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RIBBON ASSEMBLY FOR GAS BURNERS

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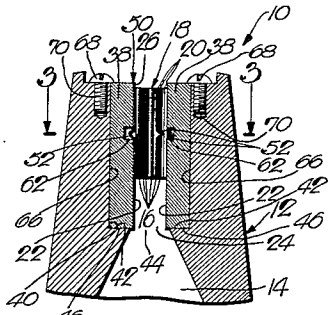


Fig. 2

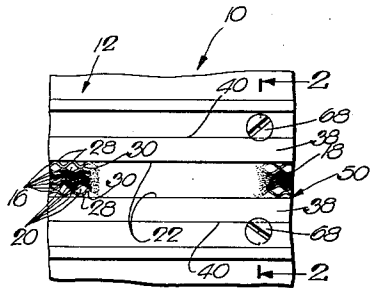


Fig. 1

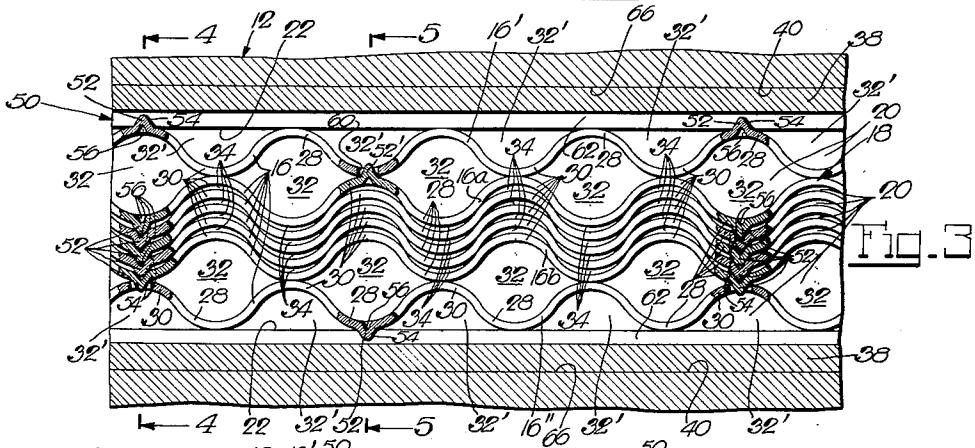


Fig. 3

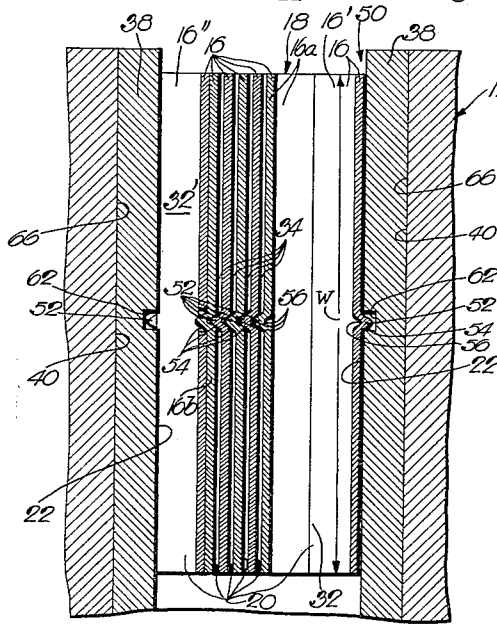


Fig. 4

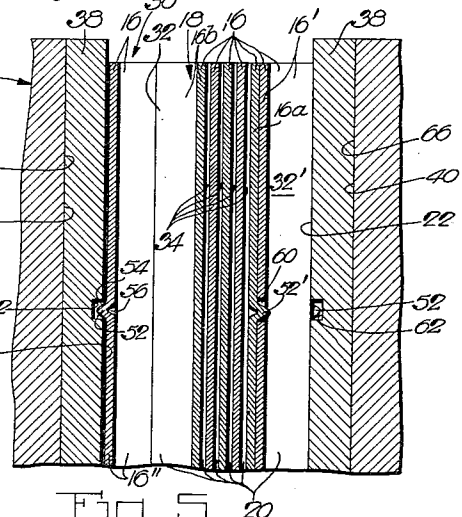


Fig. 5

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# RIBBON ASSEMBLY FOR GAS BURNERS

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This invention relates to ribbon-type gas burners in general, and to ribbon assemblies for gas burners in particular.

