

drive roller 30. The electrode is then inserted through electrode guide tube 22 between drive roller 30 and idler roller 56 through nozzle assembly 70 contacting nozzle piece 86 and upper shoe 92. After the electrode is inserted knob 60 is turned counterclockwise to allow idler roller 56 to drop into frictional engagement with the electrode. Then knob 60 is turned clockwise to lock idler roller 56 in position. After idler roller 56 is in position knob 50 is turned clockwise to raise pivot arm 42 and move drive roller 30 into frictional engagement with the electrode. Because of the presence of spring 45 idler roller 56 and drive roller 30 are biased toward each other thus assuring positive contact of the rollers to the electrode. The spring loaded drive system will permit adjustment of the roller spacing to accommodate for the electrodes that are not straight, show a variation in diameter within a general nominal size or have nonuniform electrode joints. Thus, when the motor 38 is energized motor drive gear 34 turns drive gear 32 which in turn turns the drive roller 30 to advance the electrode out of the nozzle assembly 70. At the same time current is fed through conductive ring 74 through flexible electrical conduit 96 to upper shoe 92 and to the electrode. Simultaneously therewith air through the concentric cable (not shown) enters conductive ring 74 through annular passage 78 passes through hollow passage 90 and out through orifices 88 which direct the air flow along the electrode toward the arc.

The air flowing in conductive ring 74 will cool the ring and by conduction through flexible strap 96 provide cooling to the upper shoe 92. Air flowing through hollow passage 90 in lower shoe assembly 82 will cool the entire lower shoe assembly 82 thus resulting in cooler operation of the automatic torch.

The torch provides an electrode drive system wherein electrodes varying in diameter from 7.9 to 12.7 mm (5/16 inches to 3/4 inches) in diameter having successively jointed ends can be used without changing the drive mechanism.

The drive mechanism is self aligning. The unique design automatically adjusts drive wheel pressure which will compensate for changes in the diameter of the electrode, straightness of the electrode and mis-alignment of the male and female portions of the socket of successively jointed electrodes.

The nozzle is constructed so that it transmits electric current and compressed air through the same members thus controlling temperature and permitting continuous use of the torch. The upper shoe 92 can be mounted to be resiliently in contact with the electrode if electrodes are encountered which have severe dimensional inconsistencies.

The nozzle, together with the annular ring 74, provides for increased air efficiency by reducing turbulence of the process air by allowing the process air to expand in the annulus 78 before

being conducted to the discharge orifices 88. This permits reduction in the operating air pressure in the torch which leads to reduced operating noise level of the torch. Reduction of pressure in the torch requires less compressed air and thus saves energy in the conventional shop system utilizing an automatic air-carbon arc cutting and gouging torch.

Claims

1. An automatic air-carbon arc cutting and gouging torch comprising

a) a nozzle (70) for supporting a consumable electrode juxtaposed a workpiece and for directing at least one stream of air along said consumable electrode, and

b) a feeding unit for passing said consumable electrode through said nozzle towards said workpiece as said consumable electrode is consumed, said feeding unit comprising a housing (14), a first wheel (30) and a second wheel (56) mounted in said housing (14), means for bringing said first (30) and second (56) wheels into engagement with opposite sides of said consumable electrode, and means (32) to rotate said first wheel (30) to advance said consumable electrode through said nozzle (70) characterized in that said first (30) and second (56) wheels are rotatably mounted on arms (42, 54) which are pivotably mounted on separate and distinct supports (44, 58), said first (30) and second (56) wheels can be independently positioned with respect to one another by respective control members (50, 60), and means (45) are provided to bias said first (30) and second (56) wheels together.

2. A torch according to Claim 1, characterized in that said biasing means comprises a coil spring (45).

3. A torch according to Claim 1 or 2, characterized in that each control member (50, 60) comprises a push rod mounted to exert force on a respective arm (42, 54), each push rod being movable by an associated knob.

