

Introduction of AUTO-INSPECT CORPORATION

E2308v1

**Succeeded in developing the New Technology ,
- Automating Visual Inspection of Internal Surface for various Pipes -**

World's First !

Company Profile



Kyoto Office



Research Laboratories

Company Name

AUTO-INSPECT CORPORATION

Representative
Director

Ph.D. Shutaro Nambu

Address

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【R&D Base】

106 Japan Advanced Institute of Science and Technology
2-13 Asahidai, Nomi, Ishikawa 923-1292, Japan

Start of Business

November 27, 2018

Capital

60.75million YJPN

Market Background

Visual Inspection is carried out for most 3D-Structural parts. **Automation** of the visual inspection is becoming the most important task for productivity in the manufacturing industry.

Because;

- 1) It takes many man-hours,
- 2) It takes time to have the inspection skills as inspectors,
- 3) Criterion is ambiguous for human sensory testing,
- 4) Data accumulation for quality improvement is impossible.

For example, **Visual Inspection** has been carried out to inspect the inner surface for almost all the shipping pipes, because it is difficult to acquire sharp inside images of the pipe over a long range with a normal camera because of the short in-focus area.

Unique “General-purpose High-speed Variable Focus Method”

Solves this problem for almost all the pipes with excellent cost performance ratio.

Proprietary Technology

1、About “General-purpose High-speed Variable Focus Method”

(World First)

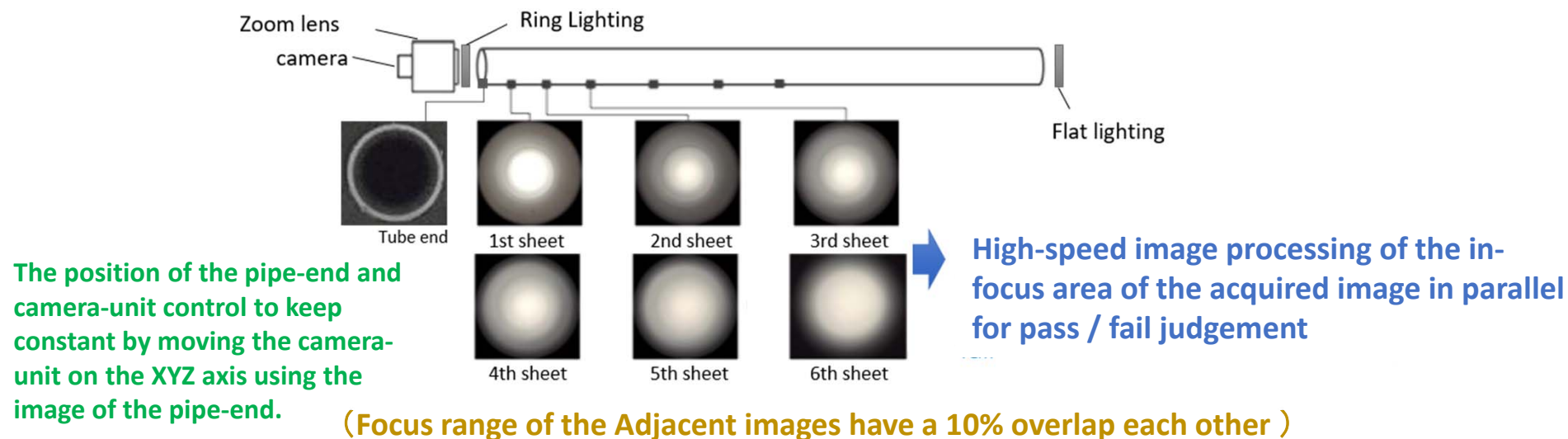
<Novelty>

- Automation Technology of Visual Inspection for the inner surface of pipe, which acquires multiple images of the inner surface of a pipe using a camera with a variable focus type zoom lens, cuts out the in-focus area, performs high-speed image processing, and judges the quality of the inner surface of the pipe in parallel.
- Much faster and cheaper than the conventional method of inserting a fiber camera inside a pipe.