The flame ports provided by ribbon assemblies in the burner slots or grooves in the casings of burners of this type are usually spaced very closely from each other and are of quite small individual cross-sectional areas for producing efficient flames, and more particularly uniform flame sheets for most intended flame applications. To this end, the individual ribbons are rather slender in any event, and they have regularly recurring lateral port formations which dimensionwise are quite shallow and short so that only accurate alignment and full complement with each other of port formations of adjacent ribbons in the same assembly will result in gas ports of sufficiently identical cross-sectional areas and shapes to produce uniform individual flames and, hence, an always desired even flame sheet thereat. However, adjacent ribbons in these assemblies invariably gap apart here and there sufficiently to keep opposite port formations thereat out of full complement with each other despite intermesh of port formations of adjacent ribbons wherever the port pattern permits this and despite the usual joinder of the ribbons at spaced places by crosspins or spot welds thereat. The reason therefor lies in the inevitable tolerances in the shapes and dimensions of the recurring lateral port formations of the individual ribbons which prevents normal gapless joinder throughout of adjacent ribbons in the first place, and non-yieldability of these ribbons into uniform gapless joinder with each other throughout under the compression against each other within the limits imposed by the requirement that the ribbon assembly may be slid or driven with relative ease and without port distortion into burner slots or grooves. Hence, gas ports of varying cross-sectional areas and even varying shapes are the order, rather than the exception, in mounted ribbon assemblies, with ensuing uneven individual flames thereat that may, and often will, adversely affect the desired evenness of the flame sheet throughout.

It is the primary aim and object of the present invention to provide a ribbon assembly of most any desired port pattern of which adjacent ribbons, despite their inevitable tolerances in size and shape of their port formations, are joined to each other uniformly throughout and without any gaps between them and with their opposite port formations in accurate alignment and full complement with each other, and with the assembly being, furthermore, insertable into a burner slot or groove directly from the top thereof with relative ease and without any port distortion.

It is another object of the present invention to provide a ribbon assembly of this type which, besides being insertable into a burner slot or groove with relative ease as aforementioned, is removable therefrom with comparative ease for replacement of the ribbon assembly or for occasional thorough cleaning of the same.

It is a further object of the present invention to provide a ribbon assembly of this type in which the assembled ribbons are held between side plates which form part of the ribbon assembly, and the latter is mounted in a burner casing by forcibly, yet facilely, driving the same with its side plates into a fitting machined slot or groove therein and locking the side plates to the casing, with the individual ribbons and side plates having lock formations wherewith they are releasably interlocked



with each other and the entire ribbon assembly thus securely locked to the burner casing when mounted therein.

Another object of the present invention is to provide a ribbon assembly of this type in which the lock formations on the aforementioned side plates thereof are longitudinal grooves therein which receive the lock formations on the adjacent outermost ribbons therebetween in releasable interlock therewith and also with freedom to give way longitudinally of the respective grooves to differential expansion and contraction of the assembled ribbons.

A further object of the present invention is to provide a ribbon assembly of this type in which the aforementioned lock formations on the ribbons are simple identical blister-like parts thereof formed by side impressions therein to provide tapering locking detents on one side as well as like tapering locking depressions on the other side, with locking detents on the ribbons being firmly wedged and seated in locking depressions in adjacent ribbons and locking detents on the outermost ribbons received in the longitudinal grooves in the side plates for secure interlock of the assembled ribbons with each other and with the side plates with freedom of the detents in the plate grooves to expand and contract with the assembled ribbons.

