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Reiner

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(54) **PORTABLE HIKING STOVE**

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(52) **U.S. Cl.** .... **126/9 B**; 126/9 R; 126/43; 126/44; 126/45; 126/40; 126/50; 126/48

(58) **Field of Search** .... 126/9 R, 9 B, 126/9 C, 25 R, 39 R, 43, 44, 45, 46, 47, 48, 49, 40, 50, 38; 431/320; D7/417, 416; D23/332; 248/174, 460; 362/161, 162, 163

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(57) **ABSTRACT**

A portable hiking or camping stove, having a base member with an opening dimensioned to receive a burner therein; and three side members dimensioned so as to be assembled together to support the base member therebetween.

18 Claims, 5 Drawing Sheets

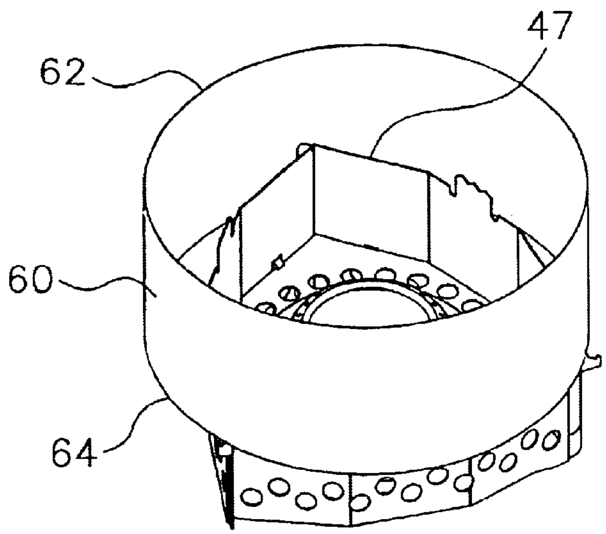


FIG. 1 – PRIOR ART

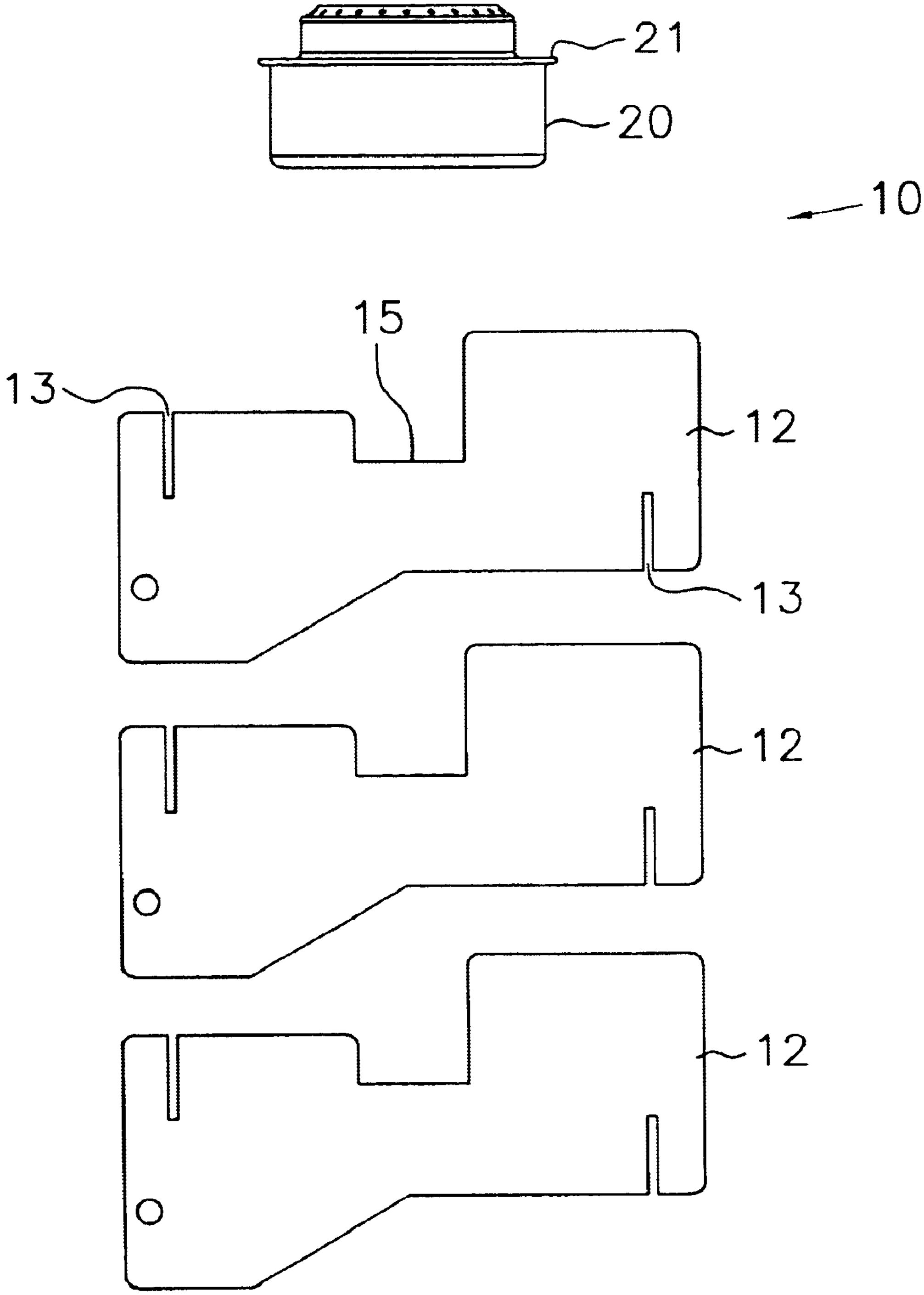


FIG.2 – PRIOR ART

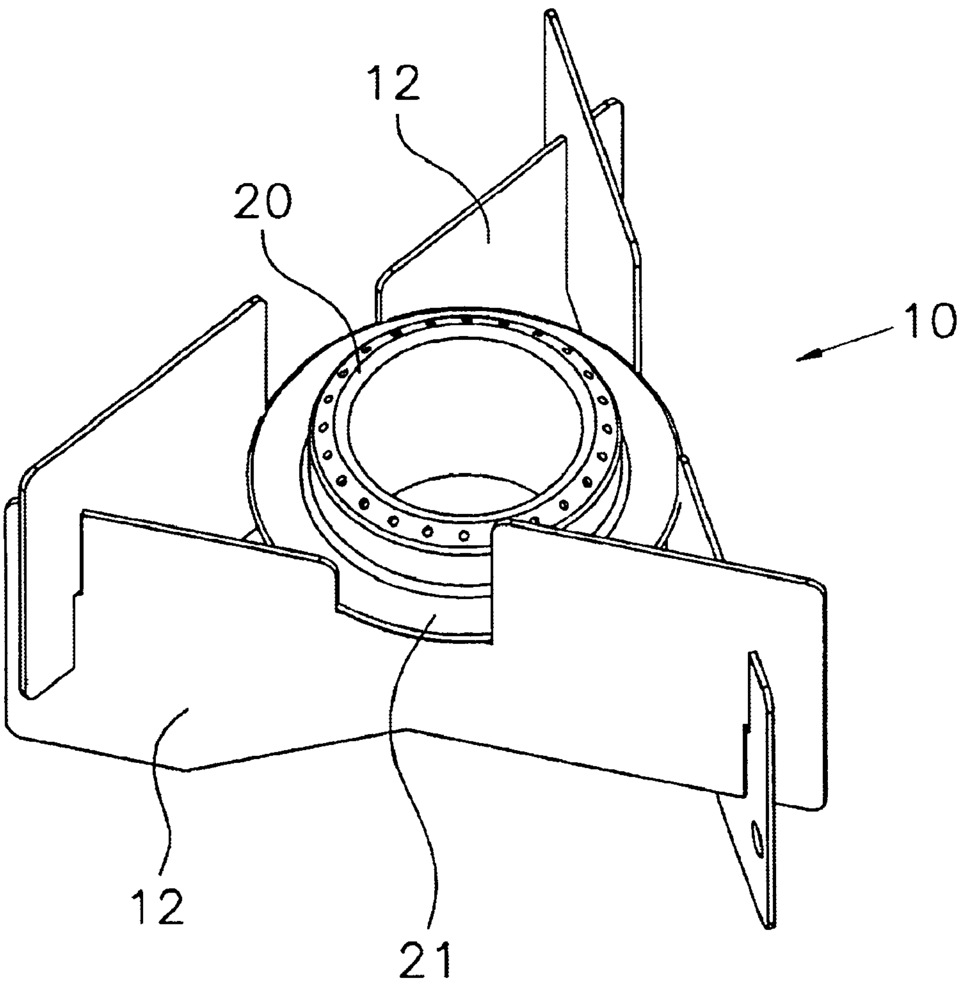


FIG.3

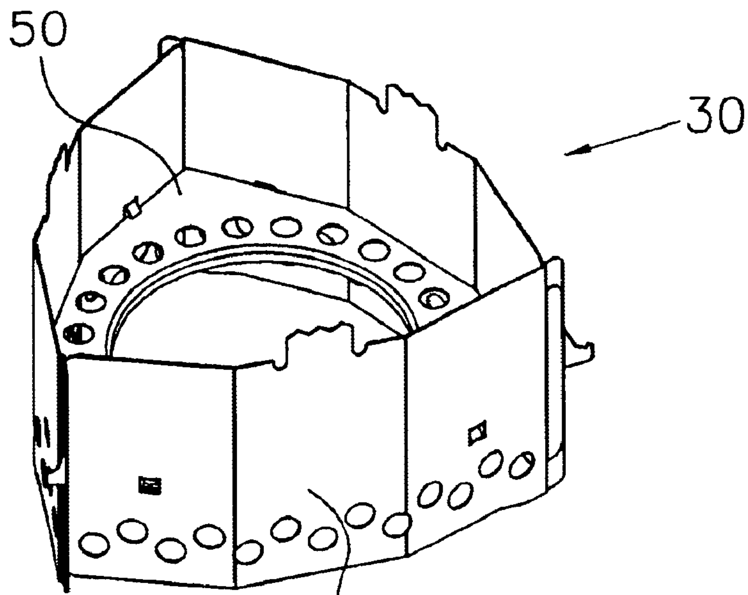


