

Inspection Device and Method for Eggcrate Grids of Nuclear Steam Generator

555

Eggcrate 16,000
 Eggcrate 가 (Tubing)
 , Tubing Tube
 ,
 Tubing
 Eggcrate
 ,
 ,
 Eggcrate (Grid) 가 Go/No Go
 Gauge Eggcrate Grid
 Marking .

Abstract

Eggcrate is a supporting device which holds about 16000 tubes in steam generator of nuclear power plant. As the quality of Eggcrate makes great influence on that of steam generator, it is necessary to inspect and supervise the manufacturing process of Eggcrate. Though the number of grids of Eggcrate is very large, dimension check should be carried out immaculately.

In this paper, we present an automated dimension check method for Eggcrate grids and the mechanism of a practical automatic inspection machine. This system utilizes multiple Go/No Go Gauges which include spray marking mechanism.

1.

가 (PWR) (,)
 1 () 2 , 1
 2 가 가
 Eggcrate 가 . Eggcrate

가

Tubing

, Tubing

(Reaming)

Eggcrate Full Eggcrate 1 16,000 , 4m
 (2set) Full Eggcrate 10 , Half Eggcrate 12 ,
 Partial Eggcrate 12 .(1) Eggcrate

가

Eggcrate

가

Go/No Go Gauge

Tool Head

Guiding ,

Eggcrate

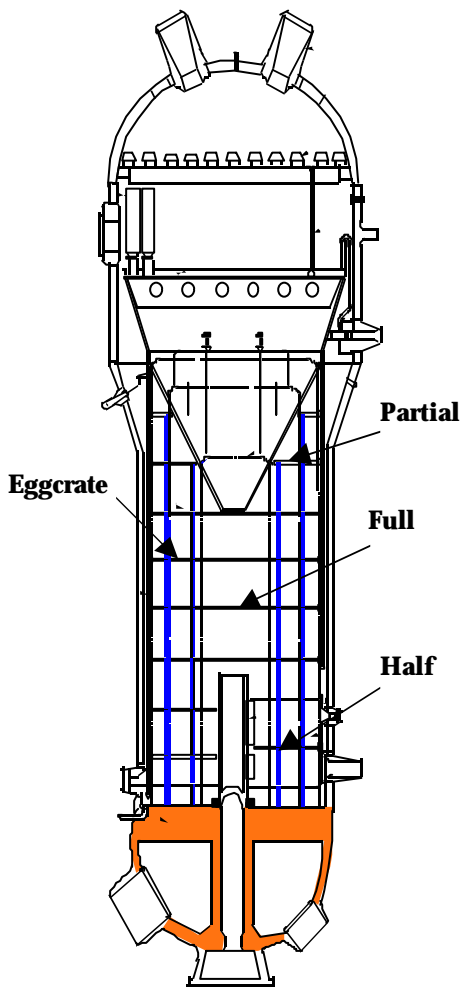
Spray Marking

Gauge

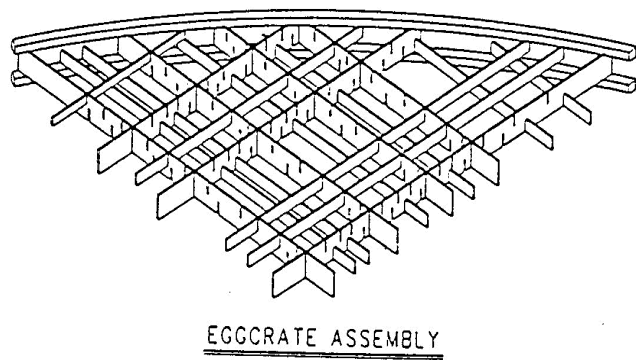
가

Vision System,

Database



1



Eggcrate

2.

2.1 Head

Eggcrate

Head(2.4)

