Co.,Ltd. exhibited nozzle for both Taslan and Interlaced Yarn. They are widely used from spinning to yarn processing and special yarn processing, and their demand are getting increase.

8.3 Measuring instruments

Quality control is getting important because products in diversified, and grading up. So there were many exhibits of automatic measuring instruments using quality check for products and on line sensor check in a manufacturing process. Major measuring instruments and major exhibited manufacturer are as follows.:

① Yarn break sensor : Dent Instrumentation Ltd., Electrotex AG, Nipponsellen Co.,Ltd.

② Entangle counter : Zellweger Uster AG, Toray Engineering Co.,Ltd., Kanebo Engineering Co.,Ltd.

③ On line fluff counter : Fibre Guide LTD., Daiko Co.,Ltd.

9. Conclusion

Whenever I remember the exhibits at the 5th OTEMAS, not only new and powerful machines with big manufacturers from all over the world, but also it was very impressive to see original machines come from new idea by several Japanese and foreign manufacturers on a small scale, I hope that these machines will be developed and progressed in the near future. As mentioned in the beginning, the exhibits of synthetic fiber manufacturing machineries at the 5th OTEMAS had a lot of entries in wide range, and was very successful.

Spinning Machinery

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1. Introduction

At the 5th Osaka International Textile Machinery Show, many halls relating to the spinning process seemed to be crowded with many people concerned throughout 7 days from November 11 to 17, 1993.

Table 1 shows numbers of exhibitors in the field of spinning machineries and their accessories. We can find so many Japanese exhibitors and the number of overseas exhibitors exceeded too beyond expectation. Both displayed their products ambitiously and enthusiastically.

Features and trends of the exhibits this time were high-speed, automatization of transportation, auto doffing and accomplishment of completely reliable

system for yarn production. Another outstanding feature was to remove the conventional "dusty" image of spinning plants by preventing energy loss which comes from circulating the plant air.

Main machines and their accessories as far as spinning process concerned will be described as follows.

Table 1 Numbers of exhibitors of spinning machineries and accessories

country	Japan	Asia	other foreign countries	total
Cotton spinning machineries				
Blowing-room m/ces & Accessories	12	2	6	20
Carding m/ces & Accessories	14	4	10	28
Combing m/ces & Accessories	11	2	5	18
Drawing frames & Accessories	15	3	8	26
Roving frames & Accessories	17	2	7	26
total	69	13	36	118
Spinning Machineries for long staple fibers				
Washing, carbonizing and drying m/ces	3	0	3	6
Garnet and rag m/ces	1	0	2	3
Carding m/ces and Accessories	7	2	6	15
Equalizer	1	0	1	2
Gill frames and combing m/ces	9	0	2	11
Bobbiners and fore-spinning m/ces	3	0	2	5
Accessories and equipment	12	1	10	23
total	36	3	26	65
Spinning Machineries for Bast Fibers				
Preparing and Combing m/ces	0	0	1	1
Carding m/ces	2	0	4	6
Draw frames	7	0	1	8
Roving frames	6	0	3	9
total	15	0	9	24
Fine Spinning Frames				
Ring spinning frames	8	2	7	17
Rotor open-end spinning frames	1	0	4	5
Air jet open-end spinning frames	1	0	1	2
Friction open-end spinning frames	1	0	1	2
Other spinning frames	3	1	4	8
Auto-doffer(for spinning frame)	3	1	4	8
Rings	8	1	3	12
Travellers	4	1	3	8
Spindles	5	1	3	9
Rollers	8	1	4	13
Automatic transport system	6	0	7	13
Other accessories for spinning frames	30	2	19	51
total	78	10	60	97
Sum total	198	26	131	304

2. Preparation of Spinning

2.1 Blowing-room process

Nihon Spindle Mfg. showed Weighing Type opening & mixing system (Fig. 1), most suitable for small-lot processing and for saving floor space. This system provides reliable fiber mixing and mixed fiber spinning as well as flexible handling. Public attention seems to be attracted by its compact design, and the actual performance and practical application of this system is expected in the near future. Also there were displayed 4-chamber-blender made by Crosrol, TOH Series for cotton by Toyoda Automatic Loom Works, new machines in the blow room by Rieter Spinning System and Blowroom line with a production capacity up to 1,000kg/h by Hergeth Hollingsworth.

