This invention relates to gas burner devices, such as are particularly adapted for use in gas cooking ranges and the like; and this application is a continuation-in-part of our application Serial No. 77,660, filed December 22, 1960, now abandoned.

It is a primary object of the invention to provide an improved burner and method of production thereof; the burner per se featuring therein the use of sheet metal stamped and/or drawn into requisite shape, in lieu of conventionally employed cast metal fabrications or the like. Features concomitant to the use of sheet metal as aforesaid include the practicable provision in such burners of substantially thinner flame port wall portions, whereby a new and substantially improved flame port width-to-length (or wall thickness) ratio is achieved, with consequent improvement of the flame-holding characteristics of the burner as a whole. In this manner, features concomitant with the use of sheet metal in the fabrication of the burner as aforesaid, as compared to the use of cast metal fabrications, include improved resistance to corrosion (even when using the same metal or alloy); simplification and reduction of manufacturing techniques and costs; production of a somewhat resilient metal product adapted to spring-fit into the burner base in improved leak-proof manner and to be less vulnerable to breakage under impact; and production of a product which is adapted to receive and retain a better finish, when compared to similar products fabricated of cast metals.

Other objects and advantages of the invention will appear from the specification hereinafter and the accompanying drawings, wherein:

FIG. 1 is a fragmentary plan view of a strip of stock sheet metal showing progressive steps in blanking out and initially stamping parts out of the stock piece for fabrication into the form of the finished burner of the invention;

FIG. 2 is a sectional view taken as suggested by line 2—2 of FIG. 1;

FIG. 3 is a sectional view through a fully cut-away portion as from the left hand end portion of the work piece of FIGS. 1, 2;

FIGS. 4, 5, are sectional views, on enlarged scale, showing succeeding steps in further forming of the part of FIG. 3;

FIG. 6 is a view corresponding to FIGS. 4, 5, but illustrating the part in finished form and disposed in operative position upon a burner base; and

FIG. 7 is a view corresponding to FIG. 6 but showing a modified form of the burner port wall construction.

Generally stated, the present invention contemplates a burner constructed of relatively thin sheet metal port wall form, whereby an improved port sectional area to length ratio may be attained. This is accomplished by fabricating the port wall portion of the burner of sheet metal of substantially less thickness than is feasible to provide in a cast metal port wall construction; and to simplify the sheet metal wall portion to provide the requisite port openings. The gas flow and flame-holding characteristics are incident to use of such “short” gas ports are substantially different and significant, in that the gas travel through the port per se meets with substantially less port wall frictional resistance to flow. Hence, the “short port” form demonstrates a substantially improved gas flow characteristic, and consequent flame-holding capability, for the same size (sectional form and area) port, compared to longer port forms such as may only be practicably provided in connection with cast metal burner fabrications. Also, the burner of the present invention is advantageous because its heat transfer performance will be rapid throughout the structure, and the burner will come almost instantaneously “up to heat” when ignited. Hence, inefficient combustion and control frustrations invariably attendant to the starting of the prior art burners referred to are avoided.

The sheet metal blank from which the burner of the invention is made, is readily apertured to provide the requisite gas outlet jet ports by simple punching or piercing processes, which is an important manufacturing advantage. The relatively thin wall form of the burner in the region of the jet ports may require however a higher gas pressure loading of the ports, to prevent “flash back” tendencies. To tolerate such higher loading of the jet ports and to prevent resultant tendencies of the flames to “lift” from the ports, the ports may be specially shaped and provided in double rows in conjunction with a top lip portion, as will be explained in more detail hereinafter.

Referring now more particularly to FIGS. 1 and 2, the manner in which the burner caps are formed according to the present invention are formed will be understood that the burner caps are formed from a sheet-like blank indicated generally by the reference character 10 and which is provided at spaced intervals therealong with pilot guide holes 12. The second step consists of stamping out the areas 14 to provide, therebetween, the generally circular intermediate body portions 16 having the pilot holes 12 disposed centrally thereof. The third step resides in drawing each of the body portions 16 to provide a dished portion as is indicated generally by the reference character 18, see particularly FIG. 2, and a subsequent step draws this portion further as is indicated by the reference character 20. The next step forms the body in the manner indicated generally by the reference character 22 and the last step insofar as the sheet blank 10 is concerned is to stamp the partially formed blank out along the line indicated generally by the reference character 24 in FIG. 1, the removed blank being shown in FIG. 3 and being indicated therein generally by the reference character 26. The rough body is next shaped into the form shown in FIG. 4 and designated generally therein by the reference character 28 and the next step is to form the body into the rough shape indicated generally by the reference character 30 in FIG. 5. Next, the body is formed generally to the shape shown in FIG. 6 or to the shape shown in FIG. 7, as may be preferred, and, lastly, the rows of ports as are more particularly hereinafter set forth are provided.

