed between said upper jaw member and said lower filament support; second blocking means interposed between said lower jaw member and said upper filament support; said blocking means being operable to effect two opening and closure cycles of said filaments for each opening and closure cycle of said jaw members.

5. Apparatus of claim 4 wherein said first and second blocking means are respectively fastened to said upper and lower jaw members.

6. Apparatus of claim 4 wherein said first and second blocking means are respectively fastened to said lower and upper filament supports.

7. An apparatus for removing insulation from wires comprising: wire holding means including upper and lower jaw members pivotably connected at their inner ends; insulation severing means including upper and lower oppositely positioned wire filaments adapted to be heated to insulation burning temperatures; means connecting said filaments to said jaw members including upper and lower resilient cantilever members respectively fastened to said upper and lower jaw members adjacent their pivotal connection, said filaments being respectively connected to said cantilever members at the outer ends, thereof; and limit stop means interposed between said lower jaw and upper cantilever members and between said upper jaw and lower cantilever members, said limit stop means being operable to convert a single cycle of jaw member opening and closing into two cycles of filament opening and closing, said filaments opening and closing in response to jaw closure and opening and closing in response to jaw opening.

8. Apparatus of claim 7 wherein said limit stop means includes a first interposing member fastened to said upper jaw and a second interposing member fastened to said lower jaw.

9. Apparatus of claim 7 wherein said limit stop means includes a first interposing member fastened to said upper cantilever member and a second interposing member fastened to said lower cantilever member.

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