Aug. 18, 1970 I. J. ROCKLIN 3,524,956

ELECTRONIC MATERIAL DEPOSITING APPARATUS

Original Filed July 16, 1965 3 Sheets-Sheet 1

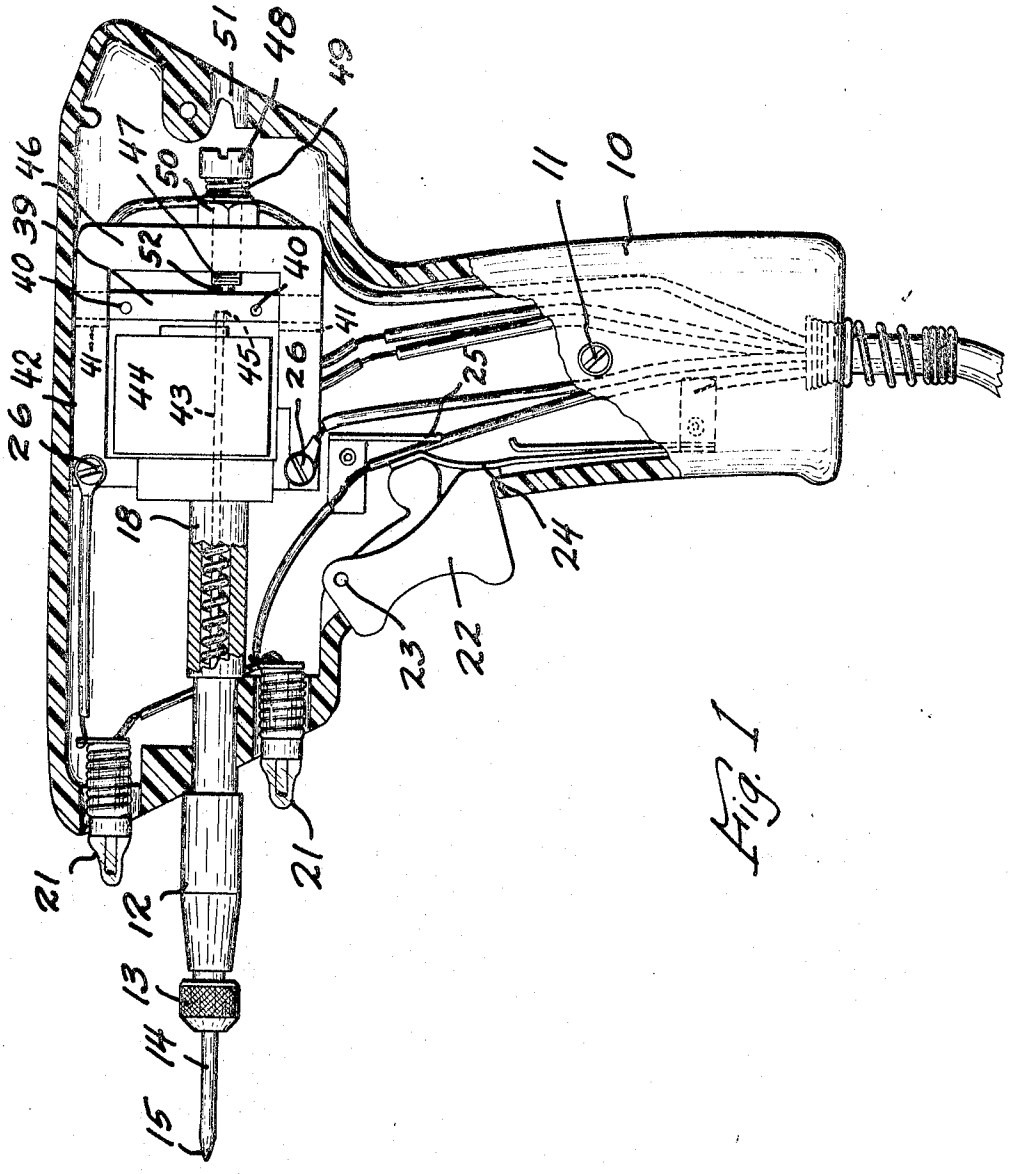


Fig. 1

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ELECTRONIC MATERIAL DEPOSITING APPARATUS

Original Filed July 16, 1965 3 Sheets-Sheet 2

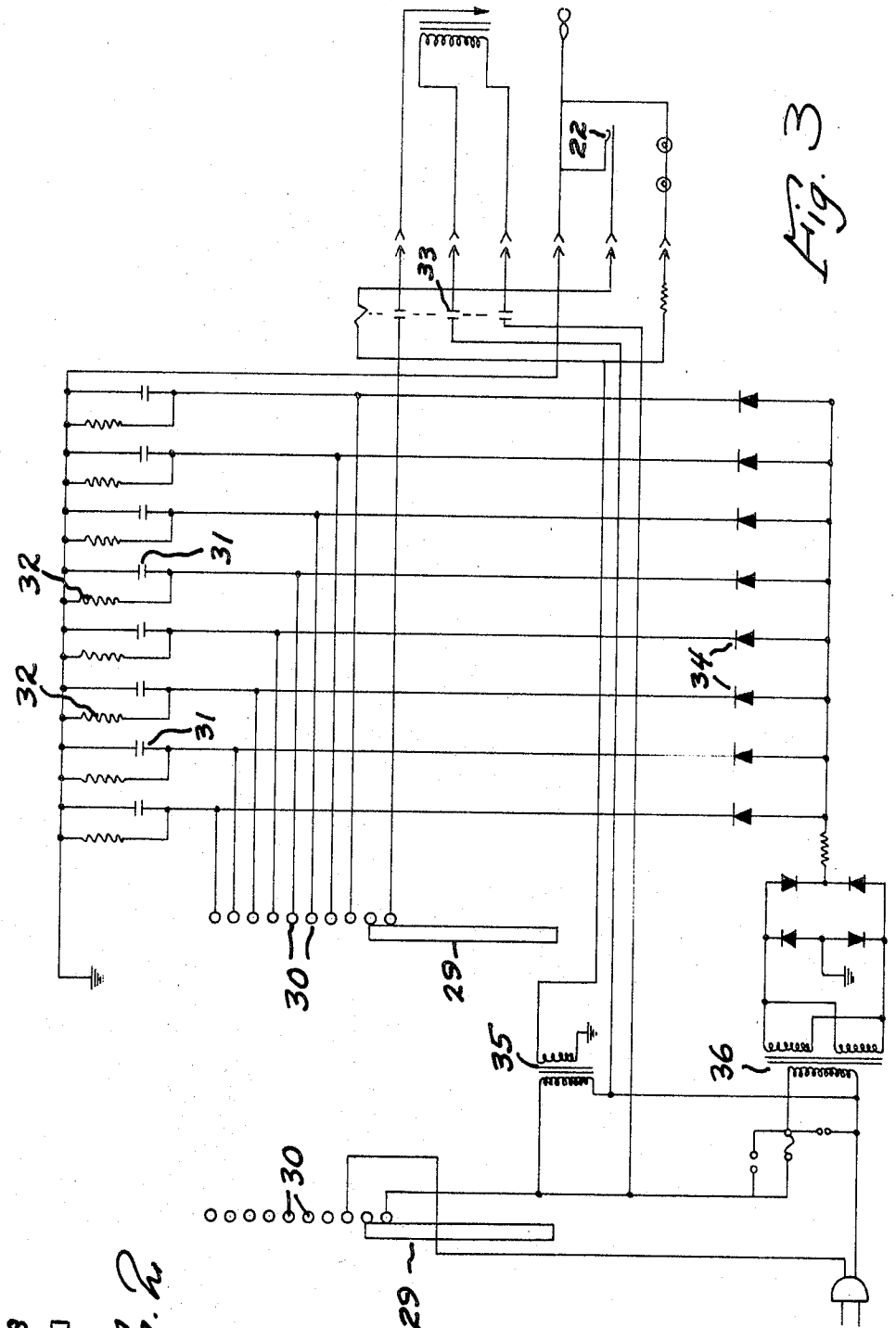


Fig. 3



Fig. 2

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ELECTRONIC MATERIAL DEPOSITING APPARATUS

Original Filed July 16, 1965 3 Sheets-Sheet 3