4. A torch according to Claim 1, 2 or 3, characterized in that said means to rotate said first wheel (30) includes a gear set with a driver gear mounted in said drive wheel shaft and a drive wheel (34) driven by a synchronous motor (38).

5. A torch according to Claim 4, characterized in that said synchronous motor (38) is adapted for control by electric means sensing the height of said nozzle (70) from said workpiece.

6. A torch according to any preceding Claim, characterized in that said nozzle includes a first or bottom electrode supporting shoe (82) having means to direct at least one stream of air along said electrode toward the end projecting from said housing and a second or upper electrode clamping shoe (92) both shoes adapted to carry electrical current to said electrode.

Electrode drive and nozzle system for automatic air-carbon
arc cutting and gouging torch

This invention relates to automatic Air-Carbon Arc Cutting and Gouging torches.

In the Air-Carbon Arc Cutting and Gouging Process an electrode is used to strike and maintain an arc between the electrode and a workpiece causing melting of metal underneath the arc. As melting progresses a stream of high pressure air is directed along the electrode to the arc causing the molten metal to be forcibly removed from the influence of the arc, thus leaving a groove or gouge, in the surface of the workpiece. The process can also be used to cut completely through the workpiece in the area traversed by the electrode and the arc. Torches for use in the Air-Carbon Arc Cutting and Gouging Process include an automatic torch wherein the torch is mounted on a carriage or other device for movement along a predetermined path. Automatic torches include means to feed electrodes toward the workpiece at a rate selected to match consumption of the electrode by the electric arc. Most automatic torches include provision for using jointed electrodes so that successive electrodes (lengths) can be mated to, in effect, provide a continuous electrode of indeterminate length.

One type of automatic Air-Carbon Arc Cutting and Gouging Torch is disclosed in US-A-3,317,779. In this patent rollers are used to frictionally engage the electrode and feed it through a nozzle containing a contact shoe which conducts electricity to the electrode. The nozzle has provision for directing air along the electrode to the arc. The patent includes means for pivoting the housing supporting drive rolls having a fixed position relative to each other about an axis to, in effect, change the spacing between the rollers and increase frictional contact with the electrode.

Means for controlling the torch including the spacing of the torch to the workpiece and the feeding of the electrode are disclosed in US-A-3,659,071. The '071 patent is an improved version of an automatic torch and control system.

Jointed electrodes for use in automatic torches are disclosed in US-A-3,131,290.

Lastly, the current state of the art is reflected in the Model N Automatic Air-Carbon Arc Cutting and Gouging Torch manufactured and sold by the Arcair Company of Lancaster, Ohio.

One of the problems with prior art automatic torches is compensating for electrodes that are not perfectly straight, electrodes that vary in diameter for a given nominal size, and poor joint fit of successive lengths of electrode.

According to the present invention there is provided

An automatic air-carbon arc cutting and gouging torch comprising

a) a nozzle for supporting a consumable electrode juxtaposed a workpiece and for

directing at least one stream of air along said consumable electrode, and

b) a feeding unit for passing said consumable electrode through said nozzle towards said workpiece as said consumable electrode is consumed, said feeding unit comprising a housing, a first wheel and a second wheel mounted in said housing, means for bringing said first and second wheels into engagement with opposite sides of said consumable electrode, and means to rotate said first wheel to advance said consumable electrode through said nozzle characterized in that said first and second wheels are rotatably mounted on arms which are pivotably mounted on separate and distinct supports, said first and second wheels can be independently positioned with respect to one another by respective control members, and means are provided to bias said first and second wheels together.

Preferably, said biasing means comprises a coil spring.

Advantageously, each control member comprises a push rod mounted to exert force on a respective arm, each push rod being movable by an associated knob.

Preferably, said means to rotate said first wheel includes a gear set with a driver gear mounted in said drive wheel shaft and a drive wheel driven by a synchronous motor. In such an embodiment said synchronous motor is preferably adapted for control by electric means sensing the height of said nozzle from said workpiece.

