February 15, 2006

To whom it may concern:

The Commendation for Superior Energy-Conserving Machinery for ZAX9100 Air Jet Loom

We are pleased to inform you that our ZAX9100 Air Jet Loom won the Japan Machinery Federation Presidential Prize (The Energy Conservation Division) at the Commendation System for Superior Energy-Conserving Machinery 2005.
This is a second time for Tsudakoma to receive this prize for our loom, following our ZW403 Water Jet Loom in 1997.

Reasons for Award:

When the air jet loom weaves fabrics, a major part of the electric power is consumed by the compressor. For Tsudakoma's air jet loom, the efficiency of the nozzle and reed that feeds the filling is increased and the inner volume of the air supply tube and electro-magnetic valve is decreased to reduce unnecessary air consumption that results from intermittent air jetting. Tsudakoma has recently invented a weaving support system that more automatically and accurately adjusts the supplied air pressure and time according to the change of the woven fabric and the weaving condition. As a result, air consumption is reduced by from 10% to 20% as compared with conventional model.

Supplement:

The air jet loom inserts the fillings into warps by jetting compressed air. The filling jet from the main nozzle passes in the air guide of the reed. The compressed air supplied by sub-nozzles shoots the air flow in the air guide, and the air flow feeds the filling.
The compressed air is supplied by the air compressor installed in the weaving mill. The air consumption for jetting and feeding the filling and the load of the compressor are reduced, and as a result, electric power consumption is also reduced.
This award is in recognition of our ZAX9100 achieving a reduction of electric power consumption with a variety of proprietary technical developments and advancements since the sales began in 2004.

(For your reference)
-The Commendation System for Superior Energy-Conserving Machinery-
(Excerpts from a website of The Japan Machinery Federation)

Every year since 1980 the Japan Machinery Federation (JMF) has implemented "The Commendation System for Superior Energy-Conserving Machinery" in response to a national policy of promotions energy-savings. In this system, the JMF presents awards to companies or groups of companies judged to have contributed to the promotion of efficient use of energy by developing and commercializing superior energy-saving machines. This system aims to encourage energy-saving machinery development as well as its widespread use.

[Japan Machinery Federation Presidential Prize]

Air Jet Loom that reduces compressed air consumption (ZAX9100)

TSUDAKOMA Corp.

1 Outline

Air jet looms use compressed air to feed the filling and have been in production for about thirty years. It can insert from 600 to 1000 fillings per minute and has higher productivity than other looms. Its sales area has increased as the kinds of fabric that it can weave (such as shirting, coat, curtain, and terry fabric) has increased. Currently, about 230,000 air jet looms operate all over the world.

The compressor that produces the compressed air consumes from 60% to 80% of the electric power required for air jet loom weaving. Reduction in air consumption has been a major goal.

For Tsudakoma's ZAX9100 air jet loom, the efficiency of the nozzle and reed that make air flow to feed the filling has increased, the inner volume of the air supply pipe and the electro-magnetic valve is decreased, and useless air consumption that results from intermittent jetting is reduced.

The air jet loom mainly weaves natural materials such as cotton and wool. Because the quality of these yarns is not even, the air supply pressure and jetting time is automatically adjusted.

The "Weave Navigation System," a weaving support system is used, and it makes the automatic adjustment more accurate and the operation easier. As a result, air consumption is reduced by about 10% to 20%. (Compared with our conventional model).

ZAX9100 Air Jet Loom

2 Technical Features and Effects

2-1 Technical feature

The air jet loom feeds the filling as in **Figure 1**. The filling length is measured according to the width of the fabric by 1 rotation of the loom. It is accelerated by the main nozzle at a specific timing, and is inserted into the air guide of the reed. Groups of sub-nozzles are located across the whole width. Each group jets compressed air in a specific order to feed the filling tip to the right end of the fabric. The compressed air is supplied from the compressor, its pressure is adjusted by the regulators for the main nozzle and the sub-nozzles, and it is stored in the proper tank. The control system of the loom opens and closes the electro-magnetic valve, and sends the compressed air to the nozzles.

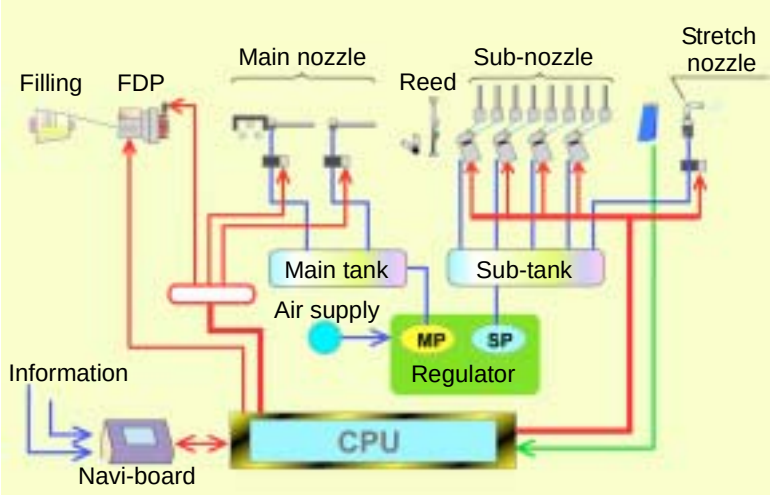

Figure 1: Filling feeding system

(1) Control of sub-nozzles by increased groups

Conventionally, as in **Figure 2**, sub-nozzles are arranged in groups of 4 or 5 nozzles. An electro-magnetic valve is attached to each group, and the sub-nozzles of the same group jet simultaneously. Tsudakoma's new arrangement, as in **Figure 3**, has an electro-magnetic valve with a smaller inner volume so that it matches to 2 sub-nozzles. The control of valve is improved, and extra jetting time is reduced.

