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(54) **Gas fired radiant heater.**

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Description

This invention relates to a radiant heater designed to heat surfaces without substantially altering the temperature of the surrounding air. It is therefore particularly suitable for use in open air environments such as public transport shelters, loading and unloading areas, sports ground terraces, etc.

The heater in accordance with the invention is fitted with a gas burner. Its characteristic feature is the special arrangement of the parts which facilitates construction and maintenance of the heater, reduces its size, and makes it very easy to regulate and therefore extremely practical.

There are already heaters in existence which exploit the possibility of transferring heat by radiation from a hot body to a cold one, and which are used in cases where the performance of a given activity makes it necessary for people to remain outdoors for long periods.

These types of heater generally consist of a burner and equipment which causes the heated air to run through a radiant tube.

In particular, there are existing heaters in which one end of the tube is welded or otherwise secured to a container which encloses a burner and the related control equipment, and at the other end there is an exhauster and devices which sense the negative pressure it creates inside the tube and activate the burner.

BE-A-665772 describes a radiant heater comprising a radiant tube constituting the combustion chamber, a burner fitted to one end of said radiant tube and burnt gas exhausting equipment fitted at the other end, whereby the burner consists of a pre-mixing chamber coaxial with the said radiant tube and an electrode, fitted at the exit, designed to light the gas issuing from a nozzle coaxial with said pre-mixing chamber, said burner being fitted to the radiant tube via a flange.

DE-A-2229763 shows a radiant heater having a negative pressure sensor placed at the tube outlet.

This invention relates to a gas-fired radiant heater according to claim 1.

Dependent claims 2 to 6 relate to further embodiments of the heater according to claim 1.

This invention will now be described in detail by way of example only, with special reference to the annexed figures in which:

- Figure 1 shows a partly cross-sectioned horizontal projection of a heater in accordance with the invention
- Figure 2 shows the cross-section along line A-A of Fig. 1
- Figure 3 shows a partly cross-sectioned perspective view of the burner of a heater in accordance with the invention
- Figure 4 shows the cross-section along line B-B of Fig. 1.

The heater in accordance with the invention basically consists of a U-shaped radiant tube 1, fitted at one end with an assembly comprising a burner with relative control and fuel supply devices, the whole assembly being marked 2, and at the other, with smoke exhausting equipment marked 3.

The heater is completed by reflector panel 4, preferably having a seagull-wing shape as illustrated in Figure 4.

Radiant tube 1 can be made of various materials, although carbon steel has proved particularly suitable as it presents high emissivity which facilitates heat transfer by radiation.

Burner 2 comprises a pressure reducer 5, fitted with a gas by-pass solenoid valve and connected to a nozzle 6 from which the gas exits and is sent to pre-mixing chamber 7.

A starting electrode 9 is located near the exit of the pre-mixing chamber, while a probe 8 is situated near the inlet of tube 1 and connected to a negative pressure switch which acts in a known way on the solenoid valve supplying pressure reducer 5.

The pressure reducer, nozzle, negative pressure switch and various electronic and electromechanical control devices are housed in a container 12 which is integral with a sleeve 13. The latter is inserted into the end of radiant tube 1, where it is locked into position by tightening a pair of bolts (14) or similar.

Pre-mixing chamber 7 is basically cylindrical, coaxial with sleeve 13 and tube 1, and fixed to the front wall of container 12.

A flame trap 15 is fitted at the end of the pre-mixing chamber which penetrates inside radiant tube while a similar trap 16 is fitted in a recessed position in pre-mixing chamber 7.

Several holes 17 are drilled in the wall of the pre-mixing chamber, near the rear end fixed to container 12, to permit the passage of a quantity of comburent air.

The dimensions of the holes are calculated so that less than the stoichiometric quantity of comburent air enters the air-gas mixture.

Several holes or slots 18 are drilled in sleeve 13 (also coaxial with radiant tube 1) and fitted with a flame trap. Sensor 19 of a flame ionisation detector is fitted near the exit of the pre-mixing chamber; this device is not illustrated in detail, as it is of a known type.

Exhausters 3, also fixed to tube 1 via a sleeve 20, are fitted at the opposite end of radiant tube 1.