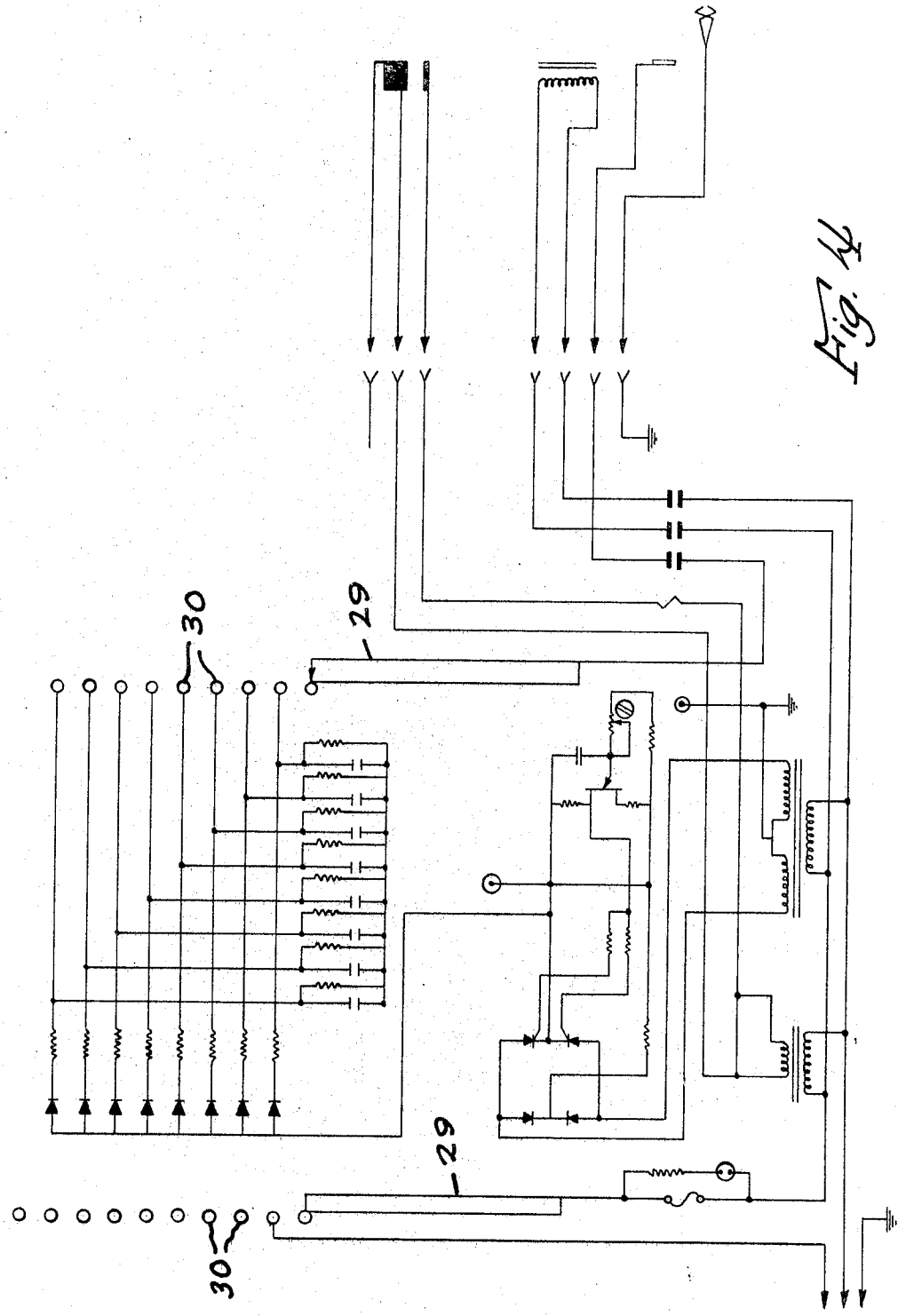


Fig. 4

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3,524,956

ELECTRONIC MATERIAL DEPOSITING APPARATUS

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Continuation of application Ser. No. 472,532, July 16, 1965. This application Sept. 8, 1969, Ser. No. 864,923
Int. Cl. B23k 9/04
U.S. Cl. 219—76 3 Claims

ABSTRACT OF THE DISCLOSURE

A device for depositing a thin layer of tungsten carbide or similar material onto a metal surface including a vibrating unit adapted rapidly to move an electrode formed of the material to be deposited into and out of contact with the surface to be covered. A circuit including a bank of capacitances in parallel and selectively used provides the necessary electronic and metallurgical action to cause the deposition. A means of providing for interchangeability of electrode sizes, types and materials is also included. The device may also be used as a percussive welder by clamping the vibrator and utilizing a single discharge to cause the welding.