It is another object of the present invention to provide a ribbon assembly of this type in which the side plates thereof are of sufficient height not only to form the effective burner slot or groove for the assembled ribbons, but also for temporary application thereto of a clamp or clamps in order securely to hold the entire assembly together and permit at the same time forced insertion of the latter into its reception slot or groove in the burner casing with relative ease and to a sufficient depth therein at which the clamps will be removed and the reception slot or groove assume the same secure hold on the assembly for its complete insertion therein with continued relative ease. With this arrangement, it is also entirely feasible to apply to the assembled ribbons safe clamping pressures which are not only far in excess of those to which assembled ribbons may be subjected when directly driven into and received in burner slots or grooves in burner casings without distortion of their ports, but which may be of sufficient magnitude greatly to reduce, if not prevent, local gapping between adjacent ribbons.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

FIG. 1 is a fragmentary view of a burner with a ribbon assembly embodying the present invention;

FIG. 2 is a fragmentary section through the burner taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary section through the burner taken on the line 3—3 of FIG. 2; and

FIGS. 4 and 5 are fragmentary sections through the burner taken on the lines 4—4 and 5—5, respectively, of FIG. 3.

Referring to the drawing, and more particularly to FIGS. 1 and 2 thereof, the reference numeral 10 designates a burner having a longitudinal casing 12 with the usual gas chamber 14 and a gas admission port or ports thereto (not shown). The instant burner is of the type in which a large multiplicity of individual flames combine to form a longitudinal flame sheet for utility purposes. To this end, the burner is provided with burner ribbons 16 which are assembled side-by-side in an array or unit 18 to form gas ports 20 according to a desired predetermined pattern. The ribbon unit 18 is located in the present instance in a longitudinal burner slot 22 in the casing 12

which at its bottom 24 is in open communication with the chamber 14 throughout and at its top 26 is open to the outside of the casing 12.

The individual ribbons 16 of the unit 18 are presently identical dimensionwise and shapewise, each being sinuous in shape and having regularly recurring alternating curved formations 28 and 30 on opposite sides thereof (FIGS. 1 and 3). These ribbons 16 are, furthermore, so coordinated in the unit 18 that their curved formations 28 and 30 define in the present instance main ports 32 and pilot ports 34, the outermost ribbons 16' and 16'' of the unit 18 furthermore defining in the burner slot 22 auxiliary main ports 32'. As best shown in FIG. 3, the main ports 32 are presently formed by complemental aligned curved formations of adjacent ribbons 16, while the pilot ports 34 are presently formed by complemental curved formations of a number of intermeshed ribbons 16. The main ports 32 and 32', being of larger individual cross-sectional areas than the pilot ports 34, receive from the chamber 14 combustible gas at greater volumetric flow rate than the pilot ports to produce individual main flames which combine into a longitudinal flame sheet of considerable height and drive, while the gas passing through the smaller pilot ports 34 produces smaller pilot flames which support the main flames, all as well known.

In accordance with an important aspect of the present invention, the burner slot 22 is formed, not in the burner casing 12, but rather by opposite side plates 38 which are received in a machined groove 40 in the burner casing and between which the ribbon unit 18 is interposed. The bottom 42 of the groove 40 is at 44 interrupted throughout its longitudinal extent to provide thereat open communication between the chamber 14 and groove 40, leaving the groove bottom 42 with opposite spaced shoulders 46 on which the side plates 38 are seated in this instance.