5

Eggcrate

8

가

Head

Head

Head

가

Head 가 90°

Head 가

Eggcrate Slotted Bar

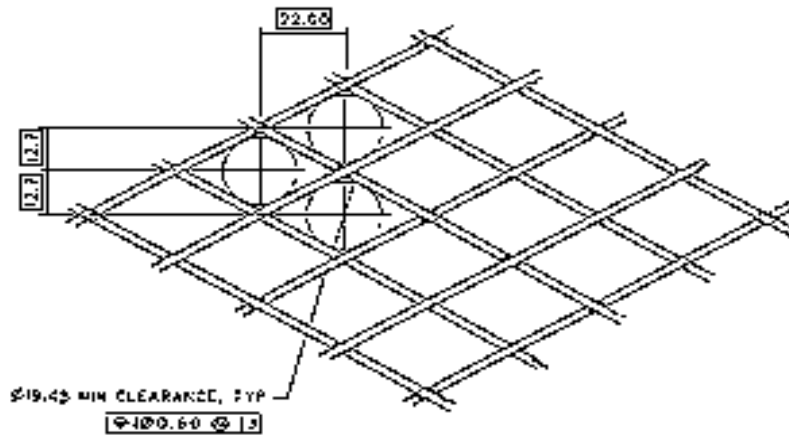
2.1 Eggcrate

Slotted Bar 가

19.43mm,

19.71mm

19.43mm(0.765inch)



2.1 Eggcrate

가 ,
16,000

Gauge Guiding
가

Eggcrate

Gauge

φ19.43mm

. Full Type

Gauge

2.2

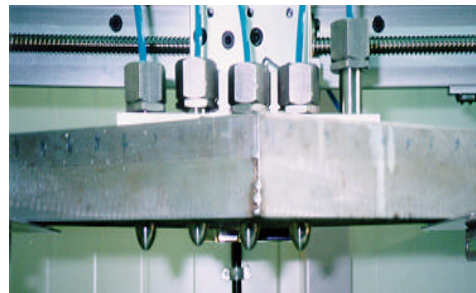
Gauge

2.3

Gauge



2.2 Go/No Go Gauge



2.3 Gauge

2.2 Guiding

Head

(Grid)

☺

2.4

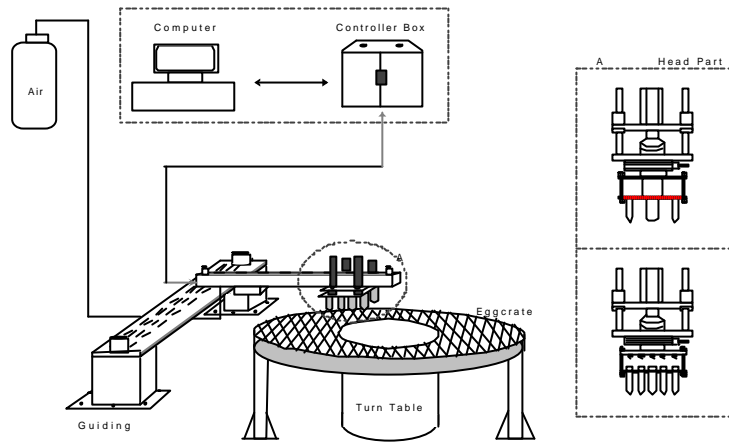
Guiding

Guiding

1) 가 가 , 가

2) 가

3) Full, Half, Partial Eggcrate



2.4 Guiding System

2.3 Marking

16,000

Gauge

가

Expanding

Marking

Gauge

Gauge

Eggcrate

가

가 19.43mm

Gauge

Gauge 가

가

(Bernoulli)

가 Gauge

(1)

가 가

가

가

$$P + 1/2 \rho V^2 = \text{const.} \quad (1)$$

P : , ρ : , V :

2kgf/cm²

6kgf/cm²

0.1 ~ 0.9sec

On/Off

4kgf/cm² 0.5 ~ 0.9sec 가 가

2.4.

Eggcrate Guiding Head
90° Head Control
Marking Spray , Setup Vision
Database

3.

Eggcrate Jig 가
Setup Station Eggcrate 가 가 Vision
Guiding , Eggcrate
가 Head
가 가
가 가
Guiding 가 Eggcrate 가 Turn Table
90° Head 90° Eggcrate
90° 가

4.

Eggcrate Slotted Bar , Bar 가
가 Slotted Bar

Tube

Gauge

5.

[1] Theodore G. Loos, et al., "Continuous Plug Gauger for Container Openings" US Patent No. 4,044,892., 1977. 8.
[2] Leif G. Larsen. "Thread Measuring Tool" US Patent No. 4,519,144., 1985. 5.
[3] Masashi Yoshida, et al., "Cell-Size Inspection device for Nuclear Fuel Assembly" US Patent No. 5,265,130., 1993.11.
[4] Thomas R. Eckmann, Killen, Ala, et al., "Control Rod Driver Length Measurement Tool" US Patent No. 5,446,972., 1995. 9.