This application is a continuation of my application Ser. No. 472,532, filed July 16, 1965.

My invention relates to an electronic metal coating arrangement.

An object of my invention is to provide a device for surfacing steel tools or other objects with suitable metallic deposits such as tungsten carbide, or the like, and whereby such coating will insure completely hardened surfaces, which are formed by means of a molecular bond to thereby lengthen the useful life of the tool so treated.

A further object of my invention is to provide a percussion weld surfacing, which is caused by vibrating an electrode made of the material to be deposited, so that arcing occurs between the electrode and the tool surface which in effect will cause the electrode material to be deposited on the surface.

A further object of my invention is to provide a vibrating head which vibrates the electrode so that the electrode itself is correspondingly vibrated to provide the arcing and percussion effect.

A further object of my invention is to provide a variety of electrode sizes wherein the ultimate coating effect of the electrode can be increased as desired.

A further object of my invention is to provide special circuits for accomplishing the contemplated results.

A further object of my invention is to provide an easily manipulated tool having a suitable light source.

A further object of my invention is to provide means whereby the vibrating electrode device can be securely clamped to provide a stationary welding tool.

With these and other objects in view, my invention consists in the construction, arrangement, and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

FIG. 1 is a partially sectional view of the gun or pistol arrangement used in my device.

FIG. 2 is a view of an electode.

FIG. 3 is a schematic view of a wiring diagram, and FIG. 4 is a further wiring diagram.

My invention contemplates the provision of a vibrating electrode type of percussive welding tool to provide means whereby the use of high capacity circuit arcing is provided between an electrode and a tool or other object surface, so that the material of the electrode, through the

arcing action, will form a molecular bond on the tool surface to thereby provide a long wearing tool and the like. My invention further contemplates an arcing tool which can be readily converted to a welding tool.

In describing my invention, and referring to FIG. 1, I have used the character **10** to designate a pistol grip handle formed of a pair of sections joined by means of the screws **11**, and I have further used the character **12** to designate a suitable chuck element having the chuck portion **13** adapted to tightly receive the electrode **14** having the point **15**, this electrode being made usually of tungsten carbide or any other suitable material, and the member **12** is suitably secured to an electrode vibrating member **18** which will thereby rapidly vibrate the electrode **14**.

The character **21** indicates a pair of light bulbs suitably connected into the trigger circuit, and the trigger itself being indicated by the character **22**, this trigger being pivoted at **23** and bearing against a contact element **24** which is adapted to engage the contact member **25**, when the circuit is established by the trigger, this trigger also breaking the contact, when released.

The character **26** indicates various other contacts, however a more complete understanding of the circuits will be apparent from FIG. 3.

In the illustrated circuit of FIG. 3, power is provided through an ordinary plug **54** which may be engaged with an outlet ordinarily provided for primary power. A switch which is illustrated as having multiple contacts **30** and a ganged operating member **29** may be provided. One of the parts of the member **29** is adapted to make or break the primary power circuit which energizes the transformer **35** and **36** and the vibrator unit indicated generally as **55**. A pilot light **56** and a fuse **57** are also provided in the circuit. These provide visual indication that the device is operative and protection for the circuit respectively. An indicator light **58** may also be provided in parallel with the fuse **57**.

The transformer **36** feeds a bridge rectifier **59** which in turn charges a bank of capacitances **31**. The diodes **34** are also a part of the rectification process. The resistors **32** are simply to bleed off the undischarged charge from the condensers. The bank of capacitance is varied by means of the switch including the multiple contacts **30**. It will be evident that as the operating unit **29** is moved to make additional contacts, the capacitances are added in parallel, thereby providing additional total capacity available for discharge through the electrode **14**.

The transformer **35** energizes the relay control **60** through the trigger operated switch **22** so that when the trigger switch is closed, the relay closes the contacts **33** and provides power both to the vibrator **39** from line voltage and to the electrode **14** from the bank of capacitance **31**. An alligator clip **43** or similar device may be used to provide proper grounding of the workpiece so that the electrode will provide proper arcing.

The circuit illustrated in FIG. 4 is somewhat similar to that of FIG. 3. Power is introduced to the transformers **35** and **36** in the same way. The transformer **35** supplies power to actuate the relay **60** through the switch **22**. This switch may be a trigger switch in a device as shown, or may be a foot actuated switch or any other type of circuit closing device.