Preferably, said nozzle includes a first or bottom electrode supporting shoe having means to direct at least one stream of air along said electrode toward the end projecting from said housing and a second or upper electrode clamping shoe both shoes adapted to carry electrical current to said electrode. Preferably, an air chamber is included upstream of said bottom shoe to receive air from a source and allow it to expand there minimizing turbulence and reducing the operating air pressure across the nozzle. Preferably, said nozzle is electrically insulated from said housing and surrounded by an insulating cover. Advantageously, said bottom shoe and said upper shoe are removable so that different shoes can be used with different size electrodes and all of said shoes are mounted for movement toward and away from each other to facilitate good electrical contact with said electrode. More advantageously the electrode contact surfaces of said upper shoe and said bottom are opposed U and V shaped grooves aligned parallel to the longitudinal axis of an electrode fed through said torch.

For a better understanding of the invention reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a top plan view of an automatic

Air-Carbon Arc Cutting and Gouging Torch with a portion of the top broken away to illustrate details of the torch;

Figure 2 is a front view of the torch of Figure 1;

Figure 3 is a section taken along the lines 3—3 of Figure 1; and

Figure 4 is a section taken along the lines 4—4 of Figure 1.

Referring to the drawings and in particular to Figures 1 and 3, the torch 10 includes a housing 14 with a cover 16. Housing 14 includes an aperture 18 aligned with an aperture 20 to permit an elongated electrode (not shown) to be passed through the cover 16 and housing 14. On the entry end of torch 10 cover 16 includes an electrode guide tube 22 covered by an insulated tube 24 affixed to electrode guide tube 22 by a hose clamp 26. Electrode guide tube 22 is adapted to align the electrode with the longitudinal axis of the housing and with the longitudinal axis of aperture 18.

Disposed within housing 14 is a drive mechanism including a drive roller 30 driven by a drive gear 32 which in turn is driven by a motor drive gear 34 mounted on a shaft 36 of a motor 38. Motor 38 is a synchronous motor which is provided with electrical conduit 40 for mating with a suitable electrical control system (not shown) to drive the motor in response to the rate of consumption to the electrode or other automatic torch parameters as is well known in the art. One such parameter is the distance of the torch nozzle to the workpiece which may vary due to varying surface condition of the workpiece as described in the specifications of US—A—3,659,071.

Drive roller 30 is mounted in a yoke 42 so that the drive roller 30 can be pivoted about shaft 44 of drive gear 32. Pivoting of drive roller 30 is accomplished by means of a pushrod 46 which is acted upon by a shaft 48 threadably mounted through housing 14 and controlled by knob 50. Coil spring 52 is included to maintain the position of yoke 42 and hence drive roller 30. Independently mounted within the housing by yoke 54 is an upper or idler roller 56. Idler roller 56 is adapted to pivot around shaft 58 and can be pivoted by a mechanism similar to the pivoting mechanism of drive roller 30 which in turn is controlled by knob 60. Drive roller 30 and idler roller 56 are normally urged toward each other by biasing means 45. Biasing means 45 comprise a coil spring fixed between the shafts of drive roller 30 and idler roller 56 by screws as shown in Figure 4.

Drive roller 30 and idler roller 56 are mounted in a juxtaposition so that they can be brought into frictional contact with an electrode inserted through electrode guide tube 22 for movement through the housing in a direction from aperture 20 toward aperture 18 and outwardly of the housing 14.

Forward of housing 14 on the end delivering the electrode there is included a nozzle

assembly 70. Nozzle assembly 70 includes an insulating spacer 72 separating housing 14 from a conductive ring 74. Conductive ring 74 has an annular internal bore 76 which aligns with aperture 18 of housing of 14. The outside surface of conductive ring 74 includes an annular groove 78 which includes 4 equally spaced threaded apertures 80 to receive a conventional hose fitting for an air hose or a combination electrical cable and air hose such as disclosed in US—A—3,234,317.