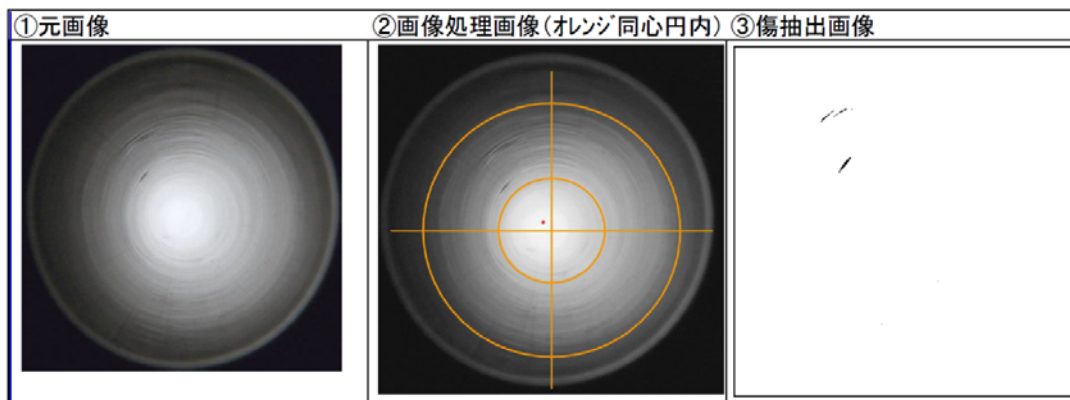
<Features>

- ✓ **Simple structure, high speed, and low cost. (Patent No. 6425972)**
 - ⇒ Especially effective for internal scratch inspection of elongated pipe.
- ✓ **Speeding inspection speed with distributed / parallel image processing technology**
 - ⇒ Less than 10 sec/pipe possible.
- ✓ **Generalized automatic inspection equipment by new technology controlling to keep the position between camera and pipes constant. (Patent No. 6512583)**
 - ⇒ This makes it easy to switch between models of various pipe.
 - ⇒ Small footprint can be achieved and installation and movement of the apparatus becomes easy.

2、Principle of General-purpose High-speed Variable Focus Method



◎Example of image processing of "General-purpose High-speed Variable Focus Method"



4、 Demonstration machine of internal defect inspection equipment by “General-purpose High-speed Variable Focus Method” (G1)

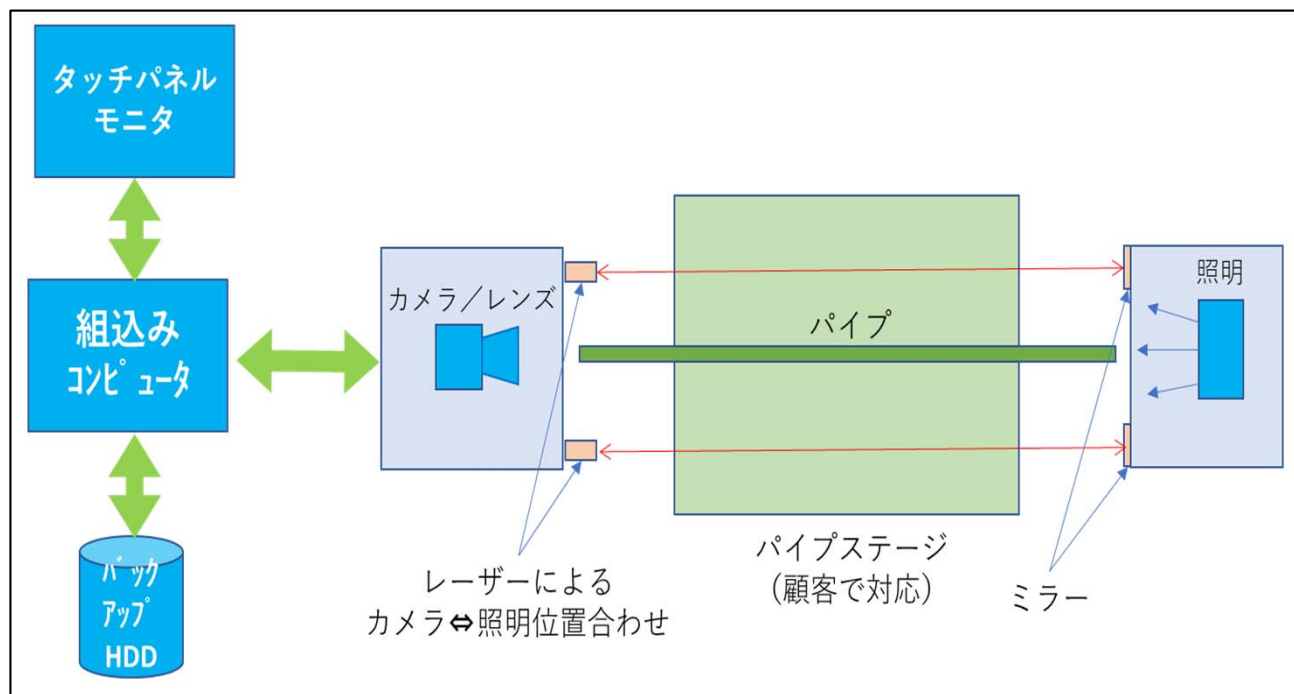


5、Simplified internal defect inspection equipment by “General-purpose High-speed Variable Focus Method” (G2)

