

FLATLOCK SEWING MACHINES

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Abstract: Durable, elastic and flat seams of activewear garments are mostly processed by sewing machines called flatlocks or flatseamers. They create coverstitches 607. The machines use to have differently shaped work surfaces. Feed-off-the-arm machines are preferable for closing narrow, long components. Feed-up-the arm flatlocks are used for small and short tubular item processing. Flat bed sewing machines are designed for joining large size flat components. Flatlocks use to be equipped with different devices: a fabric edge trimmer, a thread chain trimmer, a tape binder, a tape feeder, others. Fabric edge trimmers are available for both or single fabric edge trimming. A suction device is used to suck up the cut off fabric edges. Thread chain trimmers can be operated manually or automatic way. Tape binders are used on the machines to stitch a tape on men briefs. Advanced flatlocks are equipped with servo motors and use automatic lubrication system.

Keywords: activewear garments, flat seams, flatlock sewing machines, fabric edge trimmer, thread chain trimmer, tape binder, servo motor, automatic lubrication system.

FLATLOK ŠIVAĆE MAŠINE ZA IZRADU RAVNIH ŠAVOVA

Apstrakt: Izdržljivi, elastični i ravni šavovi na odevnim predmetima za aktivno nošenje najčešće su izrađeni sa specijalnim flatlok šivaćim mašinama. One prave mašinske šivaće ubode tip 607. Mašine su dostupne sa različitim radnim površinama. Feed-off-the-arm mašine se koriste za šivenje dugih i uskih delova odevnih predmeta. Feed-up-the arm mašine se predporučuju za šivenje malih i kratkih cevastih delova. Flatlok mašine sa ravnom radnom površinom se koriste za spajanje velikih i ravnih delova odevnih predmeta. Mašine za izradu ravnih šavova mogu da budu opremljene sa različitim pomoćnim napravama: nožem za rezanje materijala, nožem za odsecanje konaca na kraju šava, vođicom trake, drugo. Nožem za rezanje materijala odseca precizno rub materijala u toku šivenja. Nož za odsecanje konaca na kraju šava odseca lanac konaca manualno ili automatski. Vođica trake se koristi za našivanje trake na muške gaće. Napredne flatlok mašine su opremljene sa servo motorima i sistemom za automatsko podmazivanje.

Ključne reči: odeća aktivnog nošenja, ravni šavovi, flatlok šivaće mašine, nož za rezanje materijala, nož za odsecanje konca, vođica trake, servo motor, sistem automatskog podmazivanja.

1. INTRODUCTION

Currently more and more popular become active wear clothing for different kind of dry and wet sports. Often these garments are developed from high elasticity and advanced materials which gets in direct contact with a human body [1]. They have to create to their users maximal comfort during physical activities and feeling of a "second skin". The durable,

elastic and flat seams of the activewear garments are mostly processed by special kind of 4 needle sewing machines called flatlocks or flatseamers [2].

2. STITCHES AND SEAMS CREATED BY FLATLOCKS

Flatlock machines create coverstitches 607 (see Fig.1) which cover top and bottom surface and row edges of a material with a lot of thread [3,4]. They are

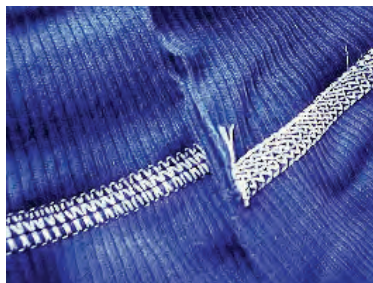
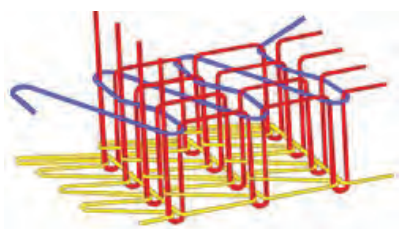