The ribbon unit 18 and side plates 38 together form a ribbon assembly 50 which may be assembled outside the burner casing 12 and then inserted into the casing groove 40. In accordance with another important aspect of the present invention, the parts of the ribbon assembly 50, namely the individual ribbons 16 and the side plates 38, are interlocked with each other in a manner permitting insertion of the assembly 50 with its interlocked parts into the casing groove 40 on the one hand, and preventing removal of any ribbon 16 from the assembly 50 when the same is installed in the casing groove 40 on the other hand. To this end, all ribbons 16 and also both side plates 38 have properly coordinated interlock formations. Thus, almost all of the interlock formations on the individual ribbons 16 are in this instance identical impressed blister-like parts 52 thereof within the widthwise confines *w* of the ribbons, with each lock part 52 in each ribbon providing a tapering detent 54 and a like tapering depression 56 on opposite sides of the ribbon stock. With the individual ribbons 16 of the unit 18 being in this instance shaped and dimensioned identically as aforementioned, and with the lock parts 52 preferably impressed simultaneously with the formation of the individual ribbons 16 and also in identical arrangement thereon, the detents 54 and depressions 56 of the lock parts 52 on all ribbons presently project from the outside and are provided on the inside, respectively, of the alternating curved ribbon formations 28, with regularly recurring lock parts on all ribbons presently occurring on each fourth successive curved formation 28 of each ribbon. Accordingly, the intermeshed ribbons 16 which define the pilot ports 34 are arranged in the same relation to each other with the regularly recurring detents 54 on successive ones of these ribbons being interlocked with the regularly recurring depressions 56 in the next ribbons and with the interlocks between these ribbons regularly recurring at each fourth successive intermeshed curved formations 28 thereof (FIGS. 3 and 4). The end or outermost ribbon 16' on one side of the burner slot 22 is simply inverted with respect to the adjacent ribbon 16*a* in order to form therewith the main ports 32 thereat, the ribbon 16' being interlocked with its regular lock parts 52 with the adjacent side plate 38 (FIG. 3). However, the ribbons 16' and 16*a* are for their mutual interlock slightly modified from the other ribbons, the ribbon 16*a* having to this end additional regularly recurring lock parts 52' which interlock with equally regularly recurring apertures 60 in the ribbon 16' (FIGS. 3 and 5).

The other end or outermost ribbon 16'', which is complemental with the adjacent ribbon 16*b* in forming the other main ports 32, may be exactly like the modified ribbon 16' and is simply inverted with respect to the latter (FIG. 3) for its interlock with the adjacent normal ribbon 16*b* and for its further interlock with its regular lock parts 52 with the adjacent side plate 38 (see also FIG. 5).

The interlock formations on the side plates 38 are presently longitudinal slots 62 therein into which project the regular lock parts 52 on the adjacent outermost ribbons 16' and 16'' with freedom to expand and contract with the ribbon unit 18 relative to the side plates.

To get the ribbon assembly 50 together outside of the casing groove 40, the ribbons 16 are arranged and mutually interlocked to form the unit 18 with the exemplary port arrangement shown best in FIG. 3, the lock parts of the individual ribbons being in sidewise releasable interlock with the lock parts of the adjacent ribbons so that the ribbons may be held in their assembled and interlocked relation from opposite sides of the unit. The ribbons thus assembled and interlocked may be held together by a few longitudinally spaced spotwelds or in any other suitable manner, whereupon the side plates 38 are applied to the opposite sides of the ribbon unit 18 with the lock parts 52 on the outermost ribbons in interlock with the grooves 62 in the adjacent side plates to complete the ribbon assembly 50. The assembly 50 may then be held together, for instance by a suitably applied clamp or clamps on the side plates 38, for its insertion, and more particularly its forced drive, into the casing groove 40.

It is a well-known fact that the inevitable tolerances in the shapes and dimensions of burner ribbons, and especially of their lateral port formations, leave assembled ribbon units with gaps here and there between the side-by-side arranged ribbons despite the compression to which the ribbon unit is subjected on its drive directly into and installation in a burner slot or groove in a burner casing. As already mentioned, the reason therefor lies in the inadequacy of the compression of such ribbon unit to close these gaps, the compression of the ribbon unit being controlled and limited by the requirement that no port distortion must occur on its drive directly into a burner slot or groove. However, the present ribbon assembly 50 permits much higher compression of its ribbon unit 18 which may be, and in most cases is, fully adequate to prevent any local gapping between adjacent ribbons thereof, yet gives no rise to port distortion. This is due to the provision of the side plates 38 in the first place, and the positive interlock of the ribbons 16 with each other and also with the side plates 38 in the second place. Thus, the side plates 38 may, outside the casing groove 40, exert on the interposed ribbon unit 18 pressure of a magnitude which is fully adequate to force the ribbons into full and gapless side-by-side engagement with each other throughout despite their aforementioned tolerances in shape and dimensions, yet avoid any port distortion, because in applying this pressure there is no consideration of limiting it for direct drive of the ribbon unit into a burner slot or groove at which port distortion primarily occurs at even much lower ribbon compression. The side plates 38 may to this end be pressed and held pressed against the interposed ribbon unit with the required force outside of the casing groove 40 by a clamp or clamps, as aforementioned, which are suitably applied near the top of the ribbon assembly 50 to permit its forced drive into the casing groove 40, presently through the top thereof, to a sufficient depth therein

