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A. SCHNEIDER

3,472,286

GRIPPER SHUTTLE

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Fig. 1

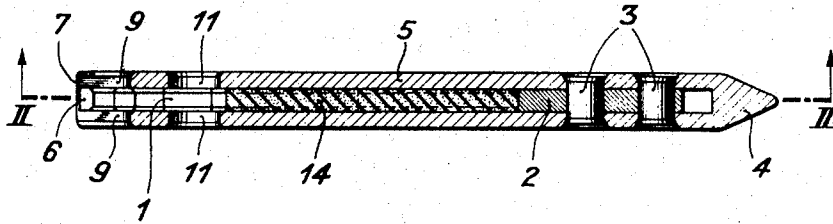


Fig. 2

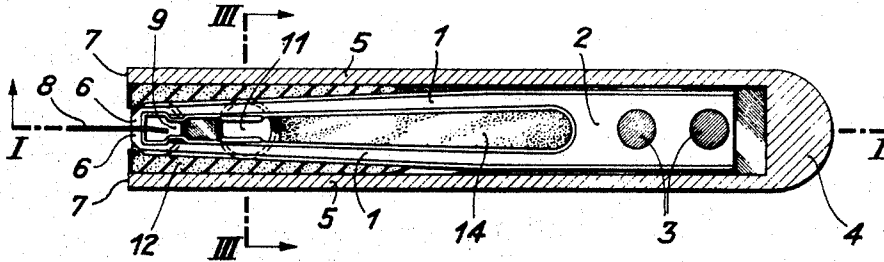


Fig. 3

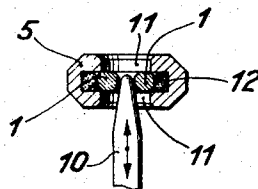
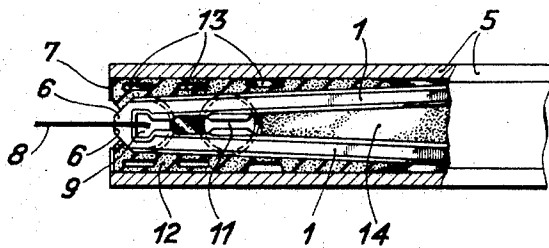


Fig. 4



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**GRIPPER SHUTTLE**

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7 Claims

**ABSTRACT OF THE DISCLOSURE**

There is disclosed a gripper shuttle in which the spaces between the spring arms which support the thread gripping jaws and the surrounding casing, and optionally also the space between those arms, are at least partly filled with a resilient foam to prevent the accumulation and compaction of foreign matter in those spaces.

The present invention relates to a gripper shuttle for picking the wefts in looms having a weft supply bobbin remaining outside the shed, the shuttle comprising a resilient weft gripper surrounded by a substantially rigid but hollow shuttle body or casing.

The weft gripper is a device comprising two resilient arms which are connected by a yoke and whose free ends carry two jaws and urge these jaws together with a certain prestressing.

The shuttle body is generally in the form of a flat, hollow casing surrounding the gripper and screening or shielding it off from the exterior. The yoke of the gripper is attached to the head of the shuttle body inside the shuttle or it may itself form this head. During picking the head points towards the catching side of the loom. The jaws are at the end of the casing, where it is usually open, and where the jaws are protected from damage from the exterior and where there is enough space inside the casing for the gripper to open and close.

In the picking motion of the loom, the jaws of the weft gripper are separated, for example by inserting a plunger opener between the two resilient arms, through suitable openings in the side walls of the shuttle body. The resilient arms, with the two jaws which are attached to their ends, are thus parted so that they can receive the end of the weft.

A yarn feed having a similarly constructed but movable gripper introduces the weft end between the open jaws of the shuttle gripper, at a recess in the rear end of the shuttle body. As soon as the plunger opener is withdrawn, the jaws close on the weft and grip it. The yarn feed then releases the weft, and the shuttle is shot through the open shed by the picking motion, while the gripper pulls the weft after it and thereby picks it through the shed.