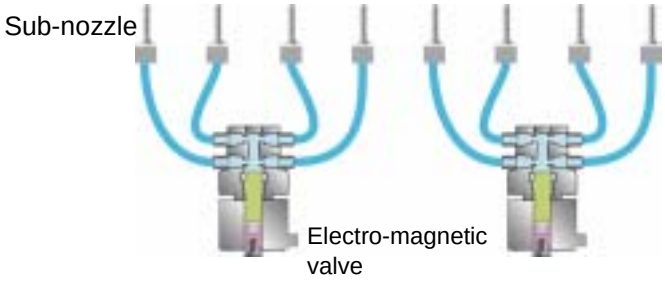

Figure 2: 4 Sub-nozzles/group

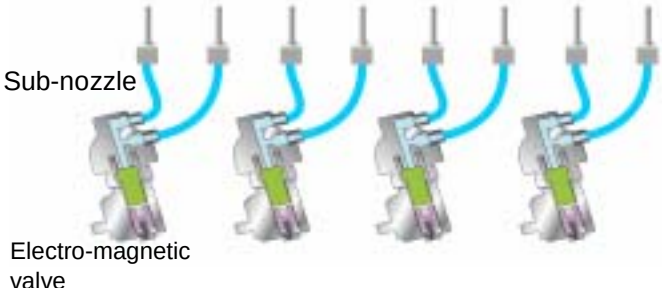

Figure 3: 2 Sub-nozzles/group

(2) Improvement of nozzle for feeding the filling and reed

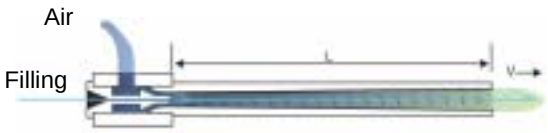

Figure 4: Main nozzle

The main nozzle pulls the filling with compressed air and guides it to the air guide of the reed as in **Figure 4**. The patented manufacturing method developed a laval-type nozzle: the interior is wider at one end than the other. The nozzle's pulling force is increased by 30%, and air consumption of the main nozzle is reduced by 10%. (Compared with the cylindrical nozzle) In addition, the sub-nozzles use almost all of the air consumption in the air jet loom because of their number. Tsudakoma invented a new sub-nozzle and has applied for a patent. The part around the jetting outlet of the new sub-nozzle is hollowed (See **Figure 5**), and the flow speed is increased by 10%. Because the filling does not touch the edge of the jetting outlet, damage to the filling is lowered. For the reed, the air guide of the reed for feeding the filling is narrowed, and the air flow speed is raised.

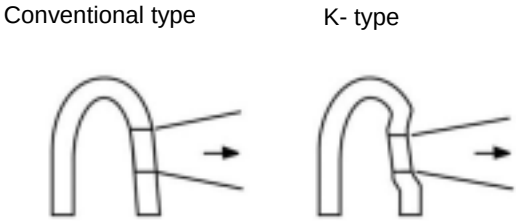

Figure 5: Sub-nozzle

(3) Improvement of the control system

Each device of air jet loom, such as the filling insertion device, has been automatically adjusted in comparatively simple formulas. Our newly invented control system, the "Weave Navigation," selects the most proper formula for the fabric type based on the data base and controls the loom relating some controls to each other. It is possible to check the change of the weaving condition with each control condition owing to Tsudakoma's integrated setting display, reset the data if it is necessary, and stop unless weaving quickly. The air consumption is much reduced and readjustment of the weaving fabric type is reduced as compared to conventional automatic adjustment.

Figure 6: Monitoring display

2-2 Economical Effect

An Air Jet Loom requires from 40m^3/h to 100m^3/h of compressed air with about 0.6MPa of air pressure for weaving fabric. (It depends on the fabric type or the loom rpm.)

The following is a comparison with our conventional model as an example of 24 looms in Company A.

Table 1 Example of reduction of air consumption

	Fabric	Model	rpm	Air consumption	Electric power	Reduction
1	Muslin	Conventional model	800	90.0m^3/h	10.8kW	
		ZAX9100	1,008	79.8	9.6	30%
2	Broadcloth	Conventional model	762	61.2	7.3	
		ZAX9100	999	58.2	7.0	28%

The absolute value of reduction of air consumption is about 8%. However, when taking production into consideration, air consumption is reduced by about 30%.

When the ZAX9100 produces as many fabrics as the conventional model and the fabric is muslin (above 1), the following electric power is saved.

Electric power/year = 10.8 x 24 (hours) x 360 (days) x 0.9 (efficiency) x 24 (looms) x 0.3
= 600,000kWh

And, when converting the above electric power into money with the electric rate in Japan (¥11/kWh), about 6,600,000 yen are saved every year.

3 Use

Table 2 Sales record in main market

Country	Number of customers	Number of looms	Main woven fabrics
Japan	21	116	Working wear, shirting
China	17	244	Shirting
Pakistan	13	574	Denim, cotton cloth
India	13	469	Bed sheet, denim, cotton cloth
Italy	8	43	Worsted

About 1,600 ZAX9100 air jet looms have been served to 90 companies in 15 countries as of November, 2005, since its sales started in September, 2004, and it has been producing various type of fabrics.