Figure 1: Stitches 607.
Slika 1: Ubodi 607

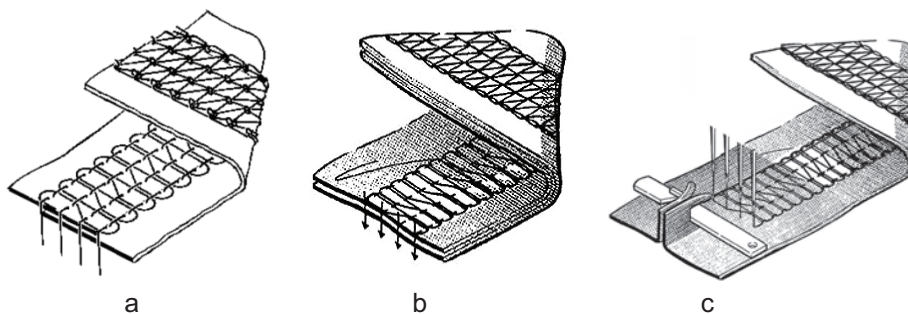


Figure 2: Lap seam (a), cover seam (b) and butt seam (c) created by a flatlock machine.
Slika 2: Tri vrste ravnih šavova

formed with 4 needle threads, a top cover thread and a bottom looper thread. Seams can also be stitched without top cover thread (for example, attaching a tape). To create the seam maximally flat textured threads are used.

The stitches 607 are used to create different kind of seams: (see Fig.2), [4]:

- **lap seams** - used to join components from light to medium thickness materials.
- **butt seams** - suitable for joining heavy materials and in situation when the fabric joining place is reinforced with a tape.
- **cover seams** - used for decorative purpose.

3. BED TYPES OF FLATLOCKS

Flatlock machines use to have three type of work surfaces [5]:

- feed-off-the-arm - preferable for closing (making tubular) narrow, log components and processing 3D items;
- feed-up-the arm - preferable for small and short tubular item processing;
- flat bed - preferable for joining large size opened/flat components.



Figure 3: Feed-off-the-arm flatlock by Juki
Slika 3: Mašina ravnih šavova sa *feed-off-the-arm* radnom površinom

3.1. Feed-off-the-arm flatlocks

During the work process an operator is sitting behind the machine (see Fig.3). He can handle a processed article on a cylinder arm from both its sides. They are used for different applications:

- to join body parts, shoulders, sleeves, legs of trousers,
- attach tape on shoulders and back neckline,
- join crotches and attach tape on panties, briefs.

3.2. Flat bed flatlocks

Using a machine with a feed-off-the-arm work surface the flat and large size components slip down from the narrow arm. The operator constantly has to pay attention to their correct handling and feeding. To eliminate this problem flat bed flatlocks are developed and used (see Fig.4).



Figure 4: Flat bed flatlock by Yamato
Slika 4: Mašina ravnih šavova sa ravnom radnom površinom

3.3. Feed-up-the-arm interlocks

There are also available feed-up-the-arm interlocks with 4 needles which can create stitches 607 (see Fig.5). Working with this kind of a machine, an operator is sitting in front of it. Feed-up-the-arm interlocks are used to process small and short circular items (cuffs, ankles, necklines), closed sleeves, sharp corners joining neckline with shoulder lines on t-shirts, similar.



Figure 5: Feed-up-the-arm interlock with 4 needles
Slika 5: Mašina ravnih šavova sa *feed-up-the-arm* radnom površinom

4. FLATLOCK DEVICES

Flatlock sewing machines use to be equipped with different devices: a fabric edge trimmer, a thread chain trimmer, a tape binder, a tape feeder, a seam end securing device, a thread wiper, a rear puller.



a



b

Figure 6: Double side cut presser foot (a) and Presser foot shoes/spacers (b)
Slika 6: Obostrani rezač materijala (a) i pritisna nožica sa papučom (b)

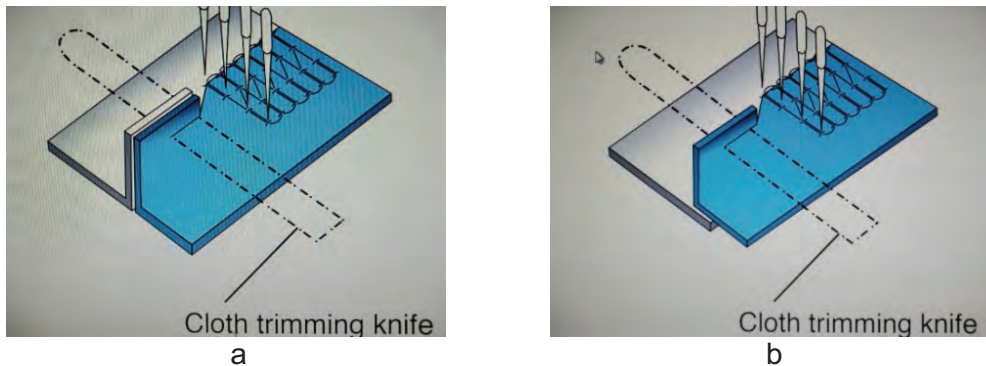


Figure 7: Both sides fabric edge trimming (a) and single fabric edge trimming (b)
Slika 6: Obostrano sečenje materijala (a) i jednostrano sečenje materijala (b)

4.1. Fabric edge trimmer

A fabric edge trimmer is installed on a presser foot of the flatlock machine (see Fig.6). It cuts fabric edges precisely before they are stitched by needles.

