Jan. 29, 1963 M. P. BENNETT ET AL 3,075,299

COOLING DEVICE

Filed June 24, 1959 2 Sheets-Sheet 1

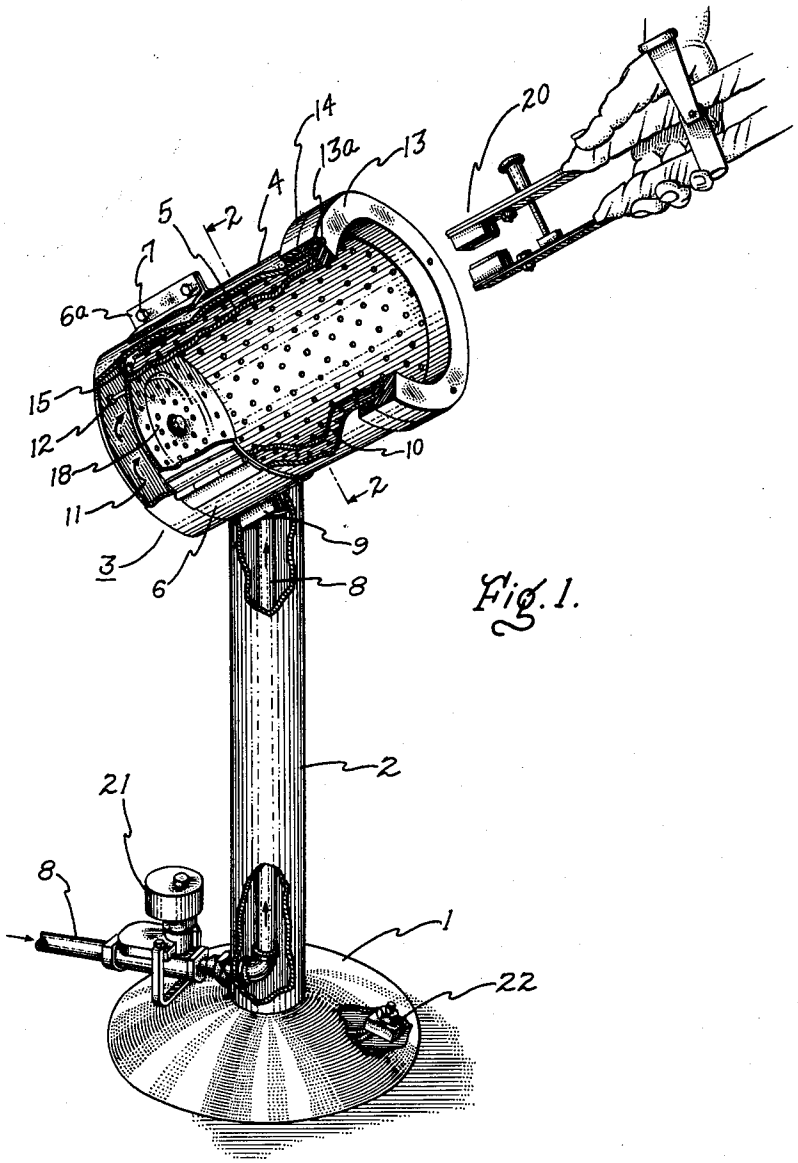



Fig. 1.

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Fig. 2.