The transformer **36** feeds a bridge rectifier **59** in the same way as in the circuit of FIG. 3. However, I use a variable frequency oscillator circuit **62** to provide a variable output direct current supply of power. This power feeds the banks of capacitances **31** with their bleed-off resistors **32** through the diodes **34**. In this circuit I also provide resistances **63** to provide for a proper discharge of the condensers **31**.

The ganged switch units **29–30** provide in one instance for energizing the entire device, and on the other unit for the discharge of only one or a plurality of the condensers in a manner similar to the switch illustrated in FIG. **3**. In all other respects also, this unit is similar to that of FIG. 3.

When operating the device, the operator merely places the point **15** of the electrode **14** against the tool surface which is to be coated with the necessary thin layer of material, and can withdraw the point slightly to start the arcing action. The vibrations of the electrode which is caused by the vibrator **18**, provides a current which rapidly breaks and makes which in effect will cause arcing between the electrode and the metal tool surface whereby the molecules of the electrode material will be torn away from the electrode and deposited on the tool surface, the arcing thereby creating erosion of the electrode to thereby deposit it on the material by heat fusion etc. The lights **21** will illuminate the work so that it can be closely observed.

FIG. 2 illustrates an electrode wherein the character **37** will designate the principal electrode portion, the character **38** indicating an expanded portion received within the chuck **13**, and these electrodes can be made of various sizes to provide means whereby the same tool can utilize various sizes to increase the density and arcs applied to the tool to be covered, and whereby the voltage and current carrying capacities can be varied for this purpose also, thereby giving the operator a wide range of deposition, all in the same tool and apparatus, and so that the tool can be efficiently regulated both as to speed of deposition and area requirements.

In considering further aspects of the tool, the character **39** indicates a laminated armature which is made up of a series of flat plates riveted together as at **40**, these plates being separated by means of the gap **41** from the substantially U-shaped electro-magnet **42**, the character **43** indicating a square rod passing through the coil **44**, the rod **43** being received within the square recess **45** in the member **39**. The character **46** indicates a stationary framework with which is threadably engaged the screw **47** having the slotted turning head **48**, the screw **47** being reecived within the spring **49** bearing against the nut **50**, the character **51** indicating an opening for the reception of a screw driver for turning the screw head **48**.

By rotating the screw head **48** in either direction, the vibrating range of the electrode **14** or **37** can be regulated, however if it is desired to convert the tool to a welding tool only, the head **48** can be screwed tightly against the spring **49**, whereby the screw which bears against the member **39** at **52** will either completely or substantially close the gap **41** so that in effect, the electrode will be held against vibration, and by using suitable circuits, the electrodes when pressed against the surface to be welded will become a welding unit, by virtue of this construction the tool will function in both mnaners; either to deposit the hardened substance on the tool surface, or to weld.

It will now be noted that I have provided the advantages

set forth in the objects of my invention with further advantages being apparent.

Some changes may be made in the construction and arrangements of the parts of my invention without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims and modified forms of structure or use of mechanical, electrical or electronic equivalents which may be reasonably included within their scope.

I claim:

1. A hand tool for electronically depositing a hard wearing metal coating on another metal surface of a tool or other object by percussive action and arcing between an electrode and the tool comprising an insulated pistol member having a body portion and a handle portion, a switch pivotably mounted in the handle portion, banks of contacts in one of the portions operated by the switch, the body portion having a closed end and a partially opened open end, an electromagnet in the body portion, a vibrating armature operated by the electromagnet, a rod operatively connected at one end to the armature and connected to a chuck at the other end, the chuck having means for engaging and retaining an electrode of a hard wearing metal, an electrical circuit within the pistol member, means to connect the circuit to a source of power, the circuit comprising the plurality of contacts, the electromagnet, a transformer, a rectifier, a plurality of diodes, a plurality of capacitors, and a resistance to each capacitor, the switch being so constructed and positioned as to bridge and engage the banks of contacts in parallel, one bank of contacts being connected to the capacitors, one contact to one capacitor, the rectifier receiving current from the transformer and distributing the current to the capacitors through the diodes, one diode to one capacitor, the position of the switch with relation to the banks of contacts determining the value of the current applied o the electrode for formation of an arc during the vibrations of the electrode whereby the arc melts the hard metal electrode and heats the metal surface of the tool or other object, the vibrations depositing the melted metal on the tool or other surface by a percussive action to create a molecular bond between the metal surface and the coating metal.