As an auxiliary equipment in the blowing-room process, Tatsumi Air Engineering exhibited Foreign Material Detector FMD F-4(Fig.2) which can distinguish and eliminate colored material (garment fragment etc.) from raw cotton material in the blow room line. FMD F-

Fig. 1 Weighig type opening & mixing system
(Nihon Spindle Mfg.)

4 detects with a high probability by the newest opt-electrical technics.

2.2 Carding process

Crosrol exhibited Single Card MK5, the features of which are revolving flats carried on ball bearing rollers and stationary flats. The unique bearing system on the cylinder means that flat speed up to 1,200 mm per minute can be achieved, and adjustment can be made to give the best possible carding effect. The most effective stationary flats concept, which includes a new, aerodynamic trash extraction system above both the taker-in and doffer areas, has been newly developed. This system, combined with unique revolving flats arrangement mentioned above, represents the ultimate in carding technology. The systems (Fig. 3) consist of a control flat, control plate, trash extractor and four fixed flats. On each cylinder two of these systems are incorporated : each system is cleaned by compressed air and suction. The first is located above the taker-in area, while the second is situated above the doffer area. The success of this system made it possible to reduce the number of flats used, which permitted the inclusion of the special aerodynamic trash extraction system, giving improved cleaning efficiency. The cylinder is able to operate at speed up to 700 rpm, because it is dynamically balanced before assembled into the card.

Nitto Unicard CH-W-700 was displayed by Nitto Engineering as a tandem card, capable of producing the highest quality sliver in a most effective way. CH-W-700 has a specially designed taker-in part marketed under the brand name "Uni-Opener" (Fig. 4), and a has highly efficient doffing equipment "Uni-Doffer".

CM80 made of Howa Machinery was displayed. Its main features are as follows. (1) Tough framing and cylinder bend integrated with cylinder pedestal. (2) High-precision cylinder and doffer made of steel plate.

Fig. 2 Foreign material detector : FMD F-4
(Tatsumi Air Engineering)

Fig. 3 Trash extraction system (Closrol)

(3) Cylinder under-casing made of light alloy. (4) Web doffing mechanism. (5) Web gathering and guide mechanism. (6) Doffer speed-change mechanism. Accordingly, CM80 can produce high quality slivers at high speed up to 500 rpm by means of high performance opening and dust removing device, short fiber and trash eliminating device, stationary flats at back and front sides, and one-body type (rigid structured) frame made of steel.

Rieter exhibited C10 card with feeding device

Fig. 4 Uni-opener (Nitto Engineering)

"Aerofeed-U" in their computer integrated spinning (C.I.S) system.

In regard to accessories of carding machines, exhibitors were Kanai Juyo Kogyo, Tateishi Industry, Nippon Card Clothing, Miyoshi Spinning Machine Mfg., Yamatokoei Machinery Works, and others.

2.3 Combing process

Hara Shokki Seisakusho exhibited their combing system : Comber preparatory machine, High lap 100 (Fig. 5), Super lap SL-100 and High-speed comber VC-300A. Comber VC-300A (1 Coiler) is equipped with automatic top comb self-cleaning device and automatic can changer, and its maximum number of nips is 300 nips/min.

Voulk Macchine Tessili displayed comber machine CM400 (Fig. 6) in their combing system. CM400 is an automatic combing machine with high production by a microprocessor. It is equipped with visualization monitor for production and quality data. Nips per minute on CM400 could be realized up to Max. 350 nips/min.

Comber CM100 with 300 nips/min was displayed by Toyoda Automatic Loom Works.