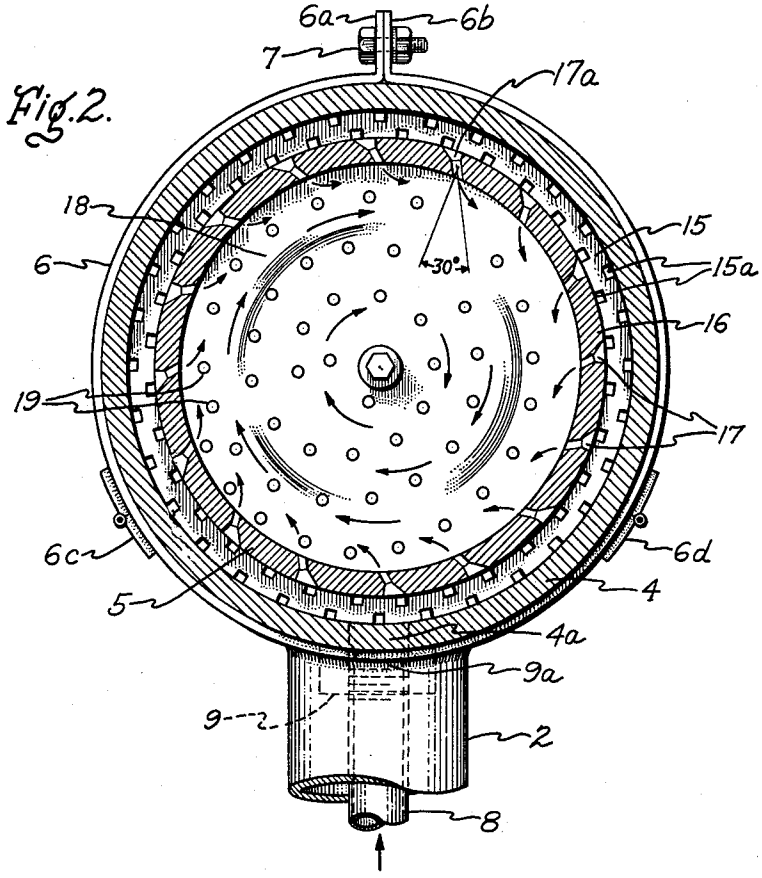



Fig. 3.

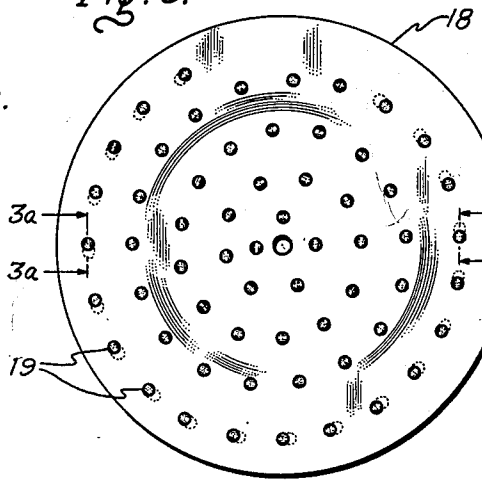



Fig. 3a.

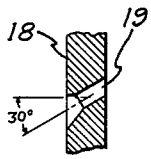
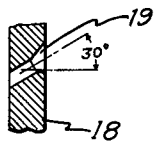



Fig. 3b.




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# COOLING DEVICE

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1 Claim. (Cl. 34—202)

The present invention relates to a cooling device, and more particularly to a device for holding and cooling heated objects such as tools, metal parts, and the like.

It is an object of the invention to provide a combined holder and cooling device adapted to rapidly and safely cool heated objects of various types.

It is another object of the invention to provide an air-cooling device of the above type which is relatively simple in construction, economical to produce, easy to operate, and which conveniently and efficiently reduces the temperature of heated articles placed therein.

Other objects and advantages will become apparent from the following description and appended claim.

In its broad aspects, the invention relates to a combined holder and cooling device comprising an outer container having an inner container therein and spaced therefrom to provide an annular chamber therebetween, the inner container being open at one end and having apertures distributed in its wall through which the annular chamber communicates with the interior of the inner container, the apertures being arranged with their axes substantially similarly oriented in a direction away from the axis of the inner container, and means for supplying a gaseous medium under pressure to the chamber between the two containers, whereby the gaseous medium is adapted to enter the inner container by the apertures of the wall thereof and to flow therethrough in a swirling, turbulent stream about a heated object placed therein for cooling the same and then to flow out of the open end of the inner container.

The invention will be better understood from the following description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a perspective view, partly broken away, showing the combined holder and cooling device of the invention;

FIGURE 2 is an enlarged cross-sectional view of the FIGURE 1 device taken along the line 2—2;

FIGURE 3 is a plan view of the bottom wall of the inner perforated container of the FIGURE 1 device as viewed from the open end thereof;

FIGURE 3*a* is a sectional view of a portion of the bottom wall shown in FIGURE 3 as taken along the line 3*a*—3*a*; and

FIGURE 3*b* is a sectional view of a portion of the bottom wall shown in FIGURE 3 as taken along the line 3*b*—3*b*.

Referring now to the drawings and particularly to FIGURE 1, there is shown an embodiment of the combined holder and cooling device comprising a base 1 having a vertical hollow support column 2 on the top of which is mounted the cooler unit 3 of the present invention. Cooler unit 3, which consists essentially of an outer cylindrical container 4 having co-axially nested therein an inner perforated cylindrical container 5, is mounted on top of column 2 by means of band 6 which is welded or otherwise secured to column 2 and is clamped around cooler unit 3. Band 6 is separable at flanged portions 6*a*, 6*b*, where the band parts may be clamped together by bolts 7 or the like, and is also provided with hinges 6*c*—6*d* (see FIGURE 2) to permit opening of the band for facilitating removal of cooler unit 3.