Forward of conductive ring 74 is a lower shoe assembly 82 including a bottom piece 84 and a top or nozzle piece 86 including three orifices 88 (Figure 2). Lower shoe assembly 82 includes a hollow passage 90 communicating with annular passage 78 of conductive ring 74 to make a continuous passage from orifices 88 through nozzle piece 86 and bottom piece 84 of lower shoe assembly 82 to the conductive ring 74. Spaced apart from the lower shoe assembly 82 is a top shoe 92 adapted through biased screw assembly 94 for movement toward the lower shoe assembly 82. As shown in Figure 2 lower shoe assembly 82 and upper shoe 92 contain longitudinal grooves semicircular and V in shape respectively to accommodate a generally cylindrical electrode to provide good surface contact with the shoes to the electrode. Upper shoe 92 is connected to conductive ring 74 by means of a flexible electrical conduit 96 which is held in place by bolt and insulator assemblies 98 and 100.

Nozzle assembly 70 includes an insulating cover 102 provided with four apertures which align with respective threaded apertures 80 in conductive ring 74. The forward end of nozzle assembly 70 includes an insulating cover 104 secured by screws 106.

The torch includes a shield 110 mounted on the housing for motor 38 to prevent excessive heat from the arc contacting motor 38 which would shorten its service life.

In operation at least one air hose and one concentric cable are connected to separate apertures of conductive ring 74. The unused apertures are closed by suitable plugs (not shown).

Lower shoe assembly 82 and upper shoe 92 are selected based upon the diameter of the electrode being used with the torch and positioned in nozzle assembly 70. Electrodes which would be used in the automatic torch vary from 29 to 19.1 mm (5/16 to 3/4 inches) in diameter. For each size electrode there is provided a lower shoe assembly 82 having a nozzle piece 86 with a semicircular cross section complimentary to the diameter of the electrode. However, upper shoe 92 only need be provided in two sizes viz: one for electrodes 7.9 to 12.7 mm (5/16 to 1/2 inch) diameter and one for electrodes 15.9 to 19.1 mm (5/8 to 3/4 inch) in diameter. The shoes are adjusted for contact with the electrode.

Knob 50 is rotated to loosen the tension on

drive roller 30. The electrode is then inserted through electrode guide tube 22 between drive roller 30 and idler roller 56 through nozzle assembly 70 contacting nozzle piece 86 and upper shoe 92. After the electrode is inserted knob 60 is turned counterclockwise to allow idler roller 56 to drop into frictional engagement with the electrode. Then knob 60 is turned clockwise to lock idler roller 56 in position. After idler roller 56 is in position knob 50 is turned clockwise to raise pivot arm 42 and move drive roller 30 into frictional engagement with the electrode. Because of the presence of spring 45 idler roller 56 and drive roller 30 are biased toward each other thus assuring positive contact of the rollers to the electrode. The spring loaded drive system will permit adjustment of the roller spacing to accommodate for the electrodes that are not straight, show a variation in diameter within a general nominal size or have nonuniform electrode joints. Thus, when the motor 38 is energized motor drive gear 34 turns drive gear 32 which in turn turns the drive roller 30 to advance the electrode out of the nozzle assembly 70. At the same time current is fed through conductive ring 74 through flexible electrical conduit 96 to upper shoe 92 and to the electrode. Simultaneously therewith air through the concentric cable (not shown) enters conductive ring 74 through annular passage 78 passes through hollow passage 90 and out through orifices 88 which direct the air flow along the electrode toward the arc.

The air flowing in conductive ring 74 will cool the ring and by conduction through flexible strap 96 provide cooling to the upper shoe 92. Air flowing through hollow passage 90 in lower shoe assembly 82 will cool the entire lower shoe assembly 82 thus resulting in cooler operation of the automatic torch.

The torch provides an electrode drive system wherein electrodes varying in diameter from 7.9 to 12.7 mm (5/16 inches to 3/4 inches) in diameter having successively jointed ends can be used without changing the drive mechanism.