To prevent any deviation of the shuttle from its path and any direct contact with the warp threads during picking, the shuttle is guided in the shed by a series of teeth on the sley which are arranged like a comb. These teeth are for example cut and machined from sheet steel. During picking, i.e. when the shed is open and the reed has swung back into its position of rest, these teeth project through the warp threads into the shed. During the throw of the reed and the change of shed, they are pivoted out of the shed. On the catching side the shuttle is caught and braked by the catching motion.

When released, the shuttle is ejected onto a conveying device and returns outside the shed to the picking station, to repeat the cycle. Meanwhile other shuttles the exact number depends on the picking rate, on the weft pattern, and the width of the loom and may be up to 18 shuttles

per loom in the case of known looms—have been put through the same cycle and have picked further wefts.

To reduce the metal abrasion which occurs as the shuttle runs through the track formed by the guide teeth and as the gripper opener enters, the shuttles are usually slightly lubricated by an oil mist before they reach the picking point. With known designs residual oil, dust and fluff invariably collect during operation inside the shuttle body, and when the shuttle has been in use for a fairly long period the cavities fill with compact material which interferes with satisfactory operation of the weft gripper, ultimately making picking of the weft uncertain. Since the shuttles used in the loom must therefore be changed and cleaned periodically, each loom requires two sets of shuttles. Cleaning may for example consist in placing the used shuttles in a petroleum bath in order to soften the solidified residues, whereupon the deposits can be removed with mechanical means such as hooks, scrapers and compressed air.

The resilient arms of the gripper are subjected to mechanical stresses as the gripper is repeatedly operated by the opener, and as the shuttle leaves the picking motion and runs through the track formed by the guide teeth. Apart from the direct effects of spring tension and inertia, some vibrations is imposed, especially on the resilient elements of the shuttle, by intermittent external influences. This vibration may lead to fatigue fractures of the spring gripper arms. To prevent arms fractured for this reason from causing the loom to break down, it has already been proposed that a rubber insert should be stuck to the portion of the arms which is subjected to most stress, i.e. to their foot, immediately beside the yoke between the two arms. This insert holds a broken arm inside the shuttle body. With this known design of gripper shuttle however the space between the spring arms and the inside wall of the shuttle body must be left vacant to give the resilient arms sufficient room to move when the gripper is operated by the opener, and these cavities in the shuttle body must be cleaned periodically.

It is an object of the invention to prevent dust and oil residues from entering the shuttle body and to reduce vibration in the spring arms of the weft gripper.

According to the invention, the space between the spring arms of the gripper and the inside wall of the shuttle body is at least partly filled with resilient inserts which seal this space off from the exterior.

In another embodiment of the invention, the space between the two spring arms of the gripper is at least partly filled by a further resilient insert which seals that space relative to openings in the shuttle body. The inserts must not interfere with motion and operation of the spring arms, and the sealing effect of the inserts should extend over the whole range of deflection of the arms. To this end, the inserts are formed, at least in part, of a resilient foam material, preferably a silicone-based plastic.

For greater resilience the inserts sealing the cavities in the shuttle body may contain recesses, or voids, or they may fill the cavities incompletely, but they must be such as to provide a dustproof closure for the openings as far as possible.

If there is intimate contact between the spring arms and the inserts which seal off the interior of the shuttle body, the vibration to which the arms are exposed can be substantially eliminated by choice of suitable materials. This is the case especially if the inserts are fastened, preferably by adhesive, to the spring arms and optionally to the inside wall of the shuttle body along the narrow edge thereof. Experiments have shown that if vibrations of the spring arms are prevented, the spring tension or prestressing acting on the jaws holding the weft can be reduced by up to 25% without affecting reliability of the gripper. Because effective damping of the vibrations per-

mits a substantial reduction in the initial spring tension, there can be a substantial reduction in the long-term stresses arising from this tension and in the wear on the opener and on the resilient arms of the gripper, and the weft can be handled more gently.

Preferably, therefore, instead of all inserts being made of resilient foam material, at least one insert is made of a homogeneous, i.e. compact and tougher material. For example, a silicone rubber has proved a very efficient vibration-damping material on account of its resistance to aging, its insensitivity to chemical influences and to temperature changes, and its toughness.

The construction and mode of operation of the gripper shuttle embodying the invention will now be described in further detail with reference to embodiments shown in the accompanying drawings.