at which the casing groove will assume the secure hold of the ribbon assembly substantially at its initially given compression after the clamps must be removed for the remainder of the drive of the ribbon assembly into the casing groove. For the transfer of the compression of the ribbon assembly **50** from the temporary clamps thereon to the casing groove **40** in this fashion, the opposite plane sidewalls **66** of this groove are preferably parallel to each other and the side plates **38** are flat and of uniform thickness throughout.

The ribbon unit **18** is preferably spaced somewhat inwardly from the tops of the side plates **38**, as shown, so that on the forced drive of the ribbon assembly **50** into the casing groove **40** the entire driving force is applied against the side plates widthwise thereof. In consequence, the ribbons **16** are on the drive of the ribbon assembly **50** into the casing groove **40** subjected to no driving force whatsoever, but merely remain compressed by and between the side plates **38**, wherefore the ribbons are entirely unaffected by their installation in the burner casing. To facilitate the safe and secure drive of the ribbon assembly **50** into the casing groove **40**, the side plates **38** are preferably of greater width than the ribbon unit **18** so that the side plates extend considerably below the ribbon unit therebetween (FIG. 2). Temporary clamps may thus be applied to the side plates **38** at places safely within the widthwise confines of the interposed ribbon unit **18** without interfering with the drive of the ribbon assembly **50** into the casing groove **40** to a depth at which the latter will securely hold the assembly under compression when the temporary clamps have to be removed for the remainder of the drive of the ribbon assembly into the casing groove. On installation of the ribbon assembly **50** in the casing groove **40** the former may, and preferably is, locked in the latter despite its pressfit therein. To this end, the heads **68** of screws **70** in the burner casing **12** overlap the side plates **38** and thus releasably lock the ribbon assembly **50** in the casing groove **40**.

Positive interlock with each other of the individual ribbons **16** of the unit **18** is advantageous in that the port pattern defined by the ribbons is preserved in any event, and even more securely than by spotwelding the ribbons at even closer intervals than is usually done if spotwelding is resorted to for this purpose. Also, positive interlock of the ribbons with each other is far preferable to pinning the ribbons together, for pins will obstruct the ports which they cross and adversely affect the flame sheet pattern thereat, whereas the present interlocks between the ribbons in no wise obstruct the ports thereat. Furthermore, the lock formations of the present ribbons, being readily impressed at regularly recurring intervals in the ribbon stock while the same is continuously formed into ribbon shape, may at the same low cost be spaced as closely or widely apart as is best suited for accurately holding any particular port pattern of any particular ribbon unit. In this connection, the lock formations on the present ribbons may be spaced differently, and even widely differently, than shown. On the other hand, relatively close spacing of the lock formations on the ribbons, and especially of the specific lock parts **52** having the tapering detents **54** and like tapering depressions **56** on opposite sides of each ribbon which on interlock have some wedge action on the respective ribbons, will, in conjunction with the compression of the ribbon unit by the side plates, go far toward forcing the lateral port formations of the ribbons into full and gapless complement with each other regardless of whether the ports are formed by intermeshed port formations or inverted port formations of adjacent ribbons.

The interlock of the ribbon unit **18** with the side plates **38** is, of course, imperative for secure retention of the ribbon unit in the burner casing through intermediation of these side plates. In this connection, the interlock of the ribbon unit with the side plates in the present fashion is not only preferable to pinning them together at a few widely spaced places because it avoids objectionable port obstruction by pins, but the interlocks between the ribbon unit and side plates may be spaced as closely or widely as the interlocks between the ribbons themselves for optimum use of identical ribbons with identical lock formations in any unit, yet the ribbon unit has freedom to expand and contract independently of the side plates despite its interlock therewith.