These exhausters basically consist of a fan 21 driven by a motor 22 and fitted with an auxiliary impeller, not shown in the figure, which supplies a current of air sufficient to cool the shaft of main fan 21.

The heater operates as follows:
When the heater is switched on, the electronic devices in container 12 check for malfunctions in the apparatus, and if there are none, send the enable signal so that motor 22 can be started up. Fan 21 is then activated, and exhausts any smoke or unburnt deposits from the inside of the radiant tube which could cause explosion when the burner is lit.

During this first stage the solenoid valve coupled to pressure reducer 5 and controlled by negative pressure switch 10 remains closed.

Air is exhausted from inside the chamber by fan 21, creating negative pressure in tube 1. This is detected by negative pressure switch 10 which sends the burner activation signal when the set value is reached.

The fact that the negative pressure switch probe is located at the entrance (unlike those of similar types of heater) means safer heater operation, because in this position the sensor can detect any obstacle to smoke circulation in radiant tube 1, due, for example, to obstruction or breakdown of the exhauster.

If everything works properly, at the end of this first heater pre-wash stage the negative pressure switch enables opening of the solenoid valve and activation of electrode 9 via the control devices.

The gas then issues from nozzle 6 and passes into chamber 7 where it is partly mixed with a quantity of air sucked in through holes 20. The mixture, sucked in by the negative pressure in the tube, crosses flame trap 15 and is set alight by electrode 9.

This produces an elongated flame which continues to be fed by the secondary air sucked into tube 1 through slits 18.

The operation of the burner is then monitored by sensor 19 of the ionisation detector.

The flame travels along the first straight stretch of tube 1, heating it up to a temperature of 250-400 °C. After passing through the central curved stretch, the smoke continues towards the outlet, releasing a further quantity of heat to the wall of tube 1, and is then evacuated by fan 21.

The heat spreads by radiation from the walls of the radiant tube, while reflector screen 4, located in the upper part of the heater, reflects such of the energy as would otherwise be lost, directing it downwards.

To ensure precise regulation of the air-gas mixture so as to obtain the best combustion, it is sufficient to loosen bolts 14 and run sleeve 13 axially along tube 1, the wall of which will close openings 18 to a greater or lesser degree, thereby regulating the inflow of air to the pre-mixing chamber and to the actual combustion chamber.

The fact that sliding sleeve 13 is used to fit the burner to the combustion chamber brings considerable advantages compared with existing types of heater, where the burner is fixed directly to tube 1. Above all, as already described, the air-gas ratio can easily be regulated simply by moving the sleeve axially.

The lower heat inertia of the configuration described prevents overheating of container 12 and the parts inside it, which would occur if there were physical continuity between the walls of radiant tube 1 and container 12.

This system means that the burner can be removed easily and quickly for servicing, with no need to work in awkward positions or dismantle the entire heater.

The fact that the combustion chamber is totally separated from container 12, which houses the pressure reducer and gas supply parts, eliminates the risk of explosions due to backflashes in the event of gas leaks.

Flame trap 15 at the end of the pre-mixing chamber is also designed to elimninate backflashes, while the second trap 16 is particularly important; in addition to constituting a further flame trap to protect nozzle 6 if the first trap should fail to do its job due to wear or other reasons, it also helps distribute the air-gas mixture evenly over the burner head.

The fact that the cylindrical pre-mixing chamber is coaxial with tube 1 means that an air filter can be inserted into the space between the two, this being particularly useful in dusty environments.

Further advantages include the grid at slot 18 which acts as a flame trap and heat barrier when the burner is extinguished, and the fact that the negative pressure sensor is located near the entrance, making operation of the entire assembly safer, as described above.

Claims

1. Gas fired radiant heater of the kind comprising a radiant tube (1) costituting the combustion chamber, a burner (2) fitted to one end of the said radiant tube and burnt gas exhausting equipment (3) fitted at the other end, said burner (2) consisting of a premixing chamber (7) coaxial with the said radiant tube (1) and an electrode (9), fitted at the exit of said pre-mixing chamber (7), designed to light the gas issuing from a nozzle (6) coaxial with the said pre-mixing chamber (7), characterised by the fact that the said burner (2) is fitted to the radiant tube (1) via a sleeve (13) which slides axially along the said tube (1) and can be locked into any position, that the said gas fired radiant heater is fitted with systems (10) de-

signed to detect pressure variations at the combustion chamber entrance, the said systems activating the heater control devices and that the gas supply parts and heater control devices are housed in a container (12) separated from the combustion chamber and integral with the burner support sleeve (13).