Two kind of fabric trimmers can be fixed on flatlock sewing machines:

- both sides fabric edge trimmer - used for light to medium heavy fabric processing (see Fig.7.a),
- single fabric edge trimmer - used for heavy fabric processing, such as, fleece, others (see Fig.7.b).

4.2. Suction device

After fabric edges are cut off, a pneumatic suction device sucks them up. It is done to keep stitching area clean from debris. A plastic or metal pipe is fixed next to the needles (see Fig.8). Through the pipe the cut off fabric parts are taken to a waist bag which is placed under the table of a sewing machine.

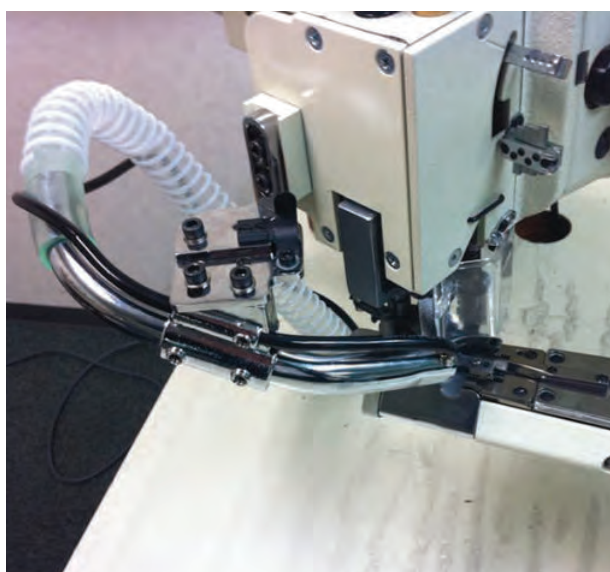


Figure 8: Cut off fabric suction pipe.
Slika 8: Cev za usisivanje odsečenog dela materijala

4.3. Thread chain trimmer

The thread chain can be cut off by manual or automatic a thread cutting device:

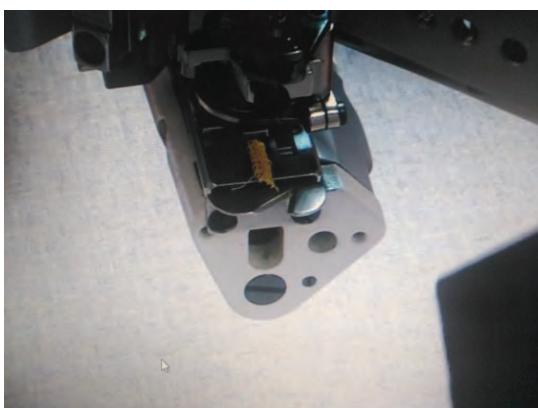
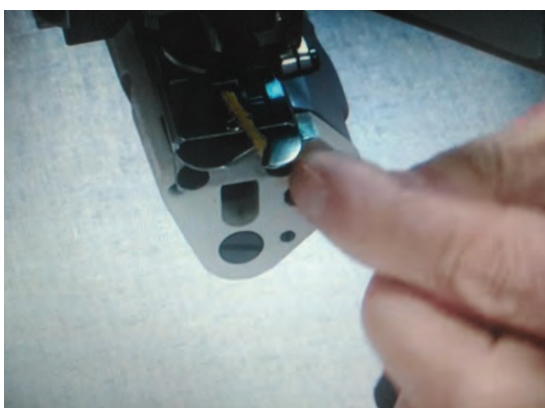


Figure 9: Knife fixed at the end of the machine's arm
Slika 9: Nož fiksiran na kraju radne površine mašine

