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The reluctant champion

An idea whose time has finally come

For more than a century, the switched reluctance principle was no more than an intriguing possibility, but now Picanol has pioneered its practical application on weaving machines. The Sumo motor based on patented Picanol technology drives the machine directly, without belt transmission or clutch and brake. This SUPER MOTOR has been an immediate success, to the extent that Picanol has been asked to produce it for other applications outside the weaving industry. Picanol's Sumo motor offers numerous advantages such as: reduced maintenance, low cost, high reliability, increased capability to withstand high temperature environments and the ability to vary torque through electromagnetic control. With its compact design and high performance, this champion is able to face every challenge.

The idea behind the Sumo motor actually dates back more than a century, to the early days of electromagnetic technology. The basic concept is extremely simple but the switching necessary to obtain top performance at an acceptable price was too complex. In fact, it was not until the early 1990s that practical designs were developed, thanks to modern electronics and software. Switched reluctance technology is extremely viable and cost-effective not only for weaving machines but for all applications requiring variable speed, precise control of a single speed under varying load conditions or position control and electrical shaft applications.

The beauty of simplicity

The great hallmark of the switched reluctance principle is its simplicity. The rotor has no permanent magnets or windings – its role is purely passive. The stator consists of slots containing a series of coil windings, whose energisation is electronically switched so as to generate a moving field.

As can be seen from the diagram, both the stator and the rotor have projecting poles. Suppose that poles 1 and 1' are energised (these are connected together). Now if one of the four phases of the stator is energised, the closest set of poles of the rotor is pulled into alignment. If phase 1 is switched off and phase 2 is energised, the rotor will be attracted to align the rotor poles closest to phase 2. And so the process continues.

Dependable

The mechanical simplicity of the Sumo motor, without any brushes or permanent magnets, makes for great robustness. The rotor does not have any critical requirements for finishing

and assembly. The stator for its part consists of a similar assembly, with the addition of stator coils. However, the great advantage compared with other types of motor is that the coils are separate, without any overlap. This not only makes the motor simpler and more robust, but also eliminates the risk of shorting between coils.

The rotor of a Sumo motor also runs cooler than in conventional induction motors, so that the bearings last longer. Moreover, the heat losses (mainly through the stator) are easier to evacuate, again contributing to lifetime and reliability. The electronics too are very robust, practically eliminating the risk of malfunctions.

Cost-effective performance

In terms of performance, the peak torque is very high, and the motor functions very effectively over a wide range of speeds. With the appropriate electrical control of the stator coils, the rotor can be made to rotate at any desired speed and torque. Compared to induction motors there is typically twice the output for a given size.

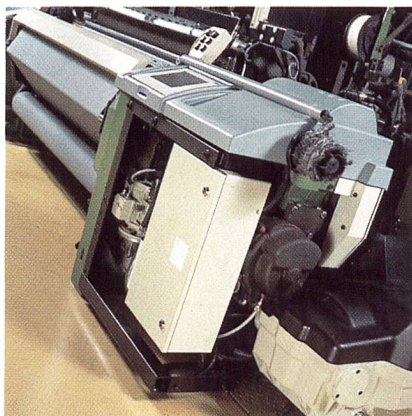
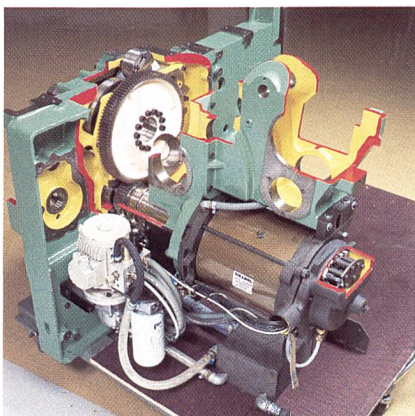
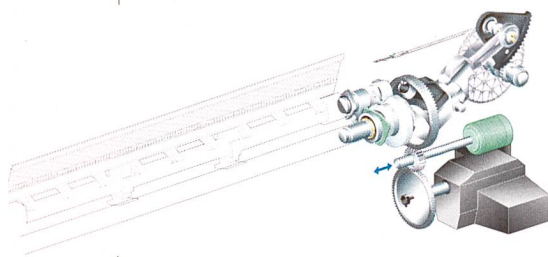
Direct benefits

The speed of the motor is variable and is electronically set and controlled. In fact, the Sumo motor is so versatile that the machine speed can be varied in milliseconds, to suit each individual pick in the insertion cycle! Thanks to this system it is no longer necessary to keep the machine speed continuously low if there is one weaker filling yarn in the fabric.

On an ordinary machine, for instance, if a 6-colour pattern contains one weaker yarn, this determines the machine speed and the other five wefts run at the speed of the weaker yarn. With the Sumo on the other hand, this single weft is treated gently at a lower speed, and after its insertion the machine returns to full-speed production. This is also the case when the dobby limits the speed because of the number of harnesses in movement.

One motor for all jobs

With the Sumo, the tedious job of changing pulleys is now a thing of the past. The motor runs from slow motion to top speed by simple electronic control. Automatic pickfinding and slow motion actions are also driven by that same motor; separate hydraulic or electrical motors are no longer required. Slow motion now simply means that the main motor runs at a slow speed. There is no need to disengage clutches or gears. For pickfinding the rotor is simply moved



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so the gear on the motor shaft runs freely in the gear that drives sley and gripper, and engages only with the gear on the cam, dobby or jacquard shaft.