FIG.4

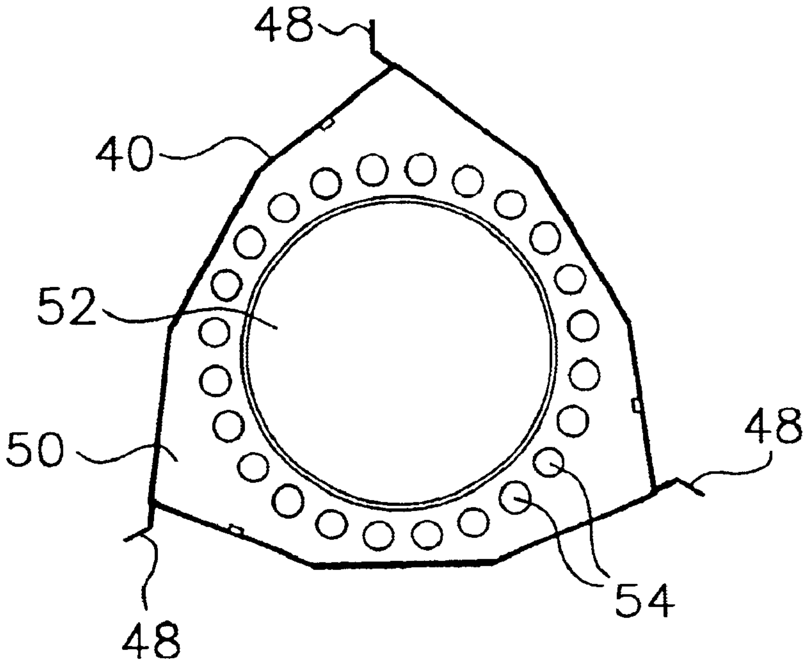


FIG. 6

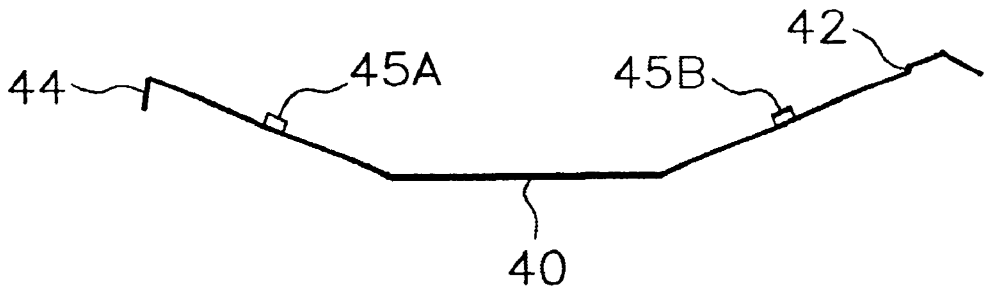


FIG. 5

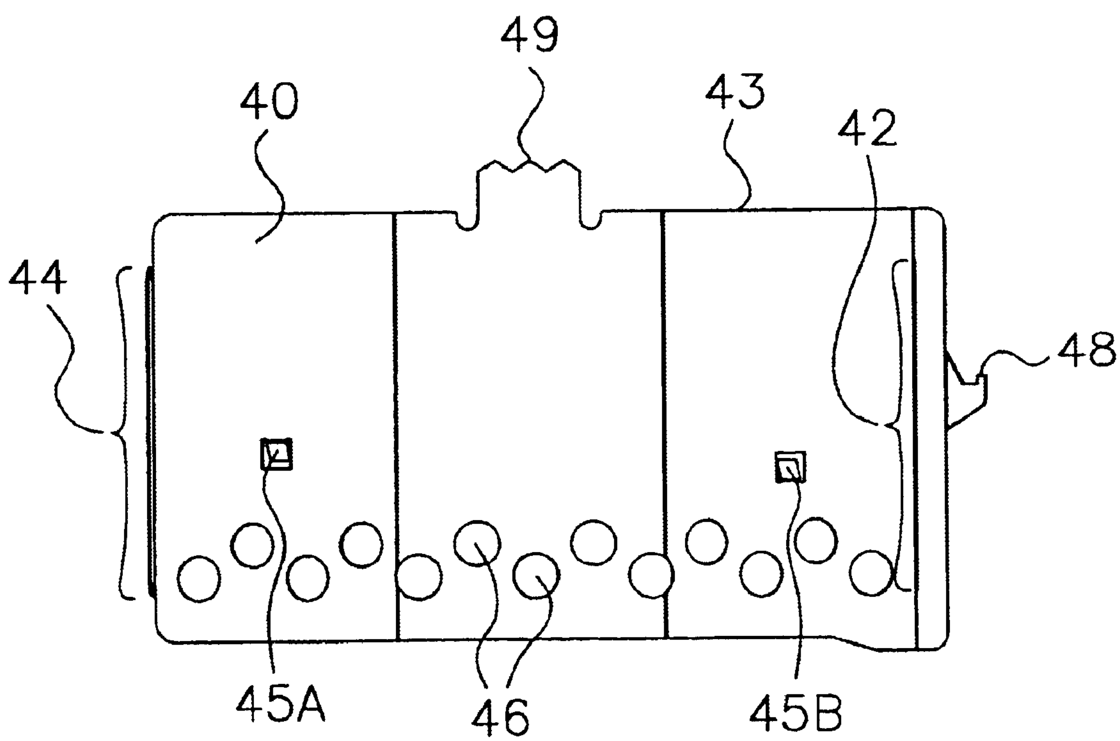


FIG.7

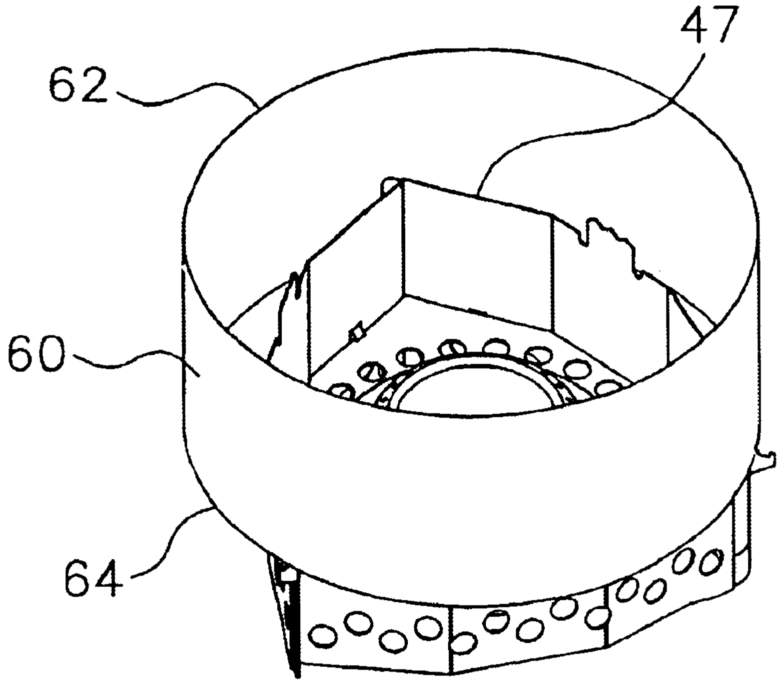
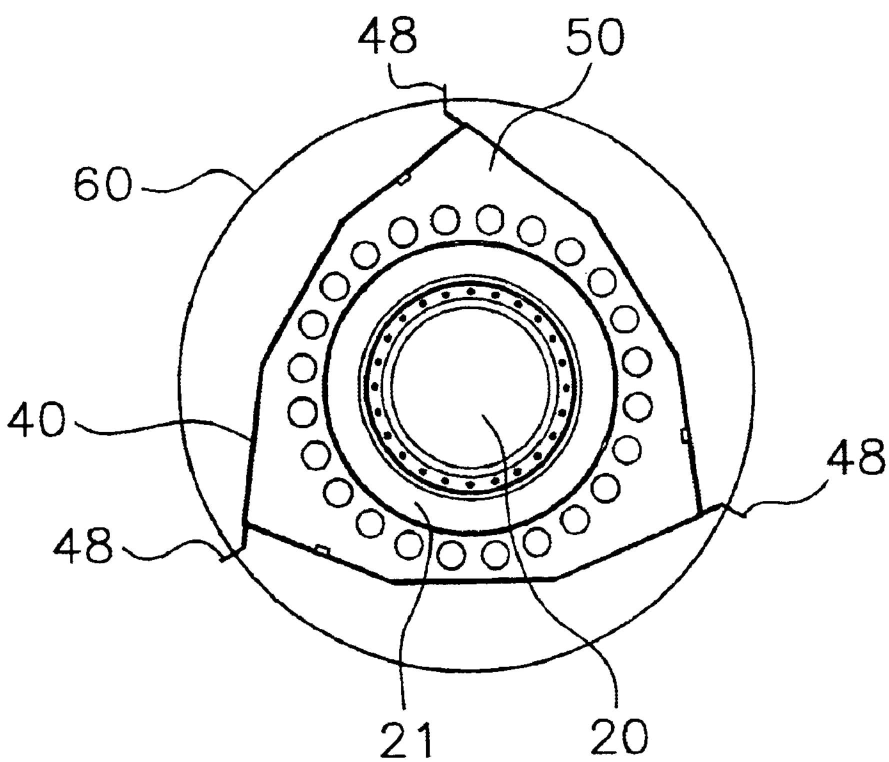


FIG.8



PORTABLE HIKING STOVE

TECHNICAL FIELD

The present invention is a portable stove, suitable for hiking or camping.

BACKGROUND OF THE INVENTION

Trangia, AB of Trangsviken, Sweden sells a variety of hiking and camping stoves, including a three part easily assembled stove, sold under the Trade name Westwind™. The present Applicant believes the Westwind™ stove is made either by Trangia AB or by Liberty Mountain of Salt Lake City, Utah. The Westwind™ stove consists of three identically shaped flat pieces of metal that are fitted together to form a triangular shaped stand for a standard sized alcohol burner.

As will be discussed below, the Trangia Westwind™ stove suffers from a number of disadvantages, related both to its efficiency and to its safety.

SUMMARY OF THE INVENTION

The present invention provides a portable hiking stove, comprising: a base member having an opening dimensioned to receive a burner therein; and three side members dimensioned so as to be assembled together to support the base member therebetween.

In optional preferred aspects, each of the three side members have a slot at one end and a tongue at another end, such that the tongue of one side member is received into the slot in another side member when the ends of the three side members are assembled together, thus forming a generally triangular shaped support for a base member.

In optional preferred aspects, each side member includes a protrusion at one end, with the protrusions projecting outwardly from the three corners where the side members are assembled together. The protrusions may be used to support an optional wind screen thereon. Preferably, the optional windscreen is a cylindrical shaped.