2. Gas fired radiant heater according to claim 1, charaterised by the fact that a sensor (19) of a flame ionisation detector connected to the heater control devices is fitted at the exit of the said pre-mixing chamber (7).

3. Gas fired radiant heater according to claims 1 or 2, charaterised by the fact that a flame trap (15) is fitted at the exit of the said pre-mixing chamber (7).

4. Gas fired radiant heater according to claim 3, characterised by the fact that a second flame trap (16) is fitted inside the said pre-mixing chamber (7) in a recessed position which also performs the function of distributing the air-gas mixture evenly over the burner head.

5. Gas fired radiant heater according to claim 1, characterised by the fact that it is fitted with equipment designed to divide the incoming air into a first flow designed to be mixed with the gas in the pre-mixing chamber (7), and a second flow sent to the exit of the said pre-mixing chamber (7).

6. Gas fired radiant heater according to claim 5, characterised by the fact that the said sleeve (13) contains several slots (18) for the passage of air directed to the combustion chamber and the said pre-mixing chamber (7) has openings (17) designed to allow the intake of less that the stoichiometric quantity of air.

Revendications

1. Appareil de chauffage à gaz par rayonnement, du type comportant un tuyau radiant (1) constituant la chambre de combustion, un brûleur (2) appliqué à une extrémité de ce tuyau radiant et dispositifs (3) pour l'aspiration du gaz brûlé à l'autre extrémité, dit brûleur consistant en une chambre de pre-mélange (7) coaxiale avec dit tuyau radiant (1), et en une électrode (9) placée à la sortie de la chambre de pre-mélange (7) pour incendier le gaz provenant d'un gicleur (6) coaxial avec dite chambre de pre-mélange (7), caractérisé en ce que ledit brûleur (2) est appliqué au tuyau radiant (1) par un manchon (13) coulissant axialement le long dedit tuyau (1) et peut être bloqué en toute position, dit appareil de chauffage à gaz par rayonnement comporte des dispositifs (10) pour détecter les variations de pression à l'entrée de la chambre de combustion, lesdits dispositifs enclenchant les dispositifs de contrôle du brûleur et les dispositifs d'alimentation du gaz et de controle de l'appareil de chauffage sont placés dans une boite séparée de la chambre de combustion et fixèe au manchon (13) de support du brûleur.

2. Appareil de chauffage à gaz par rayonnement selon la revendication 1, caractérisé en ce que un détecteur de flamme (19) à ionisation connecté aux dispositifs de controle de l'appareil de chauffage, est placé à la sortie de dite chambre de pre-mélange (7).

3. Appareil de chauffage à gaz par rayonnement selon les revendications 1 ou 2, caractérisé en ce que un filet casse-flamme (15) est placé à la sortie de dite chambre de pre-mélange (7).

4. Appareil de chauffage à gaz par rayonnement selon la revendication 3, caractérisé en ce que un deuxième filet casse-flamme (16) est placé dans dite chambre de pre-mélange (7) en position intérieuse, ayant aussi la fonction de distribuer uniformément le mélange air-gaz sur la culasse du brûleur.

5. Appareil de chauffage à gaz par rayonnement selon la revendication 1, caractérisé en ce qu'il comporte des dispositifs pour diviser l'air à l'entrée en un premier flux qui va être mélangé avec le gaz dans la chambre de pre-mélange (7) et en un deuxième flux qui va être envoyé à la sortie de dite chambre de pre-mélange.

6. Appareil de chauffage à gaz par rayonnement selon la revendication 5, caractérisé en ce que dit manchon (13) comporte plusieurs fentes (18) pour le passage d'air froide dirigée vers la chambre de combustion, et dite chambre de pre-mélange (7) a des fentes (17) pour permettre l'entrée d'une quantité d'air inférieure à la quantité stoechiométrique.

