United States Patent

[11] 3,604,270

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[54] **SAMPLING LANCE WITH METAL TUBE**
8 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **73/425.4 R**
[51] **Int. Cl.** **G01n 1/12**
[50] **Field of Search** ..... 73/421 MM; 164/4

[56] **References Cited**

UNITED STATES PATENTS

3,463,005	8/1969	Hance	73/421 MM
3,481,201	12/1969	Falk	73/354

FOREIGN PATENTS

1,172,283	11/1969	Great Britain	73/421 MM

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ABSTRACT: A sampling lance for a molten metal bath includes an elongated metal tube or sleeve having upper and lower sleeve portions which are partially separated by a notch and interconnected by a narrow web portion which bends under pressure or impact. The notch may be formed by two intersecting cuts in the sleeve. The notch is in registry with the side entry port of a refractory sample cartridge located within the metal sleeve. The metal sleeve protects the refractory cartridge while in the bath and also serves as a carrier for the cartridge. Upon removal of the lance from the metal bath, access to the cartridge is gained by striking the lower sleeve portion against the floor or a bench to shatter the cartridge and bend the web to open the notch. The refractory cartridge and sample can then be removed through the notch.

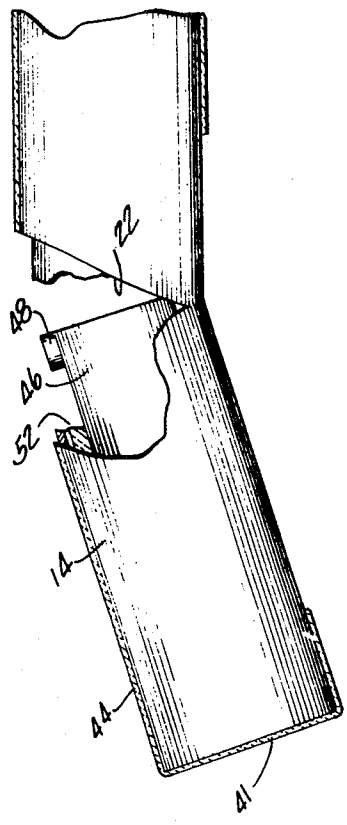


Fig. 2

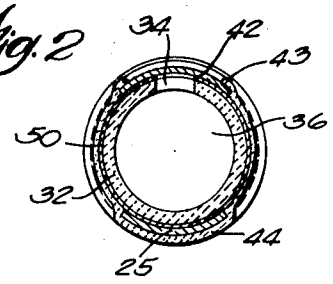


Fig. 1

Fig. 3

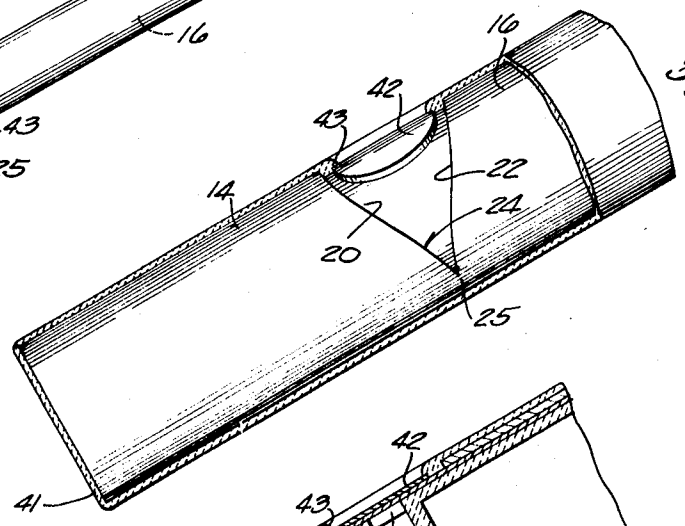
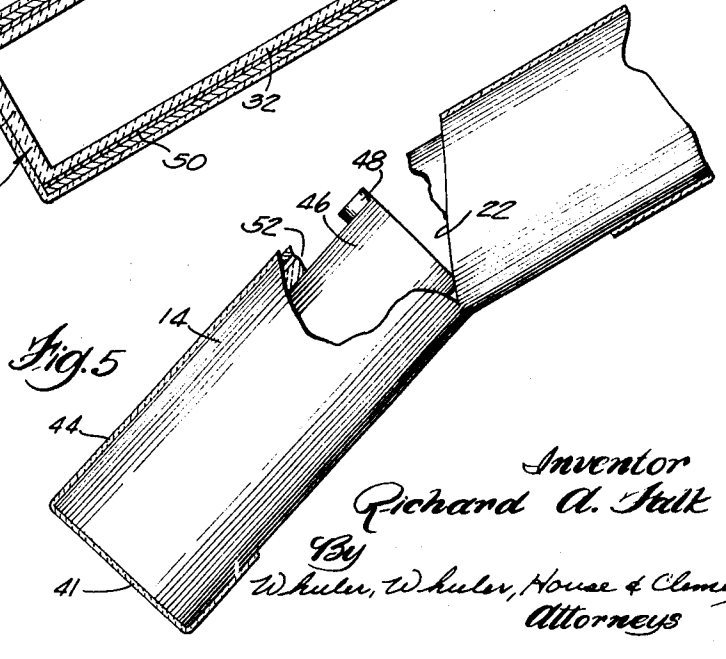