2. The hand tool as set forth in claim **1** wherein adjustment means is operatively connected to the vibrating armature to vary the length of the vibrating stroke.

3. The hand tool as set forth in claim **2**, wherein the circuit includes work illuminating means positioned in the body portion adjacent the chuck.

References Cited

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RALPH F. STAUBLY, Primary Examiner

U.S. Cl. X.R.

219—70, 234, 384

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,524,956 Dated August 18, 1970

Inventor(s) Isadore J. Rocklin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Figures 3 and 4 of the drawing figures should be deleted and the attached figures 3 and 4 substituted therefor.

Signed and Sealed this

Eighteenth Day of *April 1978*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

LUTRELLE F. PARKER
Acting Commissioner of Patents and Trademarks

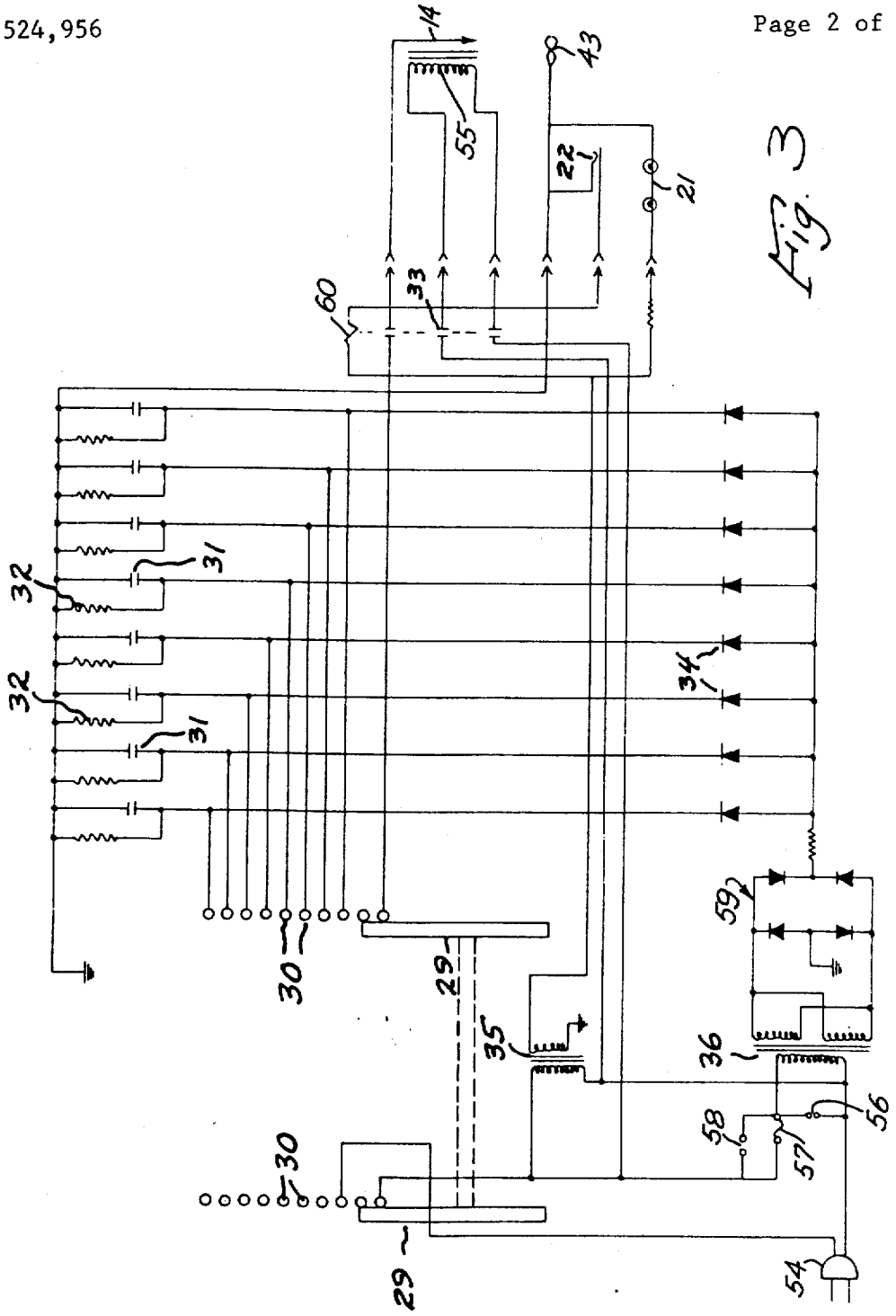


Fig. 3

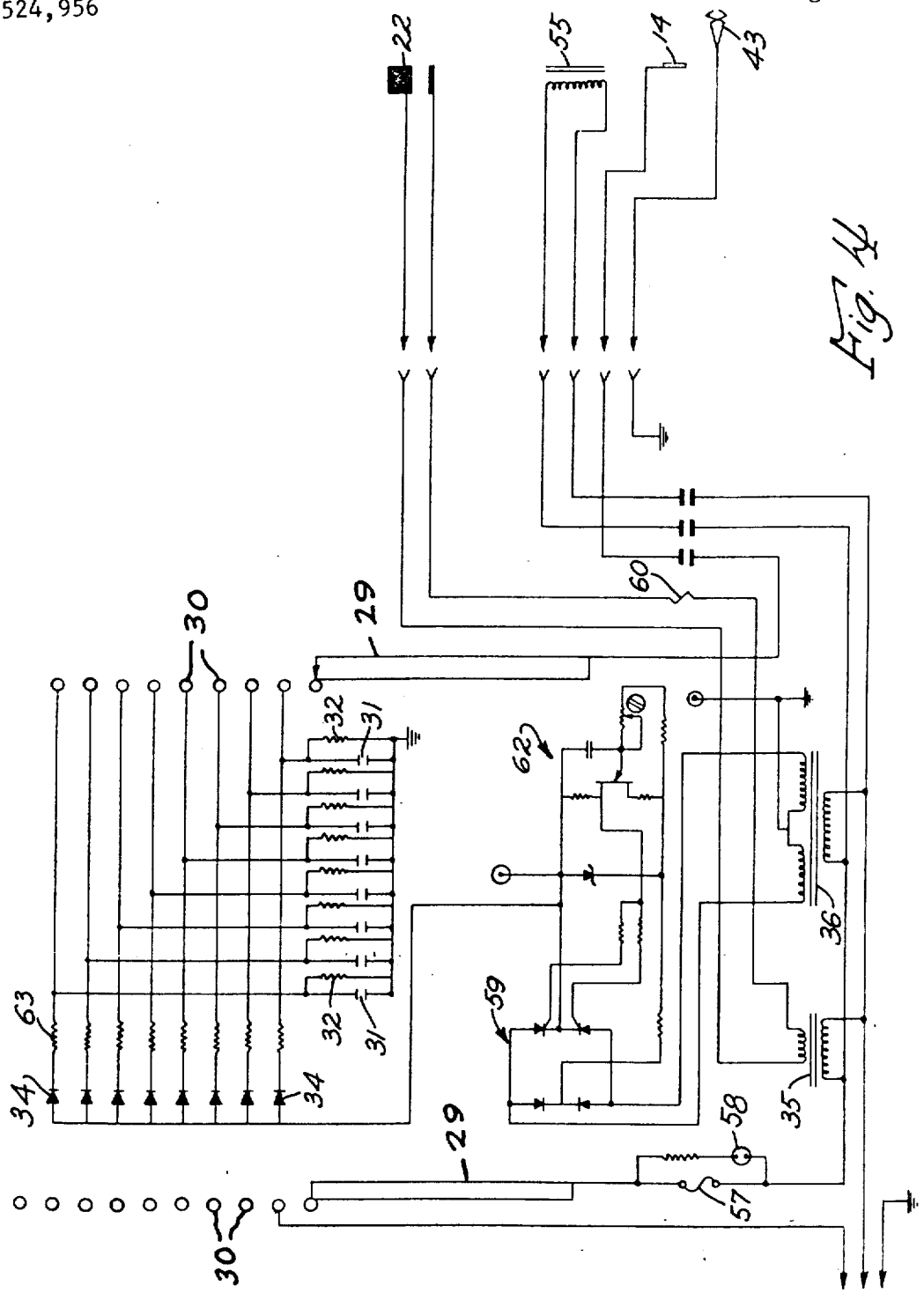


Fig. 4