An air supply pipe 8 enters hollow column 2 at its



lower end and extends upwardly therein to communicate with the interior of outer container 4 for the purpose of supplying thereto air or other gas under pressure from a suitable source. A solenoid valve 21 or the like actuated by switch 22 is provided for initiating and shutting off the supply of air to the cooler unit 3 through pipe 8.

The connection between the upper end of supply pipe 8 and container 4 in the illustrated embodiment is made by means of a tapped block 9 projecting downwardly from and fixedly secured to the wall of container 4 and into which the upper end of supply pipe 8 extends in threaded engagement, block 9 passing through an aperture provided in band 6 for this purpose. The threaded hole 9*a* in block 9 extends entirely through the latter and is in register with hole 4*a* in container 4, and thus provides a passage for the air from pipe 8 to the interior of outer container 4.

It will be evident that various other arrangements different from that shown and described could be employed, if desired, for introducing gas under pressure into container 4 or for making the necessary connection between the latter and the gas supply line.

Nested cylindrical containers 4 and 5, which normally are made of any suitable metal, e.g., aluminum, are arranged with their walls spaced from each other, so as to provide an annular chamber 10 separating the container side walls and a bottom chamber 11 separating the container bottom walls and communicating with annular chamber 10. Spacer pins 12, attached to the bottom of inner container 5 and bearing on the bottom of outer container 4, serve to ensure the desired spacing between the container bottoms and give additional strength to the assembly, thereby preventing deformation from pressures within the device. Annular cap member 13 fits over and accommodates in corresponding grooves the rims of containers 4, 5 at their open ends and serves to support and maintain the latter in assembly in proper spaced relation, as well as to close off the open end of annular chamber 10. Cap member 13 is securely mounted on the assembled unit by joining it with screws 13*a* or the like to ring member 14, which in turn is fixed to the wall of container 4 by any suitable means (not shown). Additional spacing means provided near the bottom of the containers comprises annular member 15 which has perforations or notches 15*a* formed therein to allow communication between annular and bottom chambers 10, 11.

In those cases where it is desired to prevent the possibility of electrical conduction between the nested metallic containers, as, for example, when electrical tools or the like may be placed in the cooling unit, it is preferable for the spacer members 12, 13 and 15 to be composed entirely or in part of electrical insulating material. Of course, either or both of the containers themselves could be composed of electrically insulating material, in which case the spacer members need not be of insulating material. Inner container 4, if not made of metallic material, should be composed of a refractory or other heat resisting material.

Side wall 16 of inner container 5, in accordance with the invention, is provided with uniformly distributed perforations 17 in the form of channels or passages having their axes or directions substantially similarly oriented at an angle to the corresponding radial plane (see FIGURE 2), the corresponding radial plane being that in which the axis of the container and the respective side wall apertures lie. In a preferred embodiment, this angle is approximately 30° (as shown in connection with aperture 17*a*), but this angle may vary widely below or above this value. Preferably the entrance to each aperture is enlarged in the form of a funnel-shaped opening tapering into the aperture, as shown. By virtue of the orientation of the apertures 17 as shown, air passing there-

through into container 5 is made to flow in a clockwise direction around the axis of the container.

Bottom wall 18 of inner container 5 is also provided with apertures 19 uniformly distributed therein, the axes of the channels or passages formed by these apertures likewise being substantially similarly oriented in a clockwise direction, as indicated in FIGURE 3 by the dotted lines associated with some of the apertures, so as to impart a corresponding clockwise flow of air passing therethrough into container 5. The orientation of these apertures is further shown by the partial sectional view 3*a* taken along the line 3*a*—3*a* of FIGURE 3, and view 3*b* taken along the line 3*b*—3*b* of FIGURE 3, it being understood that the view in FIGURE 3 is a plan view of the inner surface of bottom wall 18.

As indicated in FIGURES 3*a*—3*b*, the axes of the bottom wall orifices are similarly oriented at an angle of about 30° to their corresponding radial plane, the corresponding radial plane being that in which the axis of the container and the respective bottom wall orifices lie.

Apertures 19 are also preferably formed with funnel-shaped openings as above described. Advantageously, bottom wall 18 is dished outwardly so as to present a convex surface toward chamber 11, it having been found that this formation provides optimum distribution over the entire bottom wall area of the air stream impinging thereon.