Patentansprüche

1. Ein gasbefeurter Heizstrahler, der ein Strahlrohr (1) als Verbrennungsraum, und einen Brenner (2), der an einem Ende des genannten Strahlrohres eingenbaut ist, umfasst, und an dem anderen Ende die Abgasungsvorrichtung (3) aufweist, Der genannte Brenner (2) besteht aus einer dem Strahlrohr (1) koaxial liegenden

Vormischungskammer (7) und aus einer Elektrode (9), die am Ausgang der genannten Vormischungskammer (7) eingebaut ist, und die zur Anzuendung des Gases dient, das aus einer der Vormischungskammer (7) koaxial liegenden Duese heraustritt, dadurch gekennzeichnet, dass der genannte Brenner (2) an dem Strahlrohr (1) durch eine Schiebenmuffe (13) befestigt ist, die dem genannten Rohr (1) entlang axial liegt, und die in jeder Stellung blockiert werden kann; dass der genannte gasbefeurte Heizstrahler mit Systemen (10) ausgestattet ist, die die Druckaenderung beim Eingang zur Vebrennungskammer enthuellen und die die Heizstenuerungsvorrichtungen aktivieren; und dass die Gasversorgungsteile und die Heizsteurungsvorrichtungen in einem Kasten (12) aufgenommen sind, der von der Verbrennungskammer abgetrennt ist und mit der Halterungsmuffe (13) des Brenners integral ist.

2. Ein gasbefeurter Heizstrahler, nach dem Anspruch 1, dadurch gekennzeichnet, dass ein Sensor (19) mit den Heizsteuerungsvorrichtungen verbundenen Flammenionisation-Detektores am Ausgang der genannten Vormischungskammer (7) eigebaut ist.

3. Ein gasbefeurter Heizstrahler, nach den Ansprueche 1 oder 2, dadurch gekennzeichnet, dass eine Flammentrap (15) am Ausgang der genannten Vormischungskammer (7) eingebaut ist.

4. Ein gasbefeurter Heizstrahler, nach dem Anspruch 3, dadurch gekennzeichnet, dass eine zweite Flammentrap (16) hinten in der Vormischungskammer (7) eingebaut ist, eine Flammentrap, die auch als gleichmaessiger Verteiler von der Gas-Luft-Mischung ueber dem Brennerkopf dient.

5. Ein gasbefeurter Heizstrahler, nach dem Anspruch 1, dadurch gekennzeichnet, dass er mit Vorrichtungen ausgestattet ist, die dazu dienen, die Luft-Einstroemung in einen ersten Strom zuscheiden, der mit dem Gas in der Vormischungskammer (7) gemischt wird, und in eine zweiten Strom, der in Rchtung des Ausgangs der genannten Vormischungskammer (7) gefoerdert wird.

6. Ein gasbefeurter Heizstrahler, nach dem Anspruch 5, dadurch gekennzeichnet, dass die gennannte Muffe (13) mit vielen Schlitzen (18) fuer das Luftstroemen in die Verbrennungskammer ausgestattet ist und dass die genannte Vormischungskammer (7) Oeffnungen (17) aufweist, die einen Zuluftbedarf erlauben, der kleiner als die stoichiometrische Luftmenge ist.