In any event, the final shape of the body as is shown in FIG. 6 encompasses an inner wall 32 and an outer wall 34 which are both of cylindrical configuration and disposed in concentric relation with respect to each other, that is spaced apart, to provide, in conjunction with the top wall 35, a downwardly facing gas-receiving chamber 40 of the burner base assembly indicated by the reference character 42 in FIG. 6. The base 42 may be provided in any conventional form and the construction and details thereof form, per se, no part of the present invention.

The body is also provided with a locating collar port 44 of cylindrical form and which is adapted to fit relatively snugly within the center bore of the base member 42, substantially as is shown in FIG. 6. The lower edge of the inner wall portion 32 is provided with a radially inwardly extending shoulder 46 which leads integrally to the collar portion 44 and it is to be noted that the bottom surface 48 of the shoulder portion 46 is flat and is also coplanar with the bottom edge surface 50 at the lower edge of the outer wall 34. Preferably, the lower
edge of the outer wall is provided with a radially outwardly directed reinforcing rim 52 as provided for between the steps shown in FIGS. 4 and 5 which rim not only provides the reinforcing as aforesaid, but also provides a wider sealing surface for engagement against the body member 42, substantially as is shown in FIG. 6.

The top wall 36 is of greater maximum diameter, that is the outer diameter, than is the outer diameter of the outer wall 34 and the upper edge of the outer wall 34 is radially outwardly directed as shown in the portion 54 and is contiguous with the marginal edge of the upper edge of the top wall 36 to define thereby an overlapping ledge formation 56 with respect to the outer wall 34.

Of particular importance in connection with this invention is the provision of the double row of ports as are indicated by the reference characters 58 and 60 in FIG. 6 for the upper and lower rows thereof. These ports are equidistantly spaced circumferentially and, as shown in FIG. 6, the upper and lower ports are in vertical registry with each other. The wall thickness of the body is substantially uniform throughout and it is of importance that the lower row of ports 60 be of a diameter which is in the order of wall thickness utilized whereas the upper row of ports 58 are of a diameter or width substantially greater than the wall thickness. To cite a specific example, in the preferred embodiment of the invention, the wall thickness is .050 inch, the width of the lower ports 60 is .043 inch whereas the width of the upper ports 58 is .125 inch.

With the arrangement as described the burner cap will perform properly under various gas pressure conditions, ranging from low operation to high operation. It will be appreciated that the total area of the openings must be sufficiently great as to accommodate for "high" operation of the burner. This fact is not the only controlling factor inasmuch as the arrangement of ports must be substantially as is shown and described such that the large ports will not "lift off" during "high" operation nor should they "flash back" during "low" operation. It is precisely to control these situations that the double row of ports and the particular size relationships with respect to the wall thickness are utilized. Thus, at "high" operation, the tendency for the flames at the larger ports, upper ports, to "lift off" is prevented by the presence of the lower or smaller ports, size as set forth hereinabove. At the same time, during "low" operation, the smaller or lower ports will also prevent "flash back" through the larger or upper ports.

An additional feature insofar as "lift off" is concerned is the overlapping ledge 56, the presence of this ledge being effective to spread the flame peripherally of the burner cap and to somewhat lessen any tendency to "lift off." To achieve these results, the upper row of ports must be larger than the lower row of ports and, further, the width or diameter of the lower ports should be in the order of the wall thickness and preferably slightly less than such thickness whereas the diameter or width of the upper ports 60 must be substantially greater than the wall thickness. With these conditions prevailing, the maximum burner capacity can be accommodate without "lift off" and, further, the minimum gas burner capacity can be accommodated without "flash back." Furthermore, it is preferred that the vertical center-to-center spacing between the upper and lower ports be slightly greater than the diameter or width of the upper ports. Thus, in the embodiment shown in FIG. 6, the center-to-center spacing between the two rows of ports is approximately .098 inch.

A slightly modified form of construction is shown in FIG. 7, the burner cap being indicated generally therein by the reference character 62. The construction is similar to that as shown in FIG. 6 except that the outer wall 64 is upwardly and inwardly inclined substantially as is shown and the arrangement of ports is somewhat different. In the case of FIG. 7, the upper row of ports comprises alternate large ports 66 and intervening small ports 68 whereas the lower row of ports are all of the same size as indicated by the reference character 70. In a preferred embodiment of this form of the invention, the ports 66 are of .073 inch width, the ports 68 are of .055 inch width and the lower row of ports 70 are of .067 inch width; the wall thickness being .050 inch as is the case with FIG. 6.

