

[54] **METHOD AND APPARATUS FOR
CONTINUOUSLY REMOVING BURRS
FROM OBJECTS**[75] Inventors: **Bernard Moret, Bondy; Jean-Louis
Dufetele, Saint Etienne du Rouvray,**
both of France[73] Assignee: **L'Air Liquide, Societe Anonyme
Pour L'Etude Et L'Exploitation Des
Procedes Georges Claude, Paris,**
France[22] Filed: **Feb. 23, 1973**[21] Appl. No.: **335,317**[30] **Foreign Application Priority Data**

Feb. 29, 1972 France 72.06765

[52] U.S. Cl. **51/9, 51/14, 51/321,**
51/322[51] Int. Cl. **B24c 3/14, B24c 5/00**[58] Field of Search **51/8, 9, 14, 319-321,**
51/322

[56]

References Cited**UNITED STATES PATENTS**

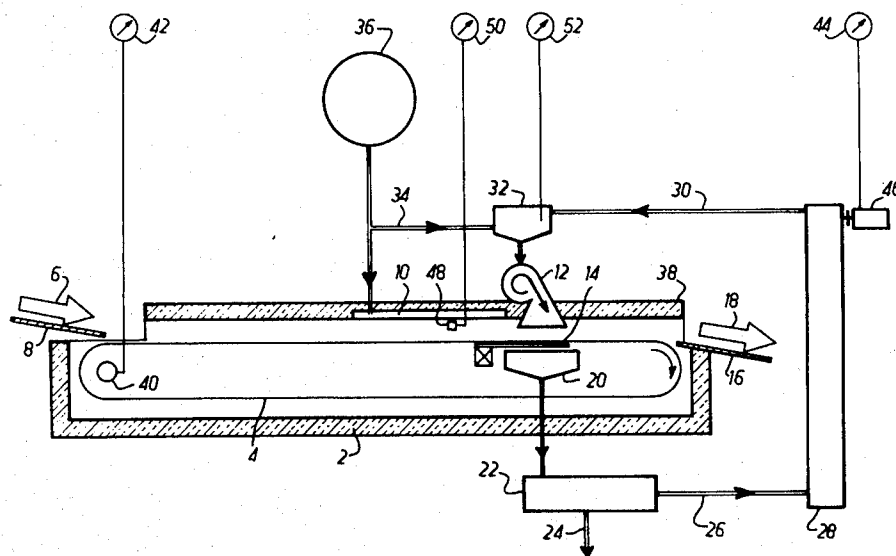
2,073,184	3/1937	Schwietzer	51/14
2,996,846	8/1961	Leliaert	51/322 X
3,110,983	11/1963	Moore	51/9

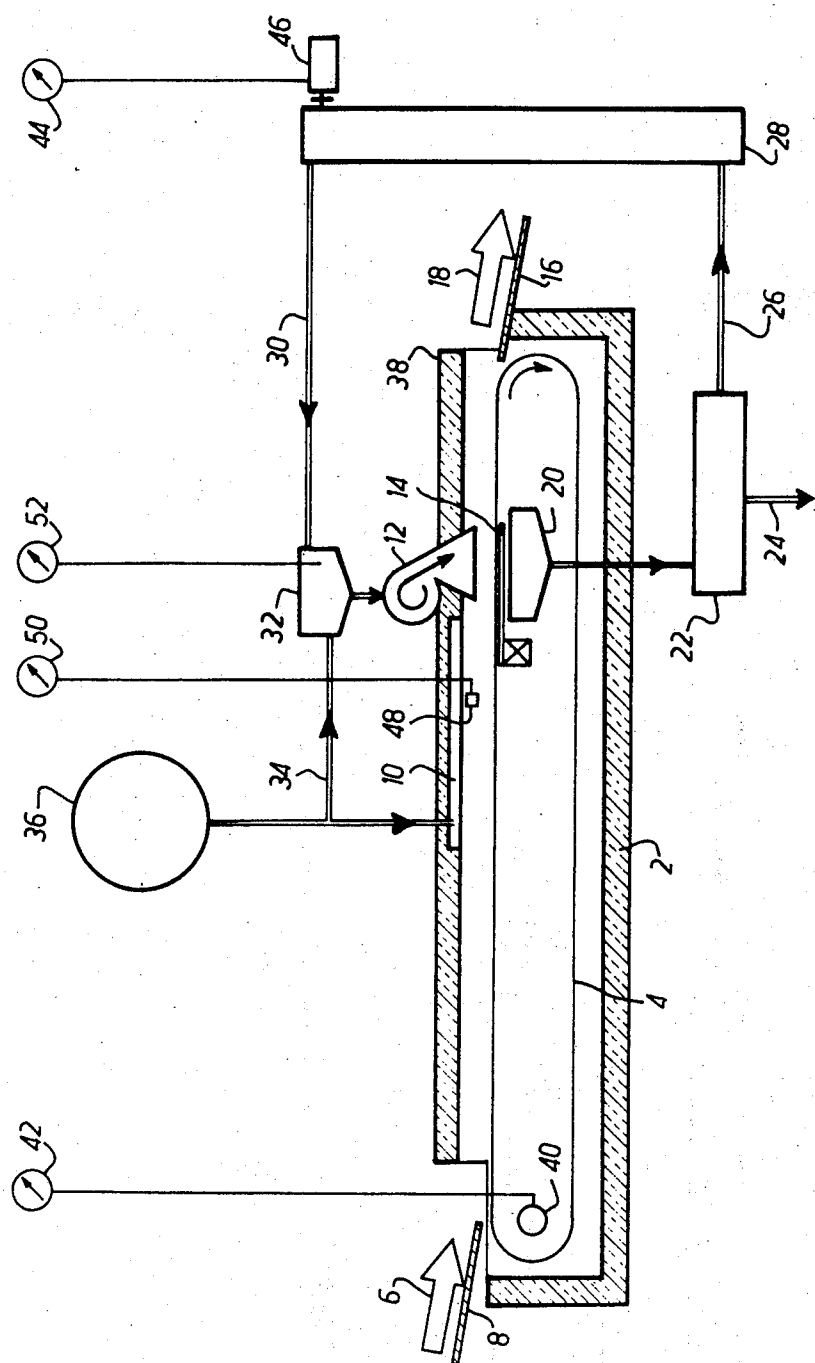
Primary Examiner—Donald G. Kelly*Attorney, Agent, or Firm*—Young & Thompson