In optional preferred aspects, each of the three side members includes at least one tab for supporting the base member. Preferably, the tab comprises a C-shaped cut out section with the center of the tab being bent at an angle with respect to a generally planar surface of the side member. More preferably, a pair of C-shaped cut out sections are provided on each side member. In various aspects, such C-shaped cut out sections may be disposed upside down with respect to none another, or disposed perpendicular to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view of the components of a Trangia Westwind™ stove in unassembled form.

FIG. **2** is a perspective view of an assembled Trangia Westwind™ stove.

FIG. **3** is a perspective view of the present invention in assembled form.

FIG. **4** is a top plan view of the present invention in assembled form.

FIG. **5** is a front elevation view of a side member of the present invention.

FIG. **6** is a top plan view of a side member of the present invention.

FIG. **7** is a perspective view of the present invention in assembled form with an optional windscreen positioned thereon.

FIG. **8** is a top plan view corresponding to FIG. **7**.

DETAILED DESCRIPTION OF THE DRAWINGS

FIGS. **1** and **2** illustrate an existing Trangia Westwind™ stove. FIGS. **3** to **7** illustrate the present invention. As will be explained, the advantages of the present invention become apparent by comparing the present invention to the existing Trangia Westwind™ stove.

FIG. **1** shows the components of a Trangia Westwind™ stove. Stove **10** is assembled from three identically shaped planar side members **12**, each having slots **13** cut therein. The three side members **12** are then assembled together, with the slot **13** of one member **12** mated with the slot **13** of another member **12** to form the triangular shaped structure as shown in FIG. **2**. An alcohol burner **20** is then placed down into the top end of the assembled stove **10**, with an outwardly projecting lip **21** of burner **20** resting on supporting surfaces **15** of each of side members **12**.

The present invention will now be explained. Referring to FIGS. **3** to **6**, a stove **30** is provided. Stove **30** comprises three side members **40** which are dimensioned so as to be assembled together to support a base member **50** therebetween. Base member **50** has an opening **52** dimensioned to receive a standard alcohol burner **20** therein. It is to be understood that the present invention may preferably be dimensioned to use the same standard alcohol burner **20** as was used in the Trangia Westwind™ stove **10** discussed above. However, the present invention is not so limited. Instead, the present invention can be dimensioned to hold any other size of burner (being alcohol, or non-alcohol) therein, as is desired.

Preferably, base member **50** comprises air passages **54** around center opening **52**. Air passages **54** may comprises a series of holes positioned equally around center opening **52**, as shown. However, the present invention is not so limited since other air passage designs through base member **50** are also contemplated within the scope of the present invention.

As seen in FIG. **3**, side members **40** are connect to one another at their respective ends, without any additional fasteners, couplers or connectors being required. For example, instead of requiring fasteners, each of the three side members **40** may simply have a slot **42** at one end and a tongue **44** at another end, wherein the tongue **44** of one side member **40** is received into the slot **42** of another side member **40** when the three side members **40** are assembled together to form stove **30**.

Advantageously, side members **40** may be identical in shape and inter-replaceable as shown, thereby facilitating an easy set up of stove **30**. Side members **40** and base member **50** are preferably made of stainless steel or titanium, but the present invention is not so limited.

Side members **40** have air passages **46** passing therethrough. Preferably, air passages **46** are positioned below a level at which base member **50** is supported by side members **40**. Base member **50** may preferably be supported by one or more tabs **45** on side members **40**. Specifically, each of tabs **45** may preferably comprise a C-shaped cut out section, as illustrated. Most preferably, each side member **40** includes at least a pair of tabs **45**A and **45**B. As seen in FIG. **5**, tab **45**A and tab **45**B may be disposed upside down with respect to one another. In the illustrated embodiment, the end of tab **45**A will rest on the top of base member **50** while the end of tab **45**B will support the bottom of base member **50**. An advantage of this design is that base member **50** will remain fixed in position between the three side members **40** even if stove **30** is tilted or turned upside down. It is to be understood that alternate structures may also be used to support base **50** between side members **40**. Thus, the present invention is not limited simply to C-shaped cut-out tab structures. For example, a dimple may be used instead. However, when tabs **45** are used, it is to be understood that although tabs **45**A and **45**B may be positioned upside down with respect to one another, tabs **45**A and **45**B can instead be disposed perpendicular to one another. In such embodiments, the sides (as opposed to the ends) of each of tabs **45** can then be used to support the top and bottom of base member **50**.

As can be seen in FIG. **6**, each side member **40** may be made of planar sections that are angled to one another or otherwise curved such that the three side members form an outwardly bowed triangle (FIG. **4**) when assembled together.

In optional preferred aspects, each side member **40** further includes a protrusion **48** at one end, wherein protrusions **48** project outwardly from the three corner locations where side members **40** are assembled together (as shown in FIGS. **4** and **8**). Protrusions **48** act as tabs that may then be used to support an optional windscreen **60** thereon. Windscreen **60** is preferably cylindrical in shape. As can be seen in FIG. **7**, a top end **62** of windscreen **60** may preferably be positioned higher than a top end **47** of side members **40** when windscreen **60** in positioned on tabs **48**. Moreover, tabs **48** may preferably have slots therein into which a bottom end **64** of windscreen **60** is received. In such embodiment, tabs **48** simply act as hooks under the bottom **64** of windscreen **60**.

In optional preferred aspects, each side member **40** has an extension **49** projecting upwardly from its top end **47**. In this embodiment, extensions **49** are used to support a pot or pan thereon, with the gaps in height between top ends **47** and extensions **49** permitting heated air to flow evenly around the pot or pan and out of stove **30**. Optionally, extensions **49** may have a serrated top edge to more firmly grasp onto the bottom of the pot or pan placed thereon.

In alternate embodiments, the windscreen can be dimensioned such that it rests on top end **43** of side members **40**. In such embodiment, extensions **49** can project through slots in the windscreen, keeping the windscreen in place on top of the stove.

The present portable stove of FIGS. **3** to **8** has many advantages over the Trangia Westwind™ system shown in FIGS. **1** and **2**.

First, the present stove **30** provides an air pocket around burner **20**. (IE: the air pocket being the space between burner **20** and side members **40**). This air pocket tends to retain the heat of burner **20** and focus the heat on the bottom of the pot or pan resting on extensions **49** above buffer **20**. In addition, the metallic interiors of side member **40** may act as reflective surfaces which further assists in focusing heating on the bottom of the pot or pan placed above burner **20**. In contrast Trangia's Westwind™ stove **10** does not provide an air pocket around its burner **20**. Instead, its burner **20** rests directly on the three side members **12**. Thus, burner **20** is fully exposed to wind, which would tend to temper the heating effect of burner **20** at those locations where burner **20** contacts side members **12**.

Second, air flows evenly around all sides of burner **20** in the present stove **30**. In part, this even air flow is caused by each of side members **40** being angled or curved (see FIG. **6**) so that stove **30** is an outwardly bowed triangle shape (see FIG. **4**) with holes **46** in side member **40** and holes **54** in base member **50** also permitting even air flow around all sides of burner **20**. In contrast, Trangia's Westwind™ stove **10** is simply triangular in shape, with its burner **20** exposed to wind at the edges of stove **10**, as explained above.