The drive mechanism is self aligning. The unique design automatically adjusts drive wheel pressure which will compensate for changes in the diameter of the electrode, straightness of the electrode and mis-alignment of the male and female portions of the socket of successively jointed electrodes.

The nozzle is constructed so that it transmits electric current and compressed air through the same members thus controlling temperature and permitting continuous use of the torch. The upper shoe 92 can be mounted to be resiliently in contact with the electrode if electrodes are encountered which have severe dimensional inconsistencies.

The nozzle, together with the annular ring 74, provides for increased air efficiency by reducing turbulence of the process air by allowing the process air to expand in the annulus 78 before

being conducted to the discharge orifices 88. This permits reduction in the operating air pressure in the torch which leads to reduced operating noise level of the torch. Reduction of pressure in the torch requires less compressed air and thus saves energy in the conventional shop system utilizing an automatic air-carbon arc cutting and gouging torch.

Claims

1. An automatic air-carbon arc cutting and gouging torch comprising

a) a nozzle (70) for supporting a consumable electrode juxtaposed a workpiece and for directing at least one stream of air along said consumable electrode, and

b) a feeding unit for passing said consumable electrode through said nozzle towards said workpiece as said consumable electrode is consumed, said feeding unit comprising a housing (14), a first wheel (30) and a second wheel (56) mounted in said housing (14), means for bringing said first (30) and second (56) wheels into engagement with opposite sides of said consumable electrode, and means (32) to rotate said first wheel (30) to advance said consumable electrode through said nozzle (70) characterized in that said first (30) and second (56) wheels are rotatably mounted on arms (42, 54) which are pivotably mounted on separate and distinct supports (44, 58), said first (30) and second (56) wheels can be independently positioned with respect to one another by respective control members (50, 60), and means (45) are provided to bias said first (30) and second (56) wheels together.

2. A torch according to Claim 1, characterized in that said biasing means comprises a coil spring (45).

3. A torch according to Claim 1 or 2, characterized in that each control member (50, 60) comprises a push rod mounted to exert force on a respective arm (42, 54), each push rod being movable by an associated knob.

4. A torch according to Claim 1, 2 or 3, characterized in that said means to rotate said first wheel (30) includes a gear set with a driver gear mounted in said drive wheel shaft and a drive wheel (34) driven by a synchronous motor (38).

5. A torch according to Claim 4, characterized in that said synchronous motor (38) is adapted for control by electric means sensing the height of said nozzle (70) from said workpiece.

6. A torch according to any preceding Claim, characterized in that said nozzle includes a first or bottom electrode supporting shoe (82) having means to direct at least one stream of air along said electrode toward the end projecting from said housing and a second or upper electrode clamping shoe (92) both shoes adapted to carry electrical current to said electrode.



7. A torch according to Claim 6, characterized in that an air chamber (78) is included upstream of said bottom shoe to receive air from a source and allow it to expand there minimizing turbulence and reducing the operating air pressure across the nozzle.

8. A torch according to Claim 6 or 7, characterized in that said nozzle is electrically insulated from said housing and is surrounded by an insulating cover.

9. A torch according to Claim 6, 7 or 8, characterized in that said bottom shoe and said upper shoe are removable so that different shoes can be used with different size electrodes and all of said shoes are mounted for movement toward and away from each other to facilitate good electrical contact with said electrode.

10. A torch according to Claim 6, 7, 8 or 9, characterized in that the electrode contact surfaces of said upper shoe and said bottom are opposed U and V shaped grooves aligned parallel to the longitudinal axis of an electrode fed through said torch.