The present ribbon assembly may also be removed from the casing groove **40** as readily as it is installed therein. Thus, while ribbon units driven directly into burner slots or grooves in burner casings can hardly be removed therefrom without extensive damage that prevents their further use, the present ribbon assembly may be removed from the casing groove by prying only the side plates **38** and without touching the interposed ribbon unit **18** in any way so that the same will remain intact. Various suitable expediencies may be resorted to in order to force the ribbon assembly **50** from the casing groove **40**, including wedging the same from the casing groove from the top thereof through intermediation of suitable crossbars temporarily screwed to the side plates on top thereof and applying temporary clamps to the assembly on partial removal from the casing groove for its complete removal therefrom. Once removed from the casing groove, the ribbon assembly **50** may be taken apart for thorough cleaning of all its parts or for replacement or repair of any part or parts thereof, with the assembly then being put together again and installed in the casing groove as good as new.

With the present arrangement of the ribbon assembly **50**, the ribbon unit **18** is mounted in the burner slot **22** which is provided, not by the burner casing, but by the side plates **38** of the ribbon assembly, wherefore the burner slot for the ribbon unit is also removable with the assembly from the casing for ready cleaning or even replacement with new side plates if need be.

The present invention is in no wise limited to any particular shape or shapes of the burner ribbons of an assembled unit or to the port pattern created thereby. Also, while the exemplary ribbon assembly **50** is adapted for a flame sheet of which the main flames at the main ports are supported by pilot flames at pilot ports in one and the same ribbon unit, the ribbon assembly for the flame sheet may contain only main ports supplied with gas from a burner slot in open communication throughout with the gas chamber in the casing, with the main flames of the flame sheet supported by pilot flames at exclusively pilot ports in similar ribbon assemblies in casing grooves which flank the casing groove containing the main-flame ribbon assembly.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

What is claimed is:

1. In a burner, the combination with a longitudinal casing having a gas chamber and a machined longitudinal passage with substantially parallel, plane opposite sidewalls and being open inwardly and outwardly to said chamber and to the outside of the casing, respectively, of a ribbon assembly in said passage comprising two flat rigid plates backed against said sidewalls and extending widthwise substantially to the outward opening of said passage and having spaced confronting plane and parallel faces defining a burner slot in said casing, and an assembly of side-by-side engaged burner ribbons having complemental port formations and being interposed between and clamped sidewise together by said plates and extending widthwise within the widthwise confines of said burner

slot, all of said ribbons having intermediate their widths longitudinally spaced identical male and female formations of which male and female formations of adjacent ribbons are sidewise releasably interlocked, said plates having in their confronting faces intermediate their widths longitudinal grooves, respectively, sidewise releasably receiving substantially fittingly male formations of adjacent ribbons, respectively, to lock all ribbons to said plates and permit differential expansion of the former and latter, and said locked plates and ribbons being as a unit forceable at a tight fit into said passage through the outward opening thereof on applying an inward driving force to said plates only; and means for releasably locking said ribbon assembly in said passage.

2. The combination in a burner as set forth in claim 1, in which said ribbons extend widthwise substantially to the outward opening of said passage, and said plates are of considerably greater width than said ribbons so as to permit partial drive of said ribbon assembly into said passage through the outward opening thereof while releasable clamps are applied to the outside of the plates over the full width of the ribbons therebetween.

3. A ribbon assembly for a machined longitudinal passage in a burner casing between a gas chamber therein and the outside thereof, comprising a sub-assembly of side-by-side engaged longitudinal burner ribbons forming complemental port formations widthwise thereof and having intermediate their widths longitudinally spaced



identical male and female formations of which male and female formations of adjacent ribbons are sidewise releasably interlocked, and two flat rigid plates on opposite sides of said ribbon sub-assembly having spaced confronting plane faces defining a burner slot and being adapted for clamping engagement with the ribbons of said subassembly therebetween, said confronting plate faces having intermediate their widths longitudinal grooves, respectively, sidewise releasably receiving substantially fittingly male formations of adjacent ribbons, respectively, to lock all ribbons to said plates and permit differential expansion of the former and latter, the ribbons of said subassembly extending widthwise within the widthwise confines of said plates when locked thereto and the locked plates and ribbons being adapted for forced drive as a unit with a tight fit into a burner passage through the outward opening thereof on applying an inward driving force to said plates only.


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