Third, the present stove **30** is considerably safer than the Trangia's Westwind™ stove since the operator's fingers are not directly exposed to burner **20**. Specifically, burner **20** of the present stove **30** is not positioned at an edge of the stove **30**, but is instead positioned recessed away from the three side members **40**, and thus away from an operator's fingers.

Fourth, an air pocket is created under base member **50** with holes **46** providing an entrance into this air pocket, and holes **54** providing an exit from the top of this pocket. An advantage of such air pocket is that air is pre-heated under burner **20**. This feature increases the heating ability of the present stove **30**.

Fifth, the present stove **30** supports its burner **20** at a position lower than the Westwind™ burner, thereby giving the present stove **30** greater stability, and shielding the burner **20** from the wind.

Sixth, a further advantage of the present stove **30** is that extensions **49** on the top of the side members **40** provide a much improved balance of stability (for a pot or pan positioned thereon) and airflow, as opposed to the Westwind™ design. Specifically, with the Westwind™ design, a concentrated airflow occurs under the pot or pan at only three (corner) locations, whereas in the present stove **30**, air flows evenly under the pot or pan.

Seventh, a further advantage of the present invention is its "hole design". Specifically, holes **46** and **54** act as a baffle by allowing a sufficient amount of air to reach burner **20** while at the same time preventing warmed air from simply being pulled away from the burner **20** by the effects of wind.

Lastly, the present stove **30** is preferably made of stainless steel or titanium, whereas the Trangia Westwind™ is made of aluminum which becomes bendable over time. This limitation is not found with the present system's stainless steel or titanium construction.

Test Data

Test 1 (Still Air):

Location: Indoors, Santa Clara, Calif.

Air Temperature: 71° F.

Fuel Amount Per Test: 3.0 oz. (By Volume, Kleen Strip Brand Denatured Alcohol)

Water Amount Per Test: 16 oz. (Tap Water)

Pot: Standard Trangia 27 Duossal Pot, Covered with titanium pot lid

Burner: Standard Trangia open alcohol burner

Water Temperature Goal: None—visual check for boiling water.

Purpose: The goal of this test was to discover the effect of the distance between the burner and the pot on boil time and fuel consumption. Five different arrangements were tested. These test were performed with no external windscreen. These units have 42, 0.234 inch diameter holes on each side wall (3 side walls per stove unit) and 72, 0.219 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 5.29 square inches of open space through the bottom perimeter of the stove and 2.71 square inches of open space through the burner platform.

H=Distance between top of burner and bottom of pot

A_{base}=Area of open space around bottom perimeter of stove

A_{burner}=Area of open space through the burner platform

$A_{total}=A_{base}+A_{burner}$

Area Ratio=A_{base}/A_{burner}

Test Arrangements:

5052 Aluminum stove with no holes blocked:

H=1.34 inches (lowest height possible)

A_{base}=5.29 square inches evenly spaced

A_{burner}=2.71 square inches evenly spaced

A_{total}=8.00 square inches

Area Ratio: 1.95

2. 5052 Aluminum stove with no holes blocked:
H=1.27 inches (lowest height possible)
A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.95

3. 5052 Aluminum stove with no holes blocked:
H=1.17 inches (lowest height possible)
A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.95

4.5052 Aluminum stove with no holes blocked:
H=1.07 inches (lowest height possible)
A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.95

5052 Aluminum stove with no holes blocked:
H=0.97 inches (lowest height possible)
A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.9

Results

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Burner Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	5.29	2.71	8.00	1.95	1.34	6:10	0.75
2	5.29	2.71	8.00	1.95	1.27	6:20	0.60
3	5.29	2.71	8.00	1.95	1.17	6:30	0.55
4	5.29	2.71	8.00	1.95	1.07	6:40	0.50
5	5.29	2.71	8.00	1.95	.97	7:10	0.65

Conclusions:

As the distance between the burner and the pot is decreased, boil time increases, but fuel consumption decreases up to a certain point. Once that point is reached boil time increases, but fuel consumption begins to increase as well. With this arrangement of open air space, the distance between the burner and the pot should be established somewhere between 1.34 and 1.07 inches.

Test 2

Location: Inside Garage, San Jose, Calif.
Air Temperature: 60° F. (measured with accurate digital thermometer)
Fuel Amount Per Test: 1.5 oz. (By Volume, Kleen Strip Brand Denatured Alcohol)
Water Amount Per Test: 16 oz. (Tap Water)
Water Temperature: 64° F.
Pot: Standard Trangia 27 Duossal Pot, Uncovered
Burner: Standard Trangia open alcohol burner

Water Temperature Goal: 210° F. (measured with accurate digital thermometer)

Part 1—No Wind (Inside Garage):

Purpose: The goal of this test was to test a stove unit with one particular arrangement of open air space against the standard Westwind™ stove which is a commercially available collapsible stove that also uses the Trangia open alcohol burner. This test was performed with no external windscreen. This unit has 17, 0.313 inch diameter holes on each side wall (3 side walls per stove unit) 24, 0.272 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 3.92 square inches of open space through the bottom perimeter of the stove and 1.39 square inches of open space through the burner platform. Aluminum tape was used to block holes to create variations in open area.

H=Pot Rest Tab Height
A_{base}=Area of open space around bottom perimeter of stove
A_{burner}=Area of open space through the burner platform
$A_{total}=A_{base}+A_{burner}$
Area Ratio=A_{base}/A_{burner}

Test Arrangements:

304 Stainless Steel stove with all holes open:
A_{base}=3.92 square inches evenly spaced
A_{burner}=1.39 square inches evenly spaced
A_{total}=5.31 square inches
Area Ratio: 2.82

2. Standard Westwind™ stove:

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Time (Seconds)	Fuel Consumed (Ounces)
1	3.92	1.39	5.31	2.82	7:41	.88
2	—	—	—	—	16:00	1.0

Conclusions:

With this particular arrangement of open air space the stove performance was significantly better than that of the Westwind™ stove. The boil time was less than half that of the Westwind™ and fuel consumption was better as well.

Part 2 (Moderate Wind):

Purpose: Same as Part 1, above, except with a light wind instead of still air. The wind was generated by a small box type set on low speed placed 72 inches from the stoves. The wind created by the fan can be classified as a moderate wind.

Test Arrangements:

304 Stainless Steel stove with all holes open:
A_{base}=3.92 square inches evenly spaced

A_{burner}=1.39 square inches evenly spaced
A_{total}=5.31 square inches
Area Ratio: 2.82
2. Standard Westwind™ stove:
Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Time (Seconds)	Fuel Consumed (Ounces)	Maximum Temperature Reached (Degrees F.)
1	3.92	1.39	5.31	2.82	10:45	Ran Out	160
2	—	—	—	—	7:00	Ran Out	95

Conclusions:

In moderate wind conditions the stove with this particular arrangement of open air pace performed significantly better than that of the Westwind™ stove. While neither stove was able to bring the water to a boil, arrangement 1 burned for much longer and raised the water temperature much more than arrangement 2 before running out of fuel.