Revendications

1. Une torche automatique à l'arc air-carbone pour découpage et décrouissage comprenant:

a) une buse (70) destinée à supporter une électrode consommable juxtaposée à une pièce travaillée et à diriger au moins un jet d'air le long de cette électrode consommable, et

b) une unité d'avance destinée à faire passer l'électrode consommable à travers la buse en direction de la pièce travaillée, au fur et à mesure que l'électrode consommable est consommée, cette unité d'avance comprenant un boîtier (14), une première roue (30) et une seconde roue (56) montées dans le boîtier (14), des moyens destinés à amener la première roue (30) et la seconde roue (56) en contact avec des côtés opposés de l'électrode consommable, et des moyens (32) destinés à faire tourner la première roue (30) pour faire avancer l'électrode consommable à travers la buse (70), caractérisée en ce que la première roue (30) et la seconde roue (56) sont montées de façon tournante sur des bras (42, 54) qui sont montés de façon pivotante sur des supports séparés et distincts (44, 58), la première roue (30) et la seconde roue (56) pouvant être positionnées indépendamment l'une par rapport à l'autre par des pièces de commande respectives (50, 60), et il existe des moyens (45) destinés à solliciter la première roue (30) et la seconde roue (56) l'une vers l'autre.

2. Une torche selon la revendication 1, caractérisée en ce que les moyens de sollicitation comprennent un ressort hélicoïdal (45).

3. Une torche selon la revendication 1 ou 2, caractérisée en ce que chaque pièce de commande (50, 60) comprend un poussoir monté de façon à exercer une force sur un bras respectif (42, 54), chaque poussoir pouvant être déplacé au moyen d'un bouton associé.

4. Une torche selon la revendication 1, 2 ou 3, caractérisée en ce que les moyens destinés à faire tourner la première roue (30) comprennent un train d'engrenages avec une roue dentée menante montée sur l'axe de roue d'entraînement et une roue d'entraînement (34) entraînée par un moteur synchrone (38).

5. Une torche selon la revendication 4, caractérisée en ce que le moteur synchrone (38) peut être commandé par des moyens électriques qui détectent la hauteur de la buse (70) par rapport à la pièce travaillée.

6. Une torche selon n'importe quelle revendication précédente, caractérisée en ce que la buse comporte un premier patin de support d'électrode, ou patin inférieur (82) comprenant des moyens destinés à diriger au moins un jet d'air le long de l'électrode, vers l'extrémité qui fait saillie à partir du boîtier, et un second patin de serrage d'électrode, ou patin supérieur (92) et les deux patins sont conçus de façon à acheminer le courant électrique vers l'électrode.

7. Une torche selon la revendication 6, caractérisée en ce qu'une chambre d'air (78) est incorporée en amont du patin inférieur, pour recevoir l'air venant d'une source et permettre son expansion, afin de minimiser la turbulence et de réduire la pression d'air en fonctionnement, au niveau de la buse.

8. Une torche selon la revendication 6 ou 7, caractérisée en ce que la buse est électriquement isolée du boîtier et est entourée par un couvercle isolant.

9. Une torche selon la revendication 6, 7 ou 8, caractérisée en ce que le patin inférieur et le patin supérieur sont amovibles de façon à permettre d'utiliser des patins différents avec des électrodes de différente taille, et tous ces patins sont montés de façon à pouvoir s'approcher et s'éloigner l'un de l'autre afin de faciliter l'établissement d'un bon contact électrique avec l'électrode.

10. Une torche selon la revendication 6, 7, 8 ou 9, caractérisée en ce que les surfaces de contact avec l'électrode du patin supérieur et du patin inférieur sont formées par des gorges opposées ayant une forme en U et en V qui sont alignées parallèlement à l'axe longitudinal d'une électrode qui avance à travers la torche.