Fig. 4

Fig. 5



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SAMPLING LANCE WITH METAL TUBE

BACKGROUND OF INVENTION

The invention relates to the art of sampling molten metal and more particularly to sampling lances which utilize a metal tube for immersion of the sample container.

Removal of the refractory cartridge and metal sample from a metal sleeve is difficult, particularly when using a cartridge with a side entry port as disclosed in my U.S. Pat. No. 3,481,201, because a small transverse extension of the sample is located in the aperture in the sleeve.

SUMMARY OF INVENTION

The invention provides a sampling lance for obtaining a sample from a molten metal bath which includes a refractory coated metal sleeve having two sleeve portions interconnected by a web portion. A sample cartridge having a side entry port is located within the sleeve. The sleeve portions are partially separated by a tapered notch with the notch in registry with the side entry port of the sample cartridge to afford communication of the cartridge interior with the bath. A web or hinge portion at the vertex of the notch interconnects the two sleeve portions. The web portion is flexible or deformable under pressure or impact to permit opening of the notch for convenient access to the cartridge and sample. Since the sample often has a radial extension at the side entry port which cannot pass through the tube, the sample cartridge becomes accessible for axial withdrawal through the opened notch, whereas it is incapable of axial withdrawal without said opened notch.

The invention also provides a consumable paper sleeve located between the refractory cartridge and the metal tube. The paper sleeve is consumed when the sampling lance is immersed in the bath leaving a clearance between the sample cartridge and the metal tube to facilitate axial withdrawal of the sample cartridge through the bottom of the metal tube if a radial extension has not been formed on the sample.

Further objects and advantages of the present invention will become apparent from the following disclosure.

THE DRAWINGS

FIG. 1 is a perspective view of a sampling lance in accordance with the invention.

FIG. 2 is an enlarged sectional view along line 2—2 of FIG. 1.

FIG. 3 is an enlarged fragmentary partially broken away view of the sampling lance shown in FIG. 1.

FIG. 4 is a sectional view of a sampling lance shown in FIG. 3.

FIG. 5 is a view of the sampling lance shown in FIG. 4 containing a metal sample and showing the notch opened for cartridge removal.

DETAILED DESCRIPTION

FIG. 1 shows a sampling lance which is generally designated 10 and which includes a metal tube or sleeve 12 having first and second sleeve portions 14 and 16. The sleeve portions 14 and 16 are provided with adjacent edges 20 and 22 which define an aperture or notch 24 in the sleeve. The notch may be formed by two intersecting cuts, and removable of the wedge of metal located between the cuts. Means are provided for connecting the first and second sleeve portions 14 and 16 and adapted to normally retain said sleeves in alignment, said means being further adapted to yieldably afford displacement of the first sleeve portion relative to the axis of the sleeve. As shown in FIG. 3, the sleeve portions 14 and 16 are joined by a web or hinge portion 25 which remains after forming the notch 24.

The sleeve 12 carries a refractory sample cartridge 30 which may be in any of the various forms disclosed in my U.S. Pat. No. 3,481,201. The cartridge is inserted in the open end 31 of the sleeve portion 14 after the notch 24 is formed in the

sleeve 12. As disclosed, the refractory cartridge 30 includes a cylindrical wall 32 provided with a side entry port 34 which is in registry with the aperture or notch 24. The cartridge also includes an end wall or partition 36 and a bottom wall 38, which may be formed integrally with the cartridge, or may be a refractory cement coating applied after the cartridge 30 is inserted in the sleeve. The sleeve 12 has an inside diameter slightly larger than the outside diameter of the cartridge to provide a snug fit with the cartridge.