Test 3:

Location: Indoors, Santa Clara, Calif.
Air Temperature: 74° F. (measured with accurate digital thermometer)
Fuel Amount Per Test: 2.1 oz. (By Weight, Kleen Strip Brand Denatured Alcohol measured on digital postage scale)
Water Amount Per Test: 16 oz. (Tap Water)
Pot: Standard Trangia 27 Duossal Pot, Uncovered
Burner: Standard Trangia open alcohol burner
Water Temperature Goal: 190° F. (measured with accurate digital thermometer)
Weight of Aluminum Stove: 2.5 oz.
Weight of Stainless Steel Stove: 3.4 oz.

Part 1 (Still Air—No Wind):

Purpose: The goal of this test was to find an arrangement of air holes on the stove in still air (no wind) conditions that would give a satisfactory balance of fast boil time vs. low fuel consumption. A secondary goal was to compare aluminum vs. stainless steel as a material for stove construction. A final goal was to see if asymmetrical arrangements of perimeter holes (similar to that of the original Trangia 27) would produce good results in wind conditions. Six different arrangements were tested simultaneously. These test were performed with no external windscreen. These units have 42, 0.234 inch diameter holes on each side wall (3 side walls per stove unit) and 72, 0.29 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 5.29 square inches of open space through the bottom perimeter of the stove and 2.71 square inches of open space through the burner platform. Aluminum tape was used to block holes to create variations in open area.

A_{base}=Area of open space around bottom perimeter of stove
A_{burner}=Area of open space through the burner platform
$A_{total}=A_{base}+A_{burner}$
Area Ratio=A_{base}/A_{burner}

Test Arrangements:

5052 Aluminum stove with no holes blocked:

A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.95

2. 5052 Aluminum stove with one side wall completely covered:

A_{base}=3.53 square inches asymmetrically spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=6.24 square inches
Area Ratio: 1.30

3. 5052 Aluminum stove with two side walls completely covered:

A_{base}=1.76 square inches asymmetrically spaced
A_{burner}=2.71 square inches evenly spaced.
A_{total}=4.47 square inches
Area Ratio: 0.65

5052 Aluminum stove with bottom row of holes left open all around:

A_{base}=1.42 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=4.13 square inches
Area Ratio: 0.5

5.5052 Aluminum stove with no holes blocked on side wall and 24 holes blocked symmetrically on burner platform (2 rows left open all around burner):

A_{base}=5.29 square inches evenly spaced
A_{burner}=1.81 square inches evenly spaced
A_{total}=7.10 square inches
Area Ratio: 2.92

304 Stainless Steel stove with no holes blocked:

A_{base}=5.29 square inches evenly spaced
A_{burner}=2.71 square inches evenly spaced
A_{total}=8.00 square inches
Area Ratio: 1.95

7. 5052 Aluminum stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

A_{base}=1.42 square inches evenly spaced
A_{burner}=0.90 square inches evenly spaced
A_{total}=2.32 square inches
Area Ratio: 1.58

8. 5052 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

A_{base}=1.42 square inches evenly spaced
A_{burner}=0.90 square inches evenly spaced
A_{total}=2.32 square inches
Area Ratio: 1.58

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	No Wind Time (Seconds)	No Wind Fuel Consumed (Ounces)
1	5.29	2.71	8.00	1.95	6:15	0.7
2	3.53	2.71	6.24	1.30	6:20	0.7
3	1.76	2.71	4.47	0.65	6:25	0.5
4	1.42	2.71	4.13	0.52	6:30	0.5
5	5.29	1.81	7.10	2.92	?	0.7
6	5.29	2.71	8.00	1.95	6:45	0.5
7	1.42	0.90	2.32	1.58	6:30	0.5
8	1.42	0.90	2.32	1.58	6:30	0.5

Conclusions:

In general, the larger the total area (A_{total}) was, the faster the boil time and the higher the fuel consumption was. There did not appear to be a direct correlation between Area Ratio and boil time/fuel consumption. When no holes were blocked the Aluminum stove and the stainless steel stove performed differently with the stainless steel version being slower, but more fuel efficient. However, when they were restricted to a total area of 2.32 (Area Ratio of 1.6) they performed exactly the same.

Part 2 (Strong Wind):

Purpose: Same as Part 1, above, except this test was performed in a steady wind condition. Also, determine whether asymmetrical hole spacing is a benefit in windy conditions. The wind was generated by a circular fan set on medium speed placed 36 inches from the stoves. The wind created by the fan can be classified as a strong wind.

Test arrangements: Same as above. On stove units with asymmetrical hole spacing, units were arranged with solid walls facing into the wind.

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	No Wind Time (Seconds)	No Wind Fuel Consumed (Ounces)	Wind Time (Seconds)	Wind Fuel Consumed (Ounces)	Maximum Temperature Reached (Degrees F.)
1	5.29	2.71	8.00	1.95	6:15	0.7	9:00	Ran Out	180
2	3.53	2.71	6.24	1.30	6:20	0.7	8:45	Ran Out	185
3	1.76	2.71	4.47	0.65	6:25	0.5	9:00	2.1	—
4	1.42	2.71	4.13	0.52	6:30	0.5	9:35	1.8	—
5	5.29	1.81	7.10	2.92	?	0.7	8:05	Ran Out	172
6	5.29	2.71	8.00	1.95	6:45	0.5	7:15	Ran Out	162
7	1.42	0.90	2.32	1.58	6:30	0.5	8:15	1.2	—
8	1.42	0.90	2.32	1.58	6:30	0.5	8:30	1.2	—

Conclusions:

Asymmetrical hole spacing was not shown to have a significant benefit under windy conditions. In addition to that, asymmetrical hole spacing requires one of the stove side walls to be different from the others so it is a disadvantage in manufacturing and will therefore be abandoned from this point on. In windy conditions there did not appear to be a correlation between total area (A_{total}) and boil time. However, fuel consumption decreased as total area decreased. There was no direct correlation between Area Ratio and boil time/fuel consumption. Once again when comparing aluminum vs. stainless steel, there is a significant difference when no holes are blocked, but when total area is restricted to 2.32 (Area Ratio of 1.6) the difference is very slight. In this case the stainless steel stove displayed only a slightly longer boil time with fuel consumption being the same as the aluminum stove. Aluminum stoves softened (lost temper) significantly after repeated heating and cooling. Also, several failed catastrophically during earlier wind testing due to thermal stress. Since the stainless steel stoves are not susceptible to thermal stress at the burner temperatures and perform similarly in boil time/fuel consumption tests this material is preferable despite a slight weight increase.

Test 4

Location: Indoors, Santa Clara, Calif.