◎ Features

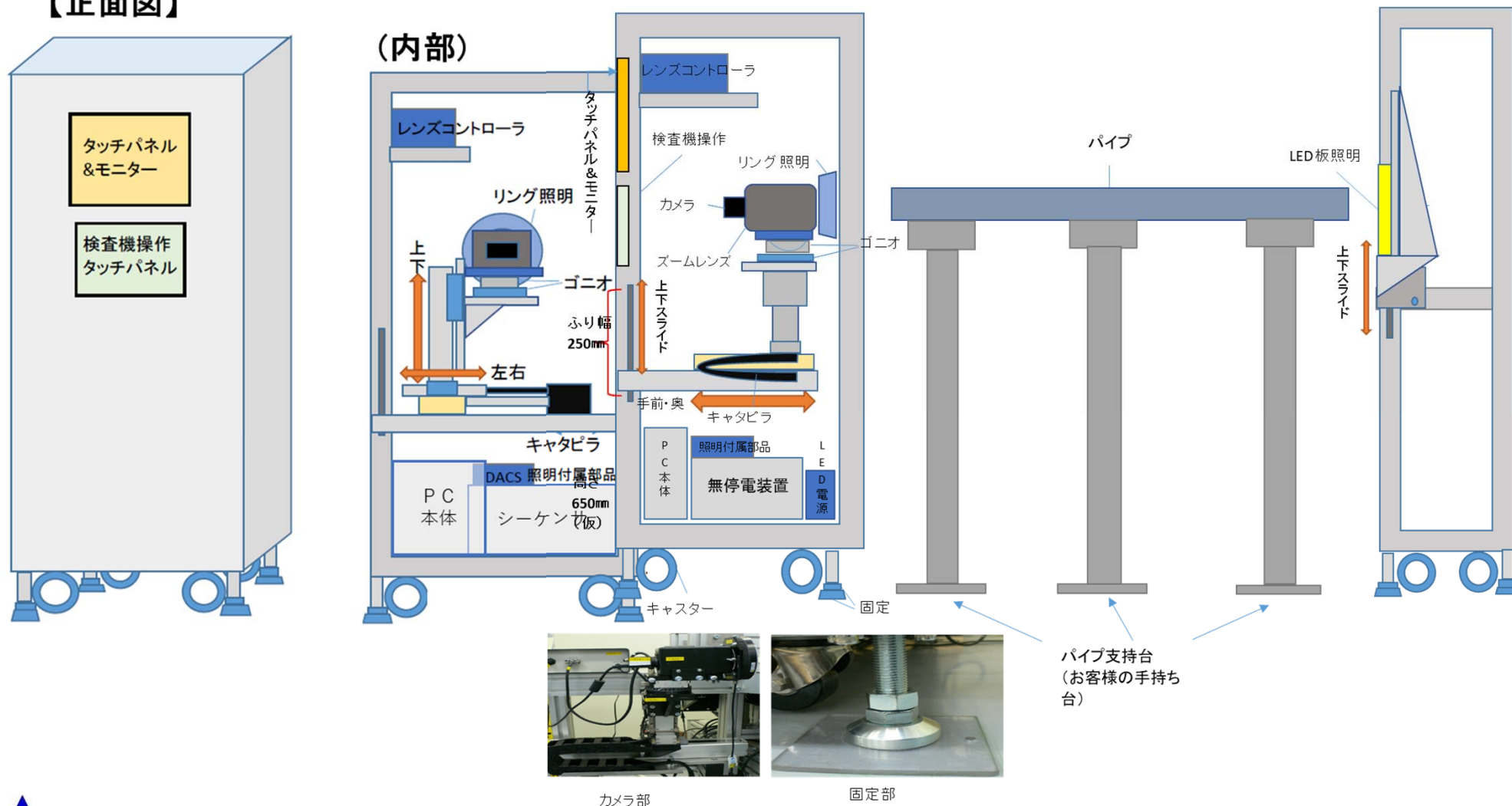
- Compatible with almost all the pipes of various sizes (length, diameter).
- Can be flexibly adapted to transfer lines of various pipes in production.