In any event, the provision of the upper and lower rows of ports as are hereinbefore described with relative size as compared to the wall thickness, substantially as has been set forth and described. It is to be understood that certain changes and modifications as illustrated and described may be made without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. A gas burner cap comprising an integral body member of substantially uniform wall thickness throughout, said body member including inner and outer cylindrical wall portions disposed in spaced relation to each other and an annular top wall portion joining said inner and outer wall portions to define therewith a downwardly opening annular channel, the lower edge of said outer wall portion having a flat bottom surface for upward engagement against a gas burner base plate, the lower edge of said inner wall portion having a radially inwardly directed shoulder having a flat bottom surface coplanar with the bottom surface of said lower edge of the outer wall portion, a cylindrical collar depending from said shoulder and being of the same size as the width of said lower edge of said outer wall portion, the upper edge of said outer wall portion extending radially outwardly and contiguous with the lower edge of said outer wall portion, the annular collar depending from said upper edge and depending therefrom a ledge overlapping said outer wall portion, said outer wall portion being provided with an upper row of circumferentially spaced ports and a lower row of circumferentially spaced ports, the upper ports being of a width greater than said wall thickness and the lower ports being of a width less than said wall thickness.

2. A gas burner cap comprising an integral body member of substantially uniform wall thickness throughout, said body member including inner and outer cylindrical wall portions disposed in spaced relation to each other and an annular top wall portion joining said inner and outer wall portions to define therewith a downwardly opening annular channel, the lower edge of said outer wall portion having an outstanding annular rim having a flat bottom surface for sealing engagement against a gas burner base plate, the lower edge of said outer wall portion having a radially inwardly directed shoulder having a flat bottom surface coplanar with the bottom surface of said rim, a cylindrical collar depending from said shoulder and adapted to be received within the center opening of a gas burner base plate, the outer diameter of said top wall being greater than the diameter of said outer wall portion and the upper edge of said outer wall portion extending radially outwardly and contiguous with the margin of said top wall to define therewith a ledge overlapping said outer wall portion, said outer wall portion being provided with an upper row of circumferentially spaced ports and a lower row of circumferentially spaced ports, the upper ports being of a width greater than said wall thickness and the lower ports being of a width less than said wall thickness.

3. A gas burner cap comprising an integral body member having substantially uniform wall thickness throughout, said body members including inner and outer cylindrical walls joined by an annular top wall to define a downwardly facing gas-receiving chamber, said outer wall being provided with upper and lower rows of circumferentially spaced ports, the upper ports being of a width substantially greater than said wall thickness and said lower ports being of a width in the order of said wall thickness.

4. A gas burner formed of sheet metal pressed from an annular blank to include an upstanding central collar portion of cylindrical form for slip-fitting connection into
a toroidal-shaped burner base, said collar portion leading radially into a shoulder portion adapted to rest upon said base when the burner is in position, said shoulder leading into a vertically standing tubular inner wall portion in turn leading into a top flange portion extending radially outwardly from said inner wall portion, the peripheral edge portion of said top flange being bent downwardly and inwardly to form an overhanging ledge leading into a downwardly extending skirt spaced from said inner wall portion, said skirt having a bottom edge adapted to rest upon said burner base when the burner is in position, said skirt being formed with an upper row and a lower row of gas outlet jet ports therethrough, the ports of said upper row being of relatively large size and disposed at intervals around said burner, the ports of said lower row being of relatively small size and each being located beneath a corresponding one of the upper ports.

5. The burner according to claim 1 wherein the ports of said upper and lower rows are in vertical registry.

6. The burner according to claim 1 wherein the ports of said upper and lower rows are staggered.

7. The burner according to claim 3 wherein the ports of said upper and lower rows are in vertical registry.

8. The burner according to claim 3 wherein the ports of said upper and lower rows are staggered.

9. The burner according to claim 1 wherein the ports of said upper and lower rows are in vertical registry, said upper row of ports also including intermediate ports of a size similar to that of the ports of said lower row.

10. The burner according to claim 3 wherein the ports of said upper and lower rows are in vertical registry, said upper row of ports also including intermediate ports of a size similar to that of the ports of said lower row.

11. A gas burner formed of sheet metal pressed from an annular blank to include an upstanding central collar portion of cylindrical form for slip-fitting connection into a toroidal-shaped burner base, said collar portion leading radially into a shoulder portion adapted to rest upon said base when the burner is in position, said shoulder leading into a vertically standing cylindrically shaped inner wall portion in turn leading into a top flange portion extending radially and horizontally from said inner wall portion, the peripheral edge portion of said top flange being bent downwardly and inwardly to form an overhanging ledge leading into a downwardly extending skirt disposed parallel to said inner wall portion, said skirt being formed with two vertically spaced rows of gas outlet jet ports therethrough disposed at intervals around said burner.

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