Air Temperature: 72° F. (measured with accurate digital thermometer)

Fuel Amount Per Test: 2.1 oz. (By Weight, Kleen Strip Brand Denatured Alcohol measured on digital postage scale)

Water Amount Per Test: 16 oz. (Tap Water)

Pot: Standard Trangia 27 Duossal Pot, Uncovered

Burner: Standard Trangia open alcohol burner

Water Temperature Goal: 210° F. (measured with accurate digital thermometer)

Part 1 (Still Air—No Wind):

Purpose: The goal of this test was to discover the relationship of the height of the pot-rest tabs and boil time/fuel consumption in still air (no wind) conditions. The pot-rest tabs are the 3 small tabs that protrude from the top edge of the stove unit (i.e. extensions **49**). Two different arrangements were tested. These test were performed with stove units with no external windscreen. These units have 42, 0.234 inch diameter holes on each side wall (3 side walls per stove unit) and 72, 0.219 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 5.29 square inches of open space through the bottom perimeter of the stove and 2.71 square inches of open space through the burner platform. Aluminum tape was used to block holes to create variations in open area.

H=Pot Rest Tab Height

A_{base}=Area of open space around bottom perimeter of stove

A_{burner}=Area of open space through the burner platform

$A_{total}=A_{base}+A_{burner}$

Area Ratio=A_{base}/A_{burner}

Test Arrangements:

304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.312 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

2. 304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.125 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	1.42	0.90	2.32	1.58	0.312	7:40	0.7
2	1.42	0.90	2.32	1.58	0.125	9:00	0.5

Conclusions:

Decreasing the height of the pot-rest tabs from 0.312 inches to 0.125 inches increased boil time and decreased fuel consumption.

Part 2 (Strong Wind):

Purpose: Same as Part 1, above, except this test was performed in a steady wind condition. The wind was generated by a circular fan set on low speed placed 24 inches from the stoves. The wind created by the fan can be classified as a strong wind.

Test Arrangements: Same as above.

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)	Max Temperature Reached (Degrees F.)
1	1.42	0.90	2.32	1.58	0.312	11:20	Ran Out	153
2	1.42	0.90	2.32	1.58	0.125	11:00	1.9	—

Conclusions:

In strong wind conditions decreasing the height of the pot-rest tabs from 0.312 inches to 0.125 inches resulted in a significant improvement in performance with respect to boil time and fuel consumption.

Part 3 (Moderate Wind):

Purpose: Same as Part 2, above, except wind intensity was decreased. The wind was generated by a circular fan set on medium speed placed 36 inches from the stoves. The wind created by the fan can be classified as a moderate wind.

Test Arrangements: Same as above.

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	1.42	0.90	2.32	1.58	0.312	14:45	1.9
2	1.42	0.90	2.32	1.58	0.125	12:10	1.4

Conclusions:

In moderate wind conditions decreasing the height of the pot-rest tabs from 0.312 inches to 0.125 inches resulted in a significant improvement in performance with respect to boil time and fuel consumption.

Part 4 (Moderate Wind):

Purpose: Same as Part 3, above, except pot-rest heights were changed from 0.312 and 0.125 to 0.125 and 0.063. Also, compare the performance of these units with that of the standard Trangia 27. The wind was generated by a circular fan set on medium speed placed 36 inches from the stoves. The wind created by the fan can be classified as a moderate wind.

Test Arrangements:

304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=. 125 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

2. 304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.063 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=3.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

3. Standard Trangia 27 with upper and low er windscreen:

A_{base}=4.20 square inches asymmetrically spaced

A_{burner}=4.83 square inches evenly spaced

A_{total}=9.03 square inches

Area Ratio: 0.87

Results:

Conclusions:

In moderate wind conditions decreasing the height of the pot-rest tabs from 0.125 inches to 0.063 inches resulted in a very significant decrease in performance with respect to boil time and fuel consumption. In this test the standard Trangia 27 showed much better performance than the two stove units tested.

Part 5 (Moderate Wind):

Purpose: Same as Part 4, above, except the unit with a pot-rest height of 0.063 inches had an additional row of air holes opened up around the bottom. The wind was generated by a circular fan set on medium speed placed 36 inches from the stoves. The wind created by the fan can be classified as a moderate wind.

Test Arrangements:

304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.125 inches

A_{base}=2.71 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=3.61 square inches

Area Ratio: 3.01

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)	Max Temperature Reached (Degrees F.)
1	1.42	0.90	2.32	1.58	.125	13:35	1.6	—
2	1.42	0.90	2.32	1.58	.063	18:00	Ran Out	205
3	4.20	4.83	9.03	0.87	—	8:48	0.5	—

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)	Max Temperature Reached (Degrees F.)
1	2.71	0.90	3.61	3.01	.063	17:00	Ran Out	206

Conclusions:

In moderate wind conditions providing more open air space around the base of the unit with a pot-rest height of 0.063 increased the performance slightly.

Part 6 (No Wind):

Purpose: Test two stove units each with a different pot-rest height against the standard Trangia 27 in no wind conditions.

Test Arrangements:

304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.125 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

2. 304 Stainless Steel stove with bottom row of holes left open all around and inner row of holes left open on burner platform:

H=0.312 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=2.32 square inches

Area Ratio: 1.58

3. Standard Trangia 27 with upper and lower windscreen:

A_{base}=4.20 square inches asymmetrically spaced

A_{burner}=4.83 square inches evenly spaced

A_{total}=9.03 square inches

Area Ratio: 0.87

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	1.42	0.90	2.32	1.58	.125	9:10	0.7
2	1.42	0.90	2.32	1.58	.312	6:38	0.5
3	4.20	4.83	9.03	0.87	—	8:32	0.3

Conclusions:

In no wind conditions increasing the height of the pot-rest tabs from 0.125 inches to 0.312 inches resulted in a very significant increase in performance with respect to boil time and fuel consumption. The standard Trangia 27 showed better performance than stove arrangement 1 with respect to both boil time and fuel consumption. However, when compared to arrangement 2 the Trangia 27 showed better performance only with respect to fuel consumption.

Test 5

Location: Outdoors, San Jose, Calif.

Air Temperature: 85° F. (measured with accurate digital thermometer)

Fuel Amount Per Test: 2.0 oz. (By Volume, Kleen Strip Brand Denatured Alcohol)

Water Amount Per Test: 16 oz. (Tap Water)

Pot: Standard Trangia 27 Duossal Pot, Uncovered

Burner: Standard Trangia open alcohol burner

Water Temperature Goal: 210° F. (measured with accurate digital thermometer)

Part 1 (Outdoors—Intermittent Breeze):

Purpose: The goal of this test was to discover the relationship of the height of the pot-rest tabs and boil time/fuel consumption in outdoor (intermittent breeze) conditions. The pot-rest tabs are the 3 small tabs that protude from the top edge of the stove unit. Three different arrangements were tested. These test were performed with stove units with no external windscreen. These units have 42, 0.234 inch diameter holes on each side wall (**3** side walls per stove unit) and 72, 0.219 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 5.29 square inches of open space through the bottom perimeter of the stove and 2.71 square inches of open space through the burner platform. Aluminum tape was used to block holes to create variations in open area.