1) System configuration
















2) Simplified Automatic Inspection Equipment for Inner-Surface of Pipes (G2)

【正面図】



Products List

List of Inspection Equipment by proprietary “General Purpose High-speed Variable Focus Method”

Series	Content	Feature	Resin pipe		Steel pipe	
			Thin diameter	Thick diameter	Thin diameter	Thick diameter
G 1	Inclined transfer type (Demonstration machine)	<ul style="list-style-type: none"> • Transport by rolling pipes down on slope • Thin diameter, 4m long pipe compatible 	 $\Phi 32\text{mm} \sim \Phi 50\text{mm}$		 $\Phi 3.2\text{mm} \sim \Phi 12.7\text{mm}$	
G 2	Simplified type	<ul style="list-style-type: none"> • One pair of cameras/Lighting unit configuration • Compatible with any pipe 				
G 3	Inclined transfer type (Mass production machine)	<ul style="list-style-type: none"> • Two pairs of cameras/Lighting unit configuration • Compatible with small diameter rigid pipes • Transport by rolling pipes down on slope 	 $\Phi 32\text{mm} \sim \Phi 50\text{mm}$			
G 4	Horizontal transfer type (Mass produced machine)	<ul style="list-style-type: none"> • Two-pair camera lighting unit configuration • Compatible with small diameter pipes • Convey horizontally 	 $\Phi 32\text{mm} \sim \Phi 50\text{mm}$		 $\Phi 3.2\text{mm} \sim \Phi 60.5\text{mm}$	
G 5	Camera moving type (Under Development)	<ul style="list-style-type: none"> • Automatic inspection while mounted on a rack • One pair of cameras/Lighting unit configuration • Compatible with pipes on a rack 				

Option

001

Image processing type (Standard specifications)

002

No image processing type (Image output only)

Advantage

Advantage of “General Purpose High-speed Variable Focus Method”

	Prior art (Visual examination)	This technology	Prior art (Insert fiber optic camera)
Accuracy	△	○	○
Speed	△	○	× (2 minutes/pipe)
Risk of damage	○	○	×
Production responsiveness	×	○	×
Facility convenience	○	○	△
Cost	×	○	×
Ease of failure analysis	×	○	○
	(Image data not available)	(Image data available)	(Image data available)

Intellectual Properties

1) Holding Patent

Title of invention	Applicant(Right holder)	Applicati on status	country, date, number, etc.
Method for inspecting an inner surface inspection apparatus and that of the pipe material.	S.Nambu , M.Kariba , A.Kamemoto , 、 S.Hashimoto , M,Yamada , Y.Watanabe, Y.Morita (Stainless Kuze Co., Ltd. , Auto-Inspect Co.,Ltd)	registered	JP,2014-222187 (Oct. 31 ,2014) JP,6425972,B
A pipe inner surface inspection apparatus.	S.Nambu, Y.Sone, M,Yamada, Y.Morita, A.Yoshitaka (Auto-Inspect Co.,Ltd)	registered	JP,2017-110374 (Jun. 2 ,2017) JP,6512583,B
The automated visual inspection apparatus	S.Nambu, Y.Sone, M,Yamada, Y.Komaruyama, Y.Morita (Auto-Inspect Co.,Ltd)	registered	JP,2017-232024 (Dec. 1 ,2017) JP,6512585,B
A pipe coupling comprising an automatic inspection apparatus.	S.Nambu , Y.Sone , M,Yamada , Y.Komaruyama , F.Azeda , Y.Morita , A.Yoshitaka, Y.Miyagishi (Auto-Inspect Co.,Ltd)	registered	JP,2020-043463 (Mar. 12 ,2020) JP,7113533,B

2) Development Publicity

【 Press Releases 】

- ① “ Succeeded in developing automation technology for visual inspection ” Nikkei newspaper (Hokuriku region) February 14 ,2018.
- ② “ Pipe inner surface flaw inspection automation technology, Twice as efficient ” Nikkei newspaper, February 22 ,2018.
- ③ “ Pipe inner surface flaw inspection automation technology Commercialization within 2-3 years ” Electronic device industry news, March 22 ,2018.

【 Paper 】

A.Kamemoto, S.Nambu, M.Kariba, T.Nakanishi, M,Yamada, H.Takamori, S.Hashimoto, Y.Morita, Y.Watanabe

「R&D and practical application of optical automatic inspection technology for clean steel pipe inner surface flaws」,

Vision technology practical application workshop ViEW2014、 December ,2014.