[57]

ABSTRACT

A device for removing burrs from objects thermally insulated from the ambient air consists of subjecting the objects to a blast of granular shot, which is recycled after separating-out the removed burrs and is led back to a storage hopper, the shot being continuously insulated thermally from the ambient air and being cooled, simultaneously with the objects by a cold gas in the liquefied form or in course of vaporization. The apparatus comprises a shot-blasting chamber in the form of a heat-insulated tunnel containing a continuously moving conveyor belt on which the objects are disposed.

4 Claims, 1 Drawing Figure



METHOD AND APPARATUS FOR CONTINUOUSLY REMOVING BURRS FROM OBJECTS

The present invention relates to a method of trimming or removing burrs from objects which are thermally insulated from the ambient air, by subjecting them to a mechanical action after they have been cooled, at least on their surface, to below 0° C.

Removal of burrs is generally carried out, either by hand with the aid of chisels, various kinds of cutting tools, rotary brushes, or by machine but in a non-continuous manner, in rotating tumbling-drums or in vibrating machines. The objects may be cooled in order to render their burrs brittle at the ordinary temperature.

These operations are always non-continuous and therefore necessitate a certain amount of labour, and they are relatively slow. When the effect of cold is utilized to make the burrs brittle, it has been considered sufficient up to the present time to carry out a simple separation of the burrs from the granular shot which is re-cycled to a hopper supplying the projection apparatus of the shot, while ensuring that the shot remains thermally insulated from the ambient air. It has proved however that this method of working is not really appropriate to ensure a good effect of the shot on the objects, and it has been established that the shot was insufficiently cooled.

The method according to the invention utilizes a cryogenic gas in the liquid form, if so desired in course of vaporization, in order to cool the objects and the shot simultaneously.

Experience has shown the excellent co-operation between a re-liquefied gas and granular shot, in the sense that it is very easy to inject the liquefied gas into a shot-storage hopper and to cause the vapours of this liquefied gas to pass through the grains of the shot. Another object of the invention is to make the operations both automatic and continuous.

The invention is further characterized in that the objects are caused to circulate in a continuous movement in contact with a cooling agent, after which their surfaces are treated with a mechanical burr-removing agent in the form of a jet of granular shot.

The accompanying drawing shows diagrammatically and by way of non-limitative example, one form of embodiment of the invention.

Inside a thermally-insulated tunnel 2, the downstream extremity of which forms a shot-blasting chamber, an endless belt 4 circulates continuously. This belt may be of very varied nature, for example of metallic fabric or of plates articulated on each other.

The objects to be trimmed (not shown) represented symbolically before treatment by an arrow 6, are brought-in on to the upper side of the endless belt after passing over a sloping face 8. They are then cooled by a system 10 which can deliver a liquefied gas, for example a liquefied permanent gas, a halogenated hydrocarbon with a low boiling point, or initially liquefied carbon dioxide — a cold brine — a gas cooled by a frigorific or cryogenic set — the vapours of a cryogenic liquid such as liquid nitrogen, etc.

The objects then pass under jets of shot projected by a wheel enclosed in a casing 12 and which is itself cold.