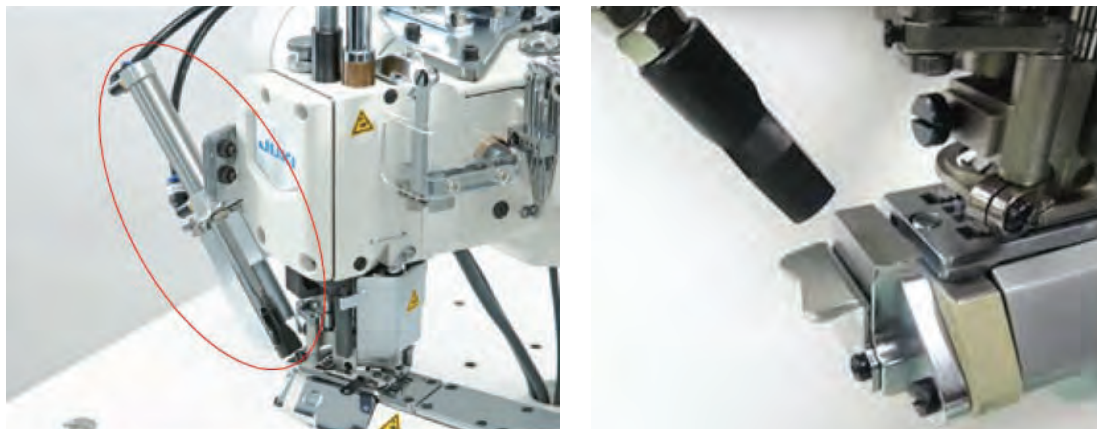


Figure 10: Chopper knife on Juki flatlock

Slika 10: Nož za odsecanje konaca

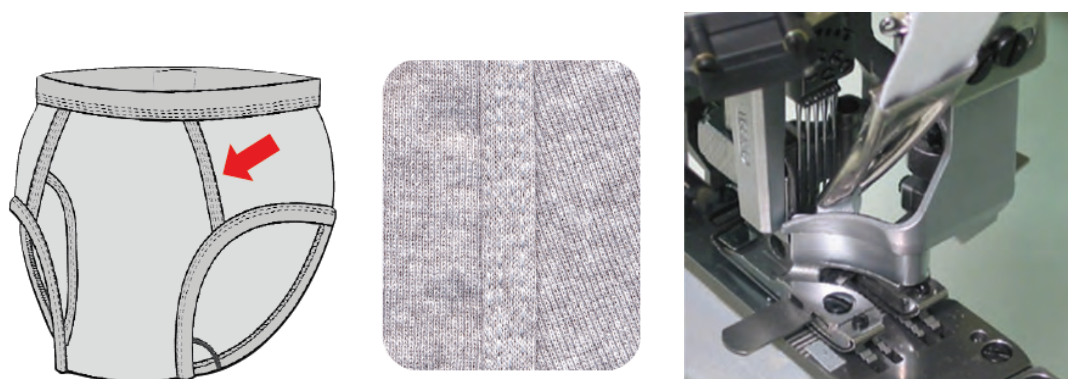


Figure 11: Tape on men's briefs (a) and a tape folder on the machine (b)

Slika 11: Trake našivene na muške gaće (a) i vodica trake (b)

- manual device - a knife is fixed at the end of the machine's arm. Finishing a sewing cycle an operator pulls the thread chain over the blade and cuts it off (see Fig.9).
- automatic device - a knife is fixed behind the needles. Light sensors detect beginning and end of a processed fabric part. Two types of knives are used: guillotine or chopper type knife (see Fig.10).

4.4. Tape binder

A tape binder is used to attach folded or flat tape on the front-placket of men briefs (see Fig.11.a) or other kind of underwear and to join wet suits for skiing, diving, canoeing, yachting. The tape can be attached with or without a top cover thread (see Fig.11.b).

The folder is designed for a specified tape width, for example, folded tape width 9.5 mm, 10mm). It is fixed in front of needles.

5. CONCLUSIONS

Flatlocks are not typical type of sewing machines. However they are very important equipment for manufacturers which are producing or going to produce high quality sportswear and underwear. Flatlocks are equipped with energy saving servo motors [6] and use automatic lubrication systems [7]. Material is fed by differential feed system mechanism [5]. By help of previously mentioned and other special devices this kind of sewing machines can ensure high quality and productivity sewing process which is demanded by the industry [8].

Feed-off-the-arm flatlocks are manufactured by many companies, such as, Juki, Yamato, Siruba, Global, Foxsew, Techsew, Kansai Special, Jack, Garudan, Sakura Stitch, Golden Choice, Sahl, Anysew, Isamu, Shing Ling, Allrico, Speedway, others. The flat bed flatlocks are manufactured by companies Yamato, Kansai Special, Garudan, Kingtex, Golden Choice, others.

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