In a preferred construction the aggregate cross-sectional area of all the orifices 17, 19 is less than half the cross-sectional area of supply pipe 8, so that the passage of the air supplied to cooler unit 3 is restricted by the orifices, and substantial pressure is thereby built up to force the incoming air through the orifices and into container 5. In a particular construction found satisfactory, the aggregate orifice area was about 40 percent of the cross-sectional area of the air supply pipe.

In the operation of the described arrangement, a hot brazing tool 20 or other heated object to be cooled is placed in the inner container 5, and a supply of air under pressure to cooler unit 3 is provided by actuating valve 21 by means of switch 22. By virtue of the described cooler unit construction, the air flowing through pipe 8 enters annular and bottom chambers 10, 11, and is forced through the side wall and bottom wall orifices of container 5. As it passes into the interior of container 5 through the small angled perforations, the air is driven in a spiral direction in the container interior in a violent swirling or turbulent action and thereby comes into intimate contact with all parts of the heated tool 20. Thereafter, it flows freely out of the open end of container 5 to dissipate its absorbed heat.

The orifices, instead of being angled to produce a clockwise direction of air flow, could of course be differently oriented to direct the air flow counter-clockwise to obtain similar results. Preferably, however, the side wall apertures 17 and the bottom wall apertures 19 are correspondingly oriented, that is, angled to produce an air flow in the same general spiral direction within the inner container.

It has been found in tests conducted with the described device that the air current undergoes a moderate drop in temperature, of the order of 2–6° Fahrenheit, as it enters the interior of the inner container, a result which obviously enhances the cooling effect of the device. It appears that this temperature drop may be due to the expansion of the gas in the container interior subsequent to its being forced under pressure through the small apertures in the container wall.

The cooling medium need not be air but could be any other appropriate gaseous medium. The cooling rate may be further enhanced if desired by the incorporation of moisture in the gaseous stream introduced into the unit.



While the described device has been found particularly suitable for use in holding and cooling brazing and hot crimping tools between operations in which these tools are employed, it may also be used to advantage in cooling tool steels, molds, dies, and the like after heat treatment; for cooling or drying of fluidized-coated, painted, bright-dipped, plated, or other simlarly treated parts or assemblies; and for cooling crack-sensitive materials that have been machined or ground.

The provision of a convenient and effective cooling holder device for holding hot tools in accordance with the present invention offers numerous benefits. For example, it enables uniform, rapid cooling of the heated tool in the intervals between repetitive, timed operations so that a desirable uniformity in the temperature of the tool, and consequently for the work itself, can be readily achieved for each succeeding operation. Moreover, the life of the tool is substantially increased because unfavorable oxidation effects on the tool are minimized by the rapid reduction in temperature after its use. Not the least advantage is the safety benefit of having readily available after a tool-heating operation a holder for protectively covering the tool while it is being rapidly cooled.

While the present invention has been described with reference to particular embodiments thereof, it will be understood that numerous modifications may be made by those skilled in the art without actually departing from the scope of the invention. Therefore, the appended claim is intended to cover all such equivalent variations as come within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

A combined holder and cooling device comprising an outer container having bottom and side walls and an open end, an inner container with bottom and side walls and an open end arranged in nesting relation within said outer container and spaced therefrom so as to provide communicating annular and bottom chambers between said containers, said inner container having a longitudinal axis, the bottom and side walls of said inner container having means defining passages distributed therein through which said bottom and annular chambers communicate with the interior of said inner container, the interior surface of said inner container being free of projections, said passages being oriented in a direction extending generally centrally between said axis and the wall of the inner container so as to direct a gaseous medium adapted to pass therethrough in a swirling motion in the interior of said container about the longitudinal axis thereof, means closing said annular chamber at the end thereof opposite the bottom chamber, and conduit means for supplying a gaseous medium under pressure to said annular and bottom chambers, the aggregate cross-sectional area of said passages being less than that of said conduit means, whereby the gaseous medium is adapted to enter the inner container under pressure via the passages therein and to flow therethrough in a swirling stream about a heated object adapted to be placed therein for cooling the same and to thereafter flow out of the open end of said inner container.


References Cited in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,943,579 | Blomquist | Jan. 16, 1934 |
| 1,982,255 | Knoll | Nov. 27, 1934 |
| 2,066,847 | McShea | Jan. 5, 1937 |
| 2,290,277 | Duncan et al. | July 21, 1942 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 232,214 | Germany | Mar. 10, 1911 |