At the same time, they are agitated by a vibrator 14 which shakes the belt and changes the orientation of the objects so that they are attacked by the shot at vari-

ous angles of incidence. The granular shot may be for example of metal, of plastic material, of a hard mineral, of glass, of a vegetable substance, etc.

At the end of the upper side of the belt, the objects are led to the exterior of the tunnel over a sloping surface 16; they are represented symbolically by an arrow 18. The sloping face may be replaced by a device arranged lower and on which the objects are delivered from the belt.

The shot having acted and the removed burrs having fallen into a recovery tank 20, are then led into a separator 22. This separator, a sieve or pneumatic separator for example, separates the shot from the fragments of burrs which are evacuated through a tube 24, the shot passing through a conduit 26 to a raising device 28. This latter may be of various kinds: chain and scoops, inclined belt, endless screw, etc.

From the device 28 the shot is led through a conduit 30 to a hopper 32 in which the shot is stored before being sent to the projection wheel in the casing 12. In the hopper, the shot is cooled, for example by extracting through a tube 34 a cooling fluid contained in a tank 36 which also supplies the system 10. This fluid is for example liquid nitrogen.

It will be noted that the whole of the shot recycling circuit, such as the separator 22, conduit 26, raising device 28, conduit 30, hopper 32, is thermally insulated from the ambient atmosphere, for example by placing this circuit in an insulated chamber (not shown in the drawing).

When the refrigerant fluid becomes vaporized in contact with the objects, it emits abundant cold vapours. These vapours escape through the extremities of the tunnel, those escaping towards the left serving to effect a pre-cooling of the objects. The quantity of vapour escaping through the right-hand extremity can be reduced by fixing at the right-hand extremity 38 of the tunnel cover, a hanging curtain made of strips of plastic material which remain flexible in the cold state.

It is useful to vary the conditions of operation of this device according to the nature and the dimensions of the objects to be trimmed, according to their weight treated per hour, etc. In addition to the nature of the cooling fluid and of its temperature, it is possible also to act on:

- the flow-rate of this fluid;
- the speed of the travelling belt, which can be controlled by a speed take-off 30 and an indicator 42;
- the delivery rate of shot, controlled for example by a tachometer 44 which measures the speed of a motor 46 actuating the raising device.

These parameters can be controlled by a perforated-card programming device, for which there have been provided as many cards or columns on a single card as there are types of treatment.

There may also be provided with advantage:

One or a number of temperatureappings in the tunnel, with temperature detector 48 and indicator 50.

A temperature tapping in the storage hopper, with indicator 52 and a detector; this tapping may directly control the inlet of cold fluid through the tube 34, if so required to give a temperature shown on the programming device.

The orientation of the objects may be modified between two shot-blasting periods, for example by oblique surfaces, by push-rods, or alternatively by bringing them on to a second suitably orientated belt.

The cooling system may be constituted by the whole of a first device, from which passes out a cold fluid, and of a second device, drawing-in this fluid through the objects to be cooled and bringing it back to the first, after cooling.

The device described may be modified without thereby departing from the scope of the present invention. For example, it may employ a number of cooling devices, several machines for projecting shots, and rotating brushes. The device actuating the burr-removal agent may be given movements which change its orientation, and the cooling of the shot may be dispensed with.

The method of the invention is especially applicable to the removal of burrs from a large quantity of objects of the same type. It can even be employed for parts having a length greater than that of the tunnel. The nature of these objects may be very diverse, provided that they can be rendered brittle on the surface by an inexpensive cooling, such as for example with liquid nitrogen.

These materials may for example be moulded polyurethane, cellular or not, a large number of thermoplastic materials, rubber, many metals and alloys. In this way, burrs may be removed from tooling keys, dash-boards for automobiles, moulded parts of zamak, etc.

What we claim is:

1. A device for removing burrs from objects by projection of granular shot on said objects, previously cooled, at least at their surface, of the kind comprising a shot-blasting chamber, thermally insulated, means for projecting said shot, a re-cycling circuit for the shot projected from said chamber to a hopper adapted to supply said projection means, means for injecting a cryogenic liquid into said chamber, said device further comprising means for injecting said cryogenic fluid into said shot-recycling circuit, and especially into said supply hopper.

2. A device for continuously removing burrs from objects, as claimed in claim 1, said device further comprising a chamber in the form of a heat-insulated tunnel said tunnel comprising a conveyor belt in continuous movement, on which said objects are disposed.

3. A device as claimed in claim 2, said device further comprising means for putting said objects into contact with a liquefied gas, and means for previously putting said objects into contact with the vapours of said liquefied gas.

4. A device as claimed in claim 2, and further comprising means for causing said conveyor belt to vibrate at a position in which the objects carried are subjected to the jet of granular shot.

* * * * *

30

35

40

45

50

55

60

65