The notch 24 is desirably located at a distance from the end 41 of the sleeve approximately the same as the distance of the side entry port 34 from the bottom 38 the cartridge 30 to facilitate manual orientation of the cartridge 30 so that the side entry port is in registry with the notch 24.

To prevent entry of slag into the side entry port 34, the side entry port 34 is covered with one of more fusible or combustible discs 42, which may be made of a metal such as steel, or formed from paper. The material should be consumed at a lower temperature than the bath temperature. If an aluminum disc is used, it will also function as a kill to deoxidize the sample. The discs 42 are preferably secured in place by a bead of refractory cement 43.

After the cartridge is inserted in the sleeve, the sleeve 12 is preferably covered with a refractory coating 44 to increase the immersion life of the sleeve 12. The coating 44 may be applied by dipping the metal sleeve 12 into a slurry of refractory cement.

The invention also provides consumable spacing means located between the refractory cartridge 30 and the metal tube 12. In the disclosed construction, the consumable spacing means is in the form of a paper sleeve 50 impregnated with sodium silicate.

FIG. 5 shows a lance which has been removed from a bath and which contains a sample 46 having a radial extension 48. Access to the sample is obtained by striking the sleeve portion 14 against the floor, etc., to open the notch 24, and partially fracture the refractory cartridge 30 so the intact portion of the cartridge 34 and the sample 46 can be removed axially toward the opened notch for analysis (see FIG. 5). The paper sleeve 50 is consumed while the lance is in the molten metal bath, leaving a clearance 52 (FIG. 5) which facilitates axial withdrawal of the cartridge and sample 46 in the event a radial extension 48 has not formed on the sample 46.

What is claimed is:

1. A sampling lance comprising a sleeve, said sleeve including first and second sleeve portions, a cartridge within a said sleeve portion and having a side entry port for receiving a molten metal sample from a molten metal bath, said first and second sleeve portions having wall portions defining an aperture in registry with said entry port, means connecting said first and second sleeve portions and adapted to normally retain said sleeves in alignment, said means being further adapted to yield to afford displacement of said first sleeve portion relative to the axis of said sleeve to open said aperture.

2. A lance in accordance with claim 1 wherein said means for connecting said first and second sleeve portions comprises a web portion integral with said sleeves.

3. A sampling lance comprising a metal sleeve having first and second sleeve portions, said first and second sleeve portions being connected by a deformable web portion, said sleeve portions having edges which define a notch in said sleeve, and a cartridge for receiving a molten metal sample located within said sleeve, said cartridge having a side entry port in registry with said notch.

4. A sampling lance in accordance with claim 3 including refractory cement filling said notch and covering said cartridge around said side entry port.

5. A sampling lance in accordance with claim 3 including a metal disc adapted to deoxidize a sample, said disc covering said side entry port and located in said notch.

6. In a sampling lance provided with a refractory sample-receiving cartridge having a side opening to receive a sample, the subcombination comprising a metal sleeve having first and

second sleeve portions connected at one side by a deformable web and separated at the opposite side to expose said cartridge.

7. A sampling lance comprising a sleeve, said sleeve including first and second sleeve portions, means connecting said first and second sleeve portions and adapted to normally retain said sleeves in alignment, said means being further adapted to yield to afford displacement of said first sleeve portion relative to the axis of said sleeve, said first and second sleeve portions having wall portions defining an aperture adjacent said connecting means, and a cartridge within a said sleeve portion and having a side entry port for receiving a molten metal sample from a molten metal bath, said side entry port being in registry with said aperture of said sleeve, and including consumable spacing means located between said cartridge and said sleeve whereby upon immersion of said lance in a molten bath, said spacing means is consumed to provide a clearance between said cartridge and said sleeve to afford axial withdrawal of said cartridge from said sleeve.

8. A sampling lance comprising a metal sleeve, an aperture in said sleeve, a refractory cartridge in said sleeve, said cartridge having a side entry port for receiving a molten metal sample from a molten metal bath, said side entry port being in registry with said aperture and consumable spacing means between said cartridge and said sleeve to provide a clearance between said cartridge and said sleeve when said spacing means is consumed upon immersion of said lance in a molten metal bath to thereby afford axial withdrawal of said cartridge from said sleeve.