Howa Machinery showed high speed comber preparatory machine (sliver lap & ribbon lap) "FINE

Fig. 5 High Lap-100 (Hara Shokki Seisakusyo)

LAP" and high speed comber Hz with automatic lap transportation ALT. The camless detaching roller adopted by this mechanism makes Hz possible for producing high quality sliver at high speed for a long time.

Rieter Machine Works exhibited high speed comber preparatory machine UNI lap and highly efficient comber E7/6 with automatic lap transportation and supplying systems.

For the rectilinear process, Osaka Kiko displayed their newly designed high speed comber HC-5 for worsted spinning process. Besides, PB-31LM worsted combing machine made by N.Schlumberger and worsted comber by Sant'Andrea Novara were displayed.

As accessories related to combing machines, several

Fig. 6 Comber CM400 (Vouk Macchine Tessili S.P.A)

makers exhibited their products, such as Asahi Industry, Tateishi Industry, Teikoku Chemical Industry, Tomen, Nakagawa Mfg., Nitto Shoji.

2.4 Drawing process

Vouk Macchine Tessili displayed automatic autolevelled draw frame SH802 equipped with autoleveller uster Model USC for count regulation in short term. Its maximum speed is 800m/min.

Hara Shokki exhibited high speed frame DX800 equipped with autoleveller USC type.

Toyoda Automatic Loom Works showed high speed drawing frame DYH800 (Fig. 7) equipped with autoleveller USC type.

High speed draw frame DFH made by Howa machinery was driven by no change-gear system at the maximum speed of 800 m/min.

Rieter displayed high speed draw frame RSB with the maximum speed of 800 m/min.

In regard to accessories and equipments of draw frames, Ogura Seisakusho, Daiko Seisakusho, Tateishi Industry, Teikoku Chemical Industries, Nitto Shoji, etc displayed their own products.

Fig. 7 High speed drawing frame (Toyoda Automatic Loom Works)

2.5 Gilling process and bobbins

OKK displayed and demonstrated automatic pre-spinning system (Fig. 8) which consists of electronically controlled HME7 mixing gill and two machines are linked together with an automatic can changing device, can transfer device and sliver piecing device. PBLE-4D is equipped with sliver irregularity control mechanisms so that no sliver irregularity occurs when the sliver is pieced by automatic sliver piecing device. HME-7 and PBLE-4D are controlled by computers, and such data as draft and delivery speed can be easily entered through the numeric keyboard, thus ensuring easy operation.

Yasuda Instrument Company exhibited PD3MF super drafter (Fig. 9). This is an intersecting gill box which is suitable for delivering not only silk, ramie and wool, but also new synthetic micro-fibers and its their blended ones. Blended slivers with long and short fibers, such as silk and cotton or silk and cashmere, can be drafted and gilled to make a sliver of good quality. PDF3MF has the following four features : (1) Since the pitch of gill screws is smaller than that for worsted gilling process, micro fiber slivers of good quality can be produced. (2) Triple back roller system allows to make slivers blended with

Fig. 8 Automatic pre-spinning system AF107 (OKK)

long fibers, new synthetic slivers, slivers of blended with different fineness or with varied cross-sections. (3) Since the adjusting range of the nip gauge is from 18 mm to 60 mm, slivers of 100% new synthetic fibers (long and short) can be produced. (4) Draft ratio can be selected and changed accurately and quickly in 1/100-pitch increments by pushing a button on the panel.

N.Schlaumberger displayed GN6 inter sector, a screw type drafter which enables to run constantly at a high speed of 20,000 drops/min. GC14 chain gill type 213 RME with automatic doffing for big ball (up to dia. 600 × 530 mm) has an autoleveller, with electric memory and sprayer. FMV32P vertical rubbing frame is equipped with automatic delivery into cans of dia. 500 × 1,200 - 2 or 4 ends per can (interchangeable with a switch).