Patentansprüche

1. Druckluftbetriebener Trenn- und Fugenschneidbrenner mit Kohlenelektrode, mit den folgenden Merkmalen:

a) ein Mundstück bzw. eine Düse (70), um eine verbrauchbare Elektrode nahe einem Werkstück zu tragen und mindestens einen Luftstrom längs der verbrauchbaren Elektrode zu leiten, und

b) eine Nachführ- bzw. Vorschubeinheit, um die verbrauchbare Elektrode durch die Düse zum Werkstück hin bei fortschreitendem Verbrauch der Elektrode hindurchzuführen, wobei die Vorschubeinheit ihrerseits die folgenden Merkmale

aufweist:

- ein Gehäuse (14),
 - ein erstes Rad (30) und ein zweites Rad (56), die im Gehäuse (14) angebracht sind,
 - eine Einrichtung, um das erste (30) und zweite (56) Rad in Eingriff mit den gegenüberliegenden Seiten der verbrauchbaren Elektrode zu bringen, und
 - eine Einrichtung (32), um das erste Rad (30) zum Vorwärtsfördern der verbrauchbaren Elektrode durch die Düse (70) hindurch zu drehen, dadurch gekennzeichnet,
 - daß das erste (30) und zweite (56) Rad drehbar an Armen (42, 54) angebracht sind, welche schwenkbar an getrennten und unterschiedlichen Halterungen (44, 58) angebracht sind, und daß das erste (30) und zweite (56) Rad unabhängig bezüglich einander durch jeweilige Steuerglieder (50, 60) positionierbar sind, und
 - daß eine Einrichtung (45) vorgesehen ist, um das erste und zweite Rad (30, 56) zusammenzudrücken.
2. Brenner nach Anspruch 1, dadurch gekennzeichnet, daß die Spanneinrichtung eine Spiralfeder (45) umfaßt.
3. Brenner nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß jedes Steuerglied (50, 60) eine Schubstange umfaßt, welche derart angebracht ist, daß sie an einem jeweiligen Arm (42, 54) eine Kraft ausübt, wobei jede Schubstange durch einen zugeordneten Griff bzw. Knopf beweglich ist.
4. Brenner nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die Einrichtung zum Drehen des ersten Rades (30) ein angetriebenes Zahnrad umfaßt, welches an der Antriebsradwelle angebracht ist, sowie ein Antriebszahnrad (34), welches von einem Synchronmotor (38) angetrieben ist.
5. Brenner nach Anspruch 4, dadurch gekennzeichnet, daß der Synchronmotor (38) zur Steuerung bzw. Regelung durch eine

elektrische Einrichtung eingerichtet ist, welche die Höhe der Düse (70) über dem Werkstück mißt.

6. Brenner nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Düse einen ersten oder unteren Elektroden-Trageschuh (82) umfaßt, welcher eine Einrichtung aufweist, um mindestens einen Luftstrom längs der Elektrode zu jenem Ende hin zu richten, welches vom Gehäuse abragt, und einen zweiten oder oberen Elektroden-Klemmschuh (92), wobei beide Schuhe dazu eingerichtet sind, elektrischen Strom auf die Elektrode zu übertragen.

7. Brenner nach Anspruch 6, dadurch gekennzeichnet, daß eine Luftkammer (78) stromaufwärts vom unteren Schuh umfaßt ist, um Luft aus einer Einspeisung aufzunehmen und es ihr zu ermöglichen, dort zu expandieren, wobei die Turbulenz auf ein Mindestmaß verringert wird und der Betriebsluftdruck über die Düse hinweg verringert wird.

8. Brenner nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß die Düse elektrisch gegenüber dem Gehäuse isoliert ist und von einer Isolierabdeckung umgeben ist.

9. Brenner nach Anspruch 6, 7 oder 8, dadurch gekennzeichnet, daß der untere Schuh und der obere Schuh entfernbar sind, so daß unterschiedliche Schuhe mit Elektroden unterschiedlicher Größe verwendet werden können, und daß alle Schuhe zur Bewegung aufeinander zu und voneinander weg angebracht sind, um den guten elektrischen Kontakt mit der Elektrode zu erleichtern.

10. Brenner nach Anspruch 6, 7, 8 oder 9, dadurch gekennzeichnet, daß die Elektroden-Kontaktflächen des oberen Schuhs und des unteren Schuhs entgegengesetzte U- und V-förmige Nuten sind, welche parallel zur Längsachse einer Elektrode ausgerichtet sind, welche durch den Brenner hindurch zugeführt wird.

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