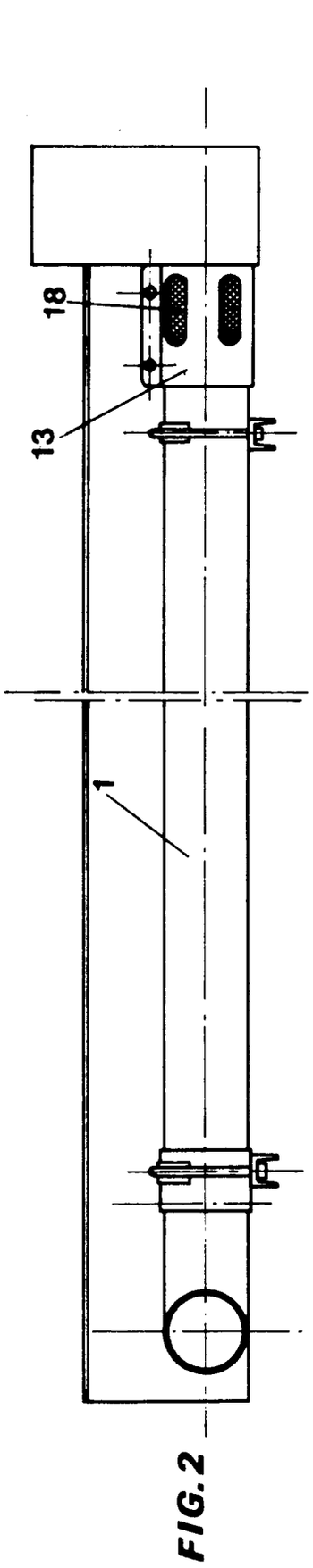

FIG.2

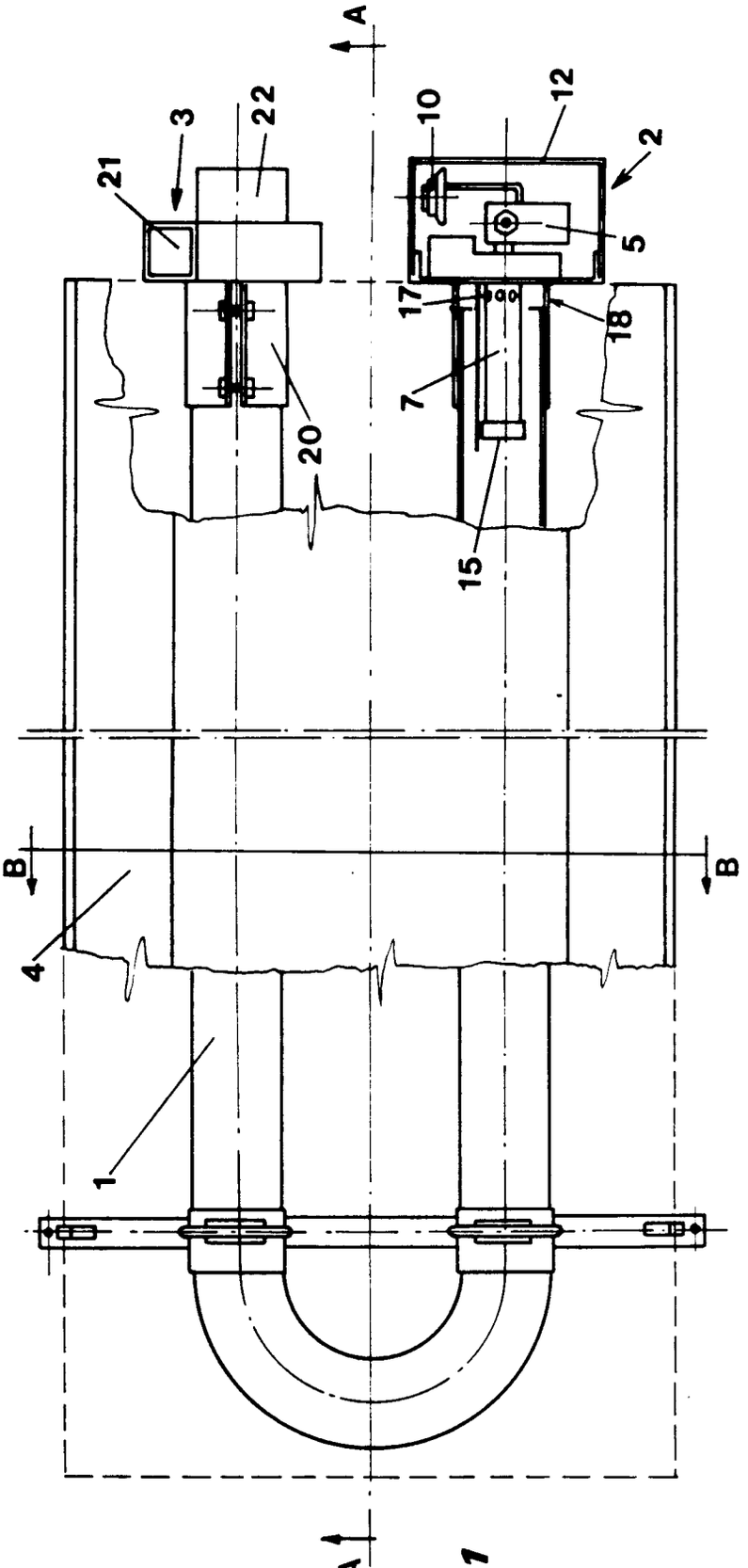