Fig. 9 Intersecting gill PD III MF super drafter (Yasuda Instrument Co. Ltd)

2.6 Roving process

Toyoda Automatic Loom Works exhibited roving frame FL100 in their automatic system. This system consists of ASP type automatic sliver-piecing device, TRD type wagon doffer in the roving process, roving transfer machine Model TRT, full automatic roving changer Model TRP and ARS-N type roving stripper. The automatic sliver piecing can be performed by the needle punching system, and piecing time to require for one sliver is about 22 seconds.

RMH high speed simplex fly frame was displayed by Howa Machinery. In RMH, Computer-controlled servo motors are employed for changing bobbin speed and building motion, reducing maintenance and giving RMH greater operating stability than conventional models with mechanical cone drum/cone belt systems. RMH possesses such a mechanism for full bobbin stop at right length at proper position that reduces loss roving left on the bobbin. RMH is equipped with automatic sliver piecer HSP (Fig. 10), automatic doffer RMD, roving transportation RT-1, spare roving changer with automatic roving splicing device SRC2 and roving stripper ARS. HSP makes can changing (full can and empty can) and

sliver piecing automatic, while the roving frame is running. This original piecing method which can feed a high quality and seamless sliver, makes operation stable with no roving breakage and with high quality.

Naniwa Kikai Kogyo exhibited a specially designed transport system which meets efficient use of the factory space and various kinds/small lot production and random exchange type (spare roving transport type) of simultaneous exchange type.

Rieter Machine Works displayed their own roving frame F5 with roving transport system SERVO tail.

Sant'Andrea Novara exhibited a new Flyer frame BF FLYER.

N.Schlumberger displayed finisher BM15 for worsted spinning.

3. Spinning

3.1 Ring spinning process

Ishikawa Seisakusho exhibited PSF-T(2), a ring spinning frame with an auto-doffer. This frame is made for long staple spinning system. The yarn quality produced on it is improved and end-downs are remarkably reduced by adopting the double-acting anti-node rings. This PSF-T(2) is equipped with their own Automatic Yarn Piecer (Fig. 11).

Sussen displayed ring can 1000, which produces high quality ring yarns directly from the sliver in the can by the remodeled drafting system, the sliver delivery equipment and the lifting mechanism.

The efficient most-advanced high speed ring frame RX230-TD by Toyoda Automatic Loom Works was exhibited.

Howa Machinery displayed high speed ring spinning frame UAG/1 with automatic doffer HBO and automatic

yarn piecer. On UAG/1 ring frame, an automatic continuous dripping lubrication system is provided to the main gearing and the draft gearing, enabling maintenance-free operation. Since a synchronous belt employed for the main drive at the gearend part

Fig. 11 PSF-T(2) Ring spinning frame with automatic yarn piecer (Ishikawa Seisakusho)

minimizes slippage, vibration and noise, and the maximum spindle speed of 25,000 rpm can be realized. Its doffing time is about 4.5 minutes. Also, a new high speed ring spinning frame UAM was exhibited by Howa machinery. It runs at the maximum driving speed of 27,000 rpm thanks to the adoption of the Spindle Direct driving system.

Rieter exhibited ring spinning frames G5/1 and G5/2 with auto-doffer ROBO doff.

N.Schlumberger displayed high production ring frames CF52 and CF53 for worsted spinning.

As accessories of ring spinning frames, Kanai Juyo Kogyo, Tomen, Naigai Denshi Kogyo, Fuji, Fuji Seiko, Machinetex, Wako Engineering and To-Tsu Shoji exhibited their own products.

3.2 Other spinning machines

Elitex Cerveny Kostelec A.s displayed a new model BD-D1 open-end spinning frame for processing cotton, synthetics and their blends. It is a newly reformed type based on BD200. The machine operates with increased performance and high operator's comfort. Some changes are its rotor speed up to 90,000 rpm, bobbin packages to 4 kg, delivery of bobbins by means of conveyor, decreased energy consumption, yarn quality sensors and waxing device. A unit-construction design makes it possible to process yarns of various types and qualities. Reliability and simple maintenance are preserved.