More reliable electronics

Picanol is a leader in weaving machinery electronics, and the Sumo drive is designed for industrial use, easily withstanding fluctuations of main voltage and frequency. In fact, the operating principle has nothing to do with voltage (within wide range) or frequency, so these cannot have any effect on the working of the motor.

A conventional motor with electronic driver is controlled by the continuous opening and closing of two switches in series. If the moment of switching is disturbed even slightly, the switches close at same time, causing a short circuit and

making the control box burn out. Unfortunately this is common problem with frequency inverters and servo drivers. The Sumo on the other hand controls the speed by opening and closing just one switch and is protected by a passive element, a 100% short-circuit proof control.

Cool customer

An additional benefit is that the bearings run at a cooler temperature than standard motor bearings, thus further improving the lifetime. Furthermore, The Sumo motor is oil-cooled, so there is no fan causing dust to accumulate or disturbing insertion with its airflow.

Higher fabric quality

The ultimate payoff for the weaver is higher fabric quality. Thanks to the Sumo motor, a speed

change is not spread over several picks, as is the case when using a conventional motor with frequency inverter. So there is no unwanted variation in pick density anymore. With the Sumo, a speed increase within a pick will never affect the appearance of the fabric.

The Sumo also brings to an end the era of starting marks. The conventional clutch/brake system causes a rather drastic transition to nominal speed, due to opening and closing of the clutch or engaging the brake. With the Sumo, by contrast, there is no more clutch, no more brake, no more transient peaks. The electronic control makes it possible to keep starting and stopping nice, smooth and controllable.

In other words, the Sumo opens up a new era of quality, reliability and cost control in weaving.

SUMO – eine Idee, deren Zeit schliesslich gekommen ist

Der Sumomotor, der auf einer patentierten Technologie von Picanol basiert, treibt die Webmaschinen direkt, ohne Riemen oder Kupplung und Bremse an. Dieser Super Motor hatte einen derart grossen Erfolg, dass Picanol auch von anderen Maschinenproduzenten ausserhalb des Webereibereichs gebeten wurde, die Motoren für sie zu produzieren. Der SUMO bietet einen

reduzierten Wartungsaufwand, geringere Kosten, eine höhere Zuverlässigkeit, eine bessere Temperaturbeständigkeit sowie eine dynamische Drehzahlvariation. Die Drehzahländerung verläuft nicht über mehrere Schuss wie bei konventionellen Motoren mit Frequenzwandler. Damit kommt es zu keinen ungewollten Schussverdichtungen und das Aussehen des Gewebes

wird nicht durch Geschwindigkeitsveränderungen beeinflusst. Gleichzeitig bringt der Sumo das Ende der Anlaufstellen. Der ölgekühlte Motor benötigt keinen Ventilator, wodurch der Schusseintrag nicht gestört wird. Die hohe Dynamik des Motors erlaubt die Abstimmung der Drehzahl auf die mechanischen Eigenschaften der einzelnen Schussfäden. Dabei kann die Geschwindigkeit bei der Verarbeitung schwacher Garne im Schussrapport so gesenkt werden, dass keine Schussfadenbrüche auftreten.

Leichter, schneller trocken, umweltfreundlicher

Studie beweist die Vorteile von leichtem Frottier

Leichte Frottiertücher aus reiner Baumwolle fühlen sich nicht nur weicher an, sie trocknen nach Gebrauch auch schneller. Ausserdem schonen sie durch ihre geringere Masse die Umwelt beim Waschen.

Nach einem heissen, verschwitzten Sommertag eine abkühlende Dusche zu nehmen, tut gut. Sich anschliessend mit einem weichen Frottier-tuch abtrocknen auch. Doch bei den Walktüchern gibt es frappante Unterschiede.

Wie eine Studie der Schweizerischen Textil-, Bekleidungs- und Modefachschule (STF) in Wattwil im Auftrag der weseta textil ag ergeben

hat, ist die Saugfähigkeit von leichtem, hochwertigem Frottier gleichwertig wie bei schweren Badetüchern. Leichtes Frottier trocknet jedoch schneller als schweres. Damit steht es in viel kürzerer Zeit wiederum zum Abtrocknen zur Verfügung. Durch seine geringere Masse fühlt es sich zudem auch weicher an.

Umweltfreundlicher

Neben den Vorteilen beim Abtrocknen macht die Studie auch Aussagen über das Waschen der Leichtfrottiertücher. Dank des geringeren Gewichts können mehr Tücher zusammen gewaschen werden, was Einsparungen beim Wasser und Stromverbrauch mit sich bringt.

Dieses Sparpotenzial zeigt sich vor allem bei Grossbetrieben, wie beispielsweise Hotels. «Bei 200 Gästen und einem täglichen Wechsel aller Frottiertücher würde man mindestens 5320 kWh Strom sparen, was bei 0,2 Franken pro kWh eine Ersparnis von mehr als 1000 Franken ausmachen würde», ermittelte die Studie. Zusätzlich liessen sich rund 96 600 Liter Wasser und 100 bis 200 kg Waschmittel einsparen. Insgesamt errechnet die Studie Einsparungen in der Höhe von über 1500 Franken.