#### Brief description of the drawings

In the drawings:

FIG. 1 shows a longitudinal section through a shuttle embodying the invention, taken on the line I—I in FIG. 2;

FIG. 2 is a plan sectional view of the shuttle shown in FIG. 1, taken along the line II—II of FIG. 1;

FIG. 3 is a cross-section through the same shuttle along the line III—III in FIG. 2, illustrating operation of the plunger opener; and

FIG. 4 is a fragmentary sectional view, similar to that of FIG. 2, through the end portion of another embodiment of the invention in which an insert contains recesses.

#### Description of the preferred embodiment

Referring to FIGS. 1 and 2, the gripper shuttle there shown has two spring arms 1 and a yoke 2 attached by rivets 3 to the head 4 of the tubular shuttle body 5. The gripper jaws 6, carried by the arms 1, are inside the rear end 7 of the shuttle body 5. During weaving the yarn feed (not shown) inserts the weft end 8, which is to be picked through the shed of the loom, between the two jaws 6 in a recess 9 in the shuttle body 5, the jaws 6 being open. The jaws are opened by inserting a plunger opener 10—a conical or wedge-shaped pin—through openings 11 in the shuttle body and between the arms 1 as indicated in FIG. 3. The arms and therefore the jaws 6 which are carried and pressed together by them are therefore splayed, in spite of the spring tension. To close the gripper, the opener is withdrawn, whereupon the jaws grip the weft end 8. During picking the shuttle pulls the weft after it, carrying it between the open warp threads as it passes through the shed.

To prevent oil mist and dust from entering and settling in the cavity at the rear end 7 between the arms 1 and the inside wall of the shuttle body, that cavity is filled with soft, resilient inserts 12 which are cemented or otherwise fastened to the arms 1 and to the inside wall of the narrow side of the shuttle body. These inserts are made of a resilient but dustproof material, preferably a silicone-based foam material, which can be inserted by injection moulding into the already assembled shuttle and which adheres firmly to the metal components. Alternatively, the inserts may be made up in suitable shapes and then incorporated into the shuttle. The resilience of the inserts 12 may be increased by providing voids or recesses

13 inside them (in the form of large pores in the foam) or on the outside of them, as shown in the embodiment of FIG. 4.

Foreign matter can enter the shuttles previously proposed not only at the open rear end thereof but also through the hole provided to receive the jaw-separating pin, and may adhere between the gripper arms themselves. In addition to the inserts 12, therefore, a further insert 14 may be added to the shuttle of the invention, filling at least part of the space between the two arms 1 and sealing it off from the opening 11. This insert 14 is affixed to the two arms by adhesive. Apart from its sealing effect, it serves to damp the vibrations caused in the arms by shocks from outside, and also, in the event of an arm fracturing, to hold the broken portion inside the shuttle body and so to prevent breakdown of the loom.

While the invention has been hereinabove described in terms of a number of presently preferred embodiments, the invention itself is not limited thereto. For example, other materials may be used for the various components. Thus the shuttle body 5 may be made of steel, of another metal, or of a thermoplastic or thermo-setting plastic. The inserts 12 which at least in part fill the space or clearance between the arms 1 and the inside of the body 5, and the insert 14 which at least in part fills the space between the arms 1, may be made of different materials and/or inserted or attached in different ways, to adapt them better to different stresses and requirements. More generally, the invention comprehends all modifications on and departures from the embodiments hereinabove described properly falling within the spirit and scope of the appended claims.

I claim:

1. A gripper shuttle comprising a weft gripper having spaced arms, a housing surrounding the gripper with clearance therefrom, and inserts of resilient material at least partly filling said clearance.

2. A gripper shuttle according to claim 1 wherein said inserts at least partly fill the space between the arms of said gripper.

3. A gripper shuttle according to claim 1 wherein said material comprises a foam.

4. A gripper shuttle according to claim 3 wherein said foam is a silicone-based plastic.

5. A gripper shuttle according to claim 1 wherein at least one of said inserts encloses voids.

6. A gripper shuttle according to claim 1 wherein at least one of said inserts is free from pores.

7. A gripper shuttle according to claim 1 wherein at least one of said inserts is made of a vibration-damping material.

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