Fig. 10 Automatic sliver piecer (Howa Machinery)

Autocoro 288, automated rotor spinning and winding machine made by W.Schlaforst was displayed. Speed of this spinning machine can be easily changed from, 40,000 to 130,000 rpm.

Murata Machinery exhibited an air jet type open-end spinning frame, No.802H MJS (Fig. 12). No.802H MJS has been redesigned and now called No.802H MJS which operates at the rate of 340 m/minute. This high speed is significantly faster than other spinning frames. During demonstration, Murata spun various yarns such as 100% cotton yarns and micro fiber yarns. Its features are an integrated control system which includes yarn quality control, operation control and maintenance

Fig. 12 Air-Jet open end spinning machine No. 802H MJS (Murata Machinery)

control. Yarn quality control is handled by a control system named Intelligence analyzer (IA/3), which removes slubs, and corrects yarn variances such as the thinness and thickness. Operation Control watches the machine stoppage time due to yarn breakage, etc. Maintenance Control measures doffing time. Can robot is available for full automation of this process, and was exhibited and demonstrated. It transports sliver cans to MJS's, replaces sliver cans, and performs sliver piecing, making the piecing even and manual-like. When yarn irregularity caused by sliver join should be removed, a switch is turned on to set the yarn clearer mounted on MJS to detect that part.

4. Conclusions

In the spinning process, many technological improvements were made to develop automation systems by computer control, for instance, automatic splicing of slivers, rovings, and yarns which requires originally a lot of man power. In the field of innovative spinning frames including pre-spinning frames, however, there were no new models using new methods, although all manufacturers of machines and accessories were trying to improve efficiency in mechanical engineering, production control and other technological means.

Various makers are putting effort into accomplishing the ideal spinning plant, i.e. comfortable working environment, high cost performance, noise reduction,

dust free and easy maintenance. Such a plant will be realized in the near future by newly developed excellent technology. Future developments of new machines are eagerly wanted by many people concerned in the world.

Weaving Machinery and its Related Machinery

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1. Outline of Weaving Machines Exhibited

The weaving machines exhibited at the 5th OTEMAS were 84 looms from 15 loom makers as shown in Table 1. Table 2 shows a comparison of the exhibits with the previous OTEMAS. From this, it is found that the feature of the 5th OTEMAS are as follows.

- 1) The number of looms exhibited increased, on the other hand the number of loom makers decreased.
- 2) The number of air-jet looms (AJL) and AJL makers still increased.
- 3) On the contrary, from the 3rd OTEMAS as the top of wave, the number of rapier looms (RL) and RL makers was inclined to decrease.
- 4) The number of water-jet looms (WJL) and projectile looms (PL) makers have been limited.
- 5) The first income of the triaxial loom. Table 3 shows some technical data of the looms exhibited at the 5th OTEMAS.

2. Increase of Productivity

High-speed competition among looms exhibited has still been continued. The highest demonstrating speed of exhibited looms has been increased at every previous OTEMAS, so the high speed looms which exceed previous ones were exhibited at 5th OTEMAS. AJL demonstrated by Tsudakoma accomplished 3,040m/min in weft insertion rate. Its weft insertion rate exceeded the fastest one of WJLs (2,700m/min) for the first time. This indicates high potentiality of AJL.

The higher speed looms run, the larger noise they produce. When looms started running all together in the 5th OTEMAS, it was impossible to have a conversation. Low noise level had been one of the advantages of shuttleless looms, but it was over the limits of tolerance. From this point of view, the environmental AJL demonstrated by Nissan attracted visitors' attention. It was said that the sound-proofing covers could decrease 6 ~ 8dB(A) in noise level at the cloth fell.

As aforementioned, high-speed loom running comes to be realized because of the following various factors