H=Pot Rest Tab Height

A_{base}=Area of open space around bottom perimeter of stove

A_{burner}=Area of open space through the burner platform

A_{total}=A_{base}+A_{burner}

Area Ratio=A_{base}/A_{burner}

Test Arrangements:

304 Stainless Steel stove with bottom row of holes left open all around and fully open holes on burner platform:

H=0.063 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=2.71 square inches evenly spaced

A_{total}=4.13 square inches

Area Ratio: 0.52

2. 304 Stainless Steel stove with bottom row of holes left open all around and fully open holes on burner platform:

H=0.125 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=2.71 square inches evenly spaced

A_{total}=4.13 square inches

Area Ratio: 0.52

3. 304 Stainless Steel stove with bottom row of holes left open all around and fully open holes on burner platform:

H=0.312 inches

A_{base}=1.42 square inches evenly spaced

A_{burner}=2.71 square inches evenly spaced

A_{total}=4.13 square inches

Area Ratio: 0.52

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	1.42	2.71	4.13	0.52	.063	13:20	1.75
2	1.42	2.71	4.13	0.52	.125	10:42	1.35
3	1.42	2.71	4.13	0.52	.312	9:42	1.5

Conclusions:

Boil time decreased as pot-rest tab height increased. However, the middle pot-rest tab height showed the lowest fuel consumption. The unit with the lowest pot-rest tab height showed very poor performance. Pot-rest tab height should be established somewhere between 0.125 and 0.312 inches.

Part 2 (Outdoors—Intermittent Breeze):

Purpose: Same as Test 1 except a different arrangement of open air space was tested.

H=Pot Rest Tab Height

A_{base}=Area of open space around bottom perimeter of stove

A_{burner}=Area of open space through the burner platform

$A_{total}=A_{base}+A_{burner}$

Area Ratio=A_{base}/A_{burner}

Test Arrangements:

304 Stainless Steel stove with all bottom perimeter holes left open and one row of open holes on burner platform:

H=0.063 inches

A_{base}=5.29 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=6.19 square inches

Area Ratio: 5.88

2. 304 Stainless Steel stove with all bottom perimeter holes left open and one row of open holes on burner platform:

H=0.125 inches

A_{base}=5.29 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=6.19 square inches

Area Ratio: 5.88

3. 304 Stainless Steel stove with all bottom perimeter holes left open and one row of open holes on burner platform:

H=0.312 inches

A_{base}=5.29 square inches evenly spaced

A_{burner}=0.90 square inches evenly spaced

A_{total}=6.19 square inches

Area Ratio: 5.88

Results:

Test 6

Location: Outdoors, San Jose, Calif.

Air Temperature: 82° F. (measured with accurate digital thermometer)

Fuel Amount Per Test: 2.0 oz. (By Volume, Kleen Strip Brand Denatured Alcohol)

Water Amount Per Test: 16 oz. (Tap Water)

Pot: Standard Trangia 27 Duossal Pot, Uncovered

Burner: Standard Trangia open alcohol burner

Water Temperature Goal: 210° F. (measured with accurate digital thermometer)

Part 1 (Outdoors—Intermittent Breeze):

Purpose: The goal of this test was to test a stove unit with one particular arrangement of open air space against the standard Trangia 27. This test was performed with a stove unit with no external windscreen. This unit has 42, 0.234 inch diameter holes on each side wall (3 side walls per stove unit) and 72, 0.219 inch diameter holes on the burner platform (1 burner platform per stove unit). This gives a total of 5.29 square inches of open space through the bottom perimeter of the stove and 2.71 square inches of open space through the burner platform. Aluminum tape was used to block holes to create variations in open area.

H=Pot Rest Tab Height

A_{base}=Area of open space around bottom perimeter of stove

A_{burner}=Area of open space through the burner platform

$A_{total}=A_{base}+A_{burner}$

Area Ratio=A_{base}/A_{burner}

Test Arrangements:

304 Stainless Steel stove with bottom 3 rows of holes left open all around and inner 2 rows of holes left open on burner platform:

H=0.312 inches

A_{base}=4.26 square inches evenly spaced

A_{burner}=1.36 square inches evenly spaced

A_{total}=5.62 square inches

Area Ratio: 3.13

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	5.29	0.90	6.19	5.88	.063	13:09	1.5
2	5.29	0.90	6.19	5.88	.125	10:23	1.0
3	5.29	0.90	6.19	5.88	.312	9:23	1.0

Conclusions:

By changing the arrangement of open air space from mostly through the burner platform to mostly through the sidewalls, fuel consumption was improved significantly. Boil time was also improved though not by a large amount.

2. Standard Trangia 27 with upper and lower windscreen:

A_{base}=4.20 square inches asymmetrically spaced

A_{burner}=4.83 square inches evenly spaced

A_{total}=9.03 square inches

Area Ratio: 0.87

Results:

Arrangement	A_{base} (Square inches)	A_{burner} (Square inches)	A_{total} (Square inches)	Hole Ratio (A_{base}/A_{burner})	Pot-rest Tab Height (inches)	Time (Seconds)	Fuel Consumed (Ounces)
1	4.26	1.36	5.62	3.13	.312	8:15	1.0
2	4.20	4.83	9.03	0.87	—	8:15	.75

Conclusions:

With this particular arrangement of open air space the stove performance was very similar to that of the standard Trangia 27. Boil time was equal, but the Trangia 27 consumed less fuel showing it is slightly more efficient. An upper windscreen attached to the stove would probably increase it's efficiency close to that of the Trangia 27.

What is claimed is:

1. A portable stove, comprising:

a base member having an opening dimensioned to receive a burner therein; and

three side members dimensioned so as to be assembled together to support the base member therebetween; and,

a wind screen dimensioned to be supported by protrusions projecting outwardly from ends of each side member.

2. The stove of claim **1**, wherein the base member comprises air passages around the opening.

3. The stove of claim **1**, wherein the three side members connect to one another at their ends.

4. The stove of claim **3**, wherein the three side members connect to one another without any additional connectors.

5. The stove of claim **1**, wherein the three side members each have air passages below a level at which the base member is supported therebetween.

6. The stove of claim **1**, wherein the windscreen is cylindrical.

7. The stove of claim **1**, wherein an end of the windscreen is higher than an end of the side members when the windscreen is positioned on the protrusions.

8. The stove of claim **1**, wherein the three side members are identical in shape.

9. The stove of claim **1**, wherein the three side members are dimensioned to be assembled together in a generally triangular shape.

10. The stove of claim **1**, wherein each side member has an extension projecting from an end thereof.

11. The stove of claim **1**, wherein each of the three side members includes at least one tab positioned to support the base member.

12. The stove of claim **11**, wherein the at least one tab comprises a cut out section.

13. The stove of claim **12**, wherein the at least one tab comprises a pair of C-shaped cut out sections.

14. The stove of claim **13**, wherein the C-shaped cut out sections are disposed upside down with respect to one another.

15. The stove of claim **13**, wherein the C-shaped cut out sections are disposed perpendicular to one another.

16. The stove of claim **1**, wherein each of the three side members has a slot at one end and a tongue at another end, and wherein the tongue of each side member is received into the slot of another side member when the three side members are assembled together.

17. The stove of claim **1**, wherein the three side members form an outwardly bowed triangle when assembled together.

18. The stove of claim **1**, wherein each side member has an extension projecting from an end thereof, and wherein the top end of each extension is serrated.

* * * * *