FIG.1

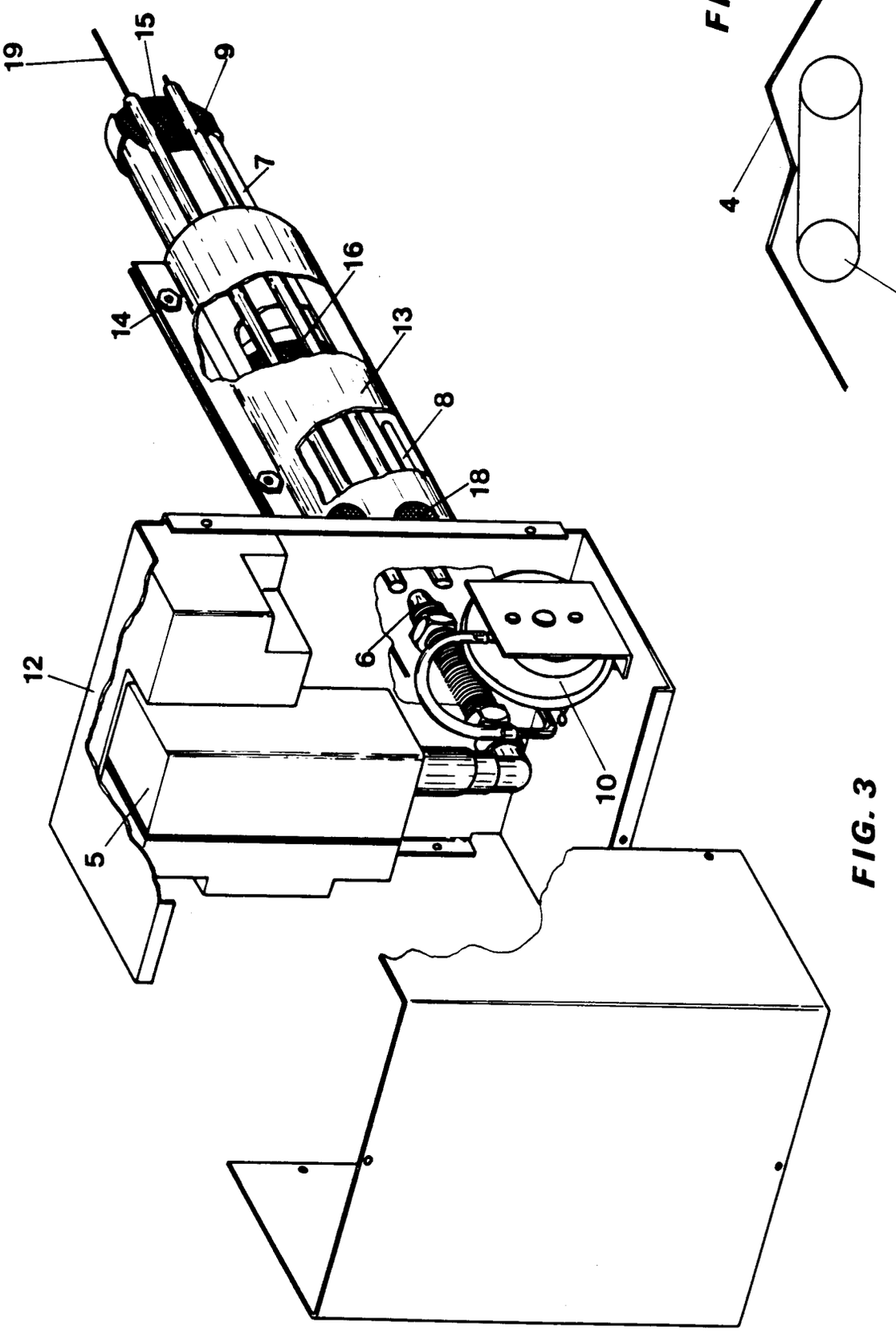

FIG. 3

FIG. 4