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(54) **Double-doffing weaving machine provided with improved lifter driving devices.**

(57) There is disclosed a double-doffing weaving machine including computer controlled improved devices for driving the machine lifters or hooks.

The machine essentially comprises a plurality of lifters or hooks (1), with each of said lifter cooperating an electromagnet (11) and a side pusher element (12).

The lifters or hooks (1), in particular, consist of a flexible strip length (2) made of a ferromagnetic material, or plastics material, with ferromagnetic material inserts arranged at given positions.

Through the thickness of this strip there are formed, at the top, latching and discharging longitudinal slots (3, 4, 5) and, at the bottom, a further latching opening (6), there being moreover provided electromagnetic means for holding the lifters in their raised positions.

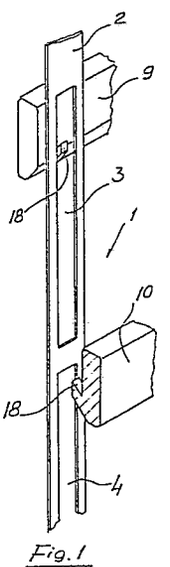


Fig. 1

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Description

DOUBLE-DOFFING WEAVING MACHINE PROVIDED WITH IMPROVED LIFTER DRIVING DEVICES

BACKGROUND OF THE INVENTION

The present invention relates to a double-doffing weaving machine including improved devices for driving the lifters or hooks thereof.

As is known, weaving machines generally comprise a plurality of lifters which operate on the warp threads under the control of driving needle members moving along horizontal paths.

Also known is the fact that the mentioned driving needle members are individually driven by pusher needles which are suitably selected by readout needles and are selectively engaged by pusher blade members.

Thus, the provision of a very great number of component mechanical members cooperating with one another, causes the construction of these weaving machines to be comparatively complex with consequent frequent maintenance operations being required.

Weaving machines are also known comprising electromagnetic elements for advantageously replacing the lifter selection and/or latching mechanical parts.

However, these weaving machines also have a comparatively complex structure and, moreover, they are scarcely reliable.

SUMMARY OF THE INVENTION

Accordingly, the task of the present invention is to overcome the above mentioned drawbacks, by providing an improved weaving machine which is very simple construction-wise and very reliable in operation.

Within the scope of the above mentioned task, a main object of the present invention is to provide such an improved weaving machine in which each individual lifter can be selected by a single electromagnet.

Another object of the present invention is to provide such an improved weaving machine including a very reduced number of moving parts.

According to one aspect of the present invention, the above mentioned task and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an improved weaving machine, of the double-doffing type, in which the grid movement is performed by substantially conventional mechanisms, said weaving machine being characterized in that it essentially comprises a plurality of lifters or hooks with each of which an electromagnet and a side pusher element cooperate, said lifters consisting of a flexible strip length made of a ferro magnetic material or of a plastic material including ferromagnetic material inserts, through the thickness of said strip length being formed, at the top, longitudinal latching and discharging slots and, at the bottom, a further latching opening, there being moreover provided electromagnetic means for holding said lifters in their raised positions.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the improved double-doffing weaving machine according to the present invention, will become more apparent hereinafter from the following detailed description of a preferred, though not exclusive, embodiment of said machine which is illustrated, by way of a merely indicative but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a perspective view illustrating a portion of a lifter with the related driving grid pair;

Figures 2 and 3 are side views showing the operating stroke of the mentioned grids;

Figure 4 is a partial top plan view illustrating the grids;

Figures 5, 6 and 7 are schematic views illustrating the procedure for the transfer of a lifter to a raised position;

Figures 8, 9 and 10 are further schematic views illustrating a driving sequence of the grids, in which said grids do not engage the related lifter; and

Figures 11 and 12 are further schematic views illustrating the procedure for the transfer of a lifter to a raised position by means of an electromagnet of a different structure and arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the figures of the accompanying drawings, the improved weaving machine according to the invention, comprises a plurality of lifters or hooks, indicated overally at the reference number 1 and having a suitable shape.

More specifically, these lifters consist of a strip length 2, having a suitable flexibility and made of a ferromagnetic material, or of a plastics material including ferromagnetic inserts at given positions, through the thickness of said strip length there being formed a first latching top slot 3, a pair of discharging intermediate slots 4 and 5, and a bottom latching opening 6.

With each of said lifters, which are engaged on top 7 and bottom 8 guides and are driven in a rais ing and lowering stroke by pairs of grids 9 and 10, cooperate an electromagnet 11 and a side pusher element 12.

The side pusher element 12 is advantageously formed by a pin affecting the lifter from an opposite portion with respect to the mentioned electromagnet, mounted on a horizontal rod 13 adapted to slide along support members 14 and counterbiassed by a resilient member (not shown) and driven by a cam mechanism 15 or the like.

In this connection, it should be pointed out that one of the mentioned grids is displaced along a vertical path 16, whilst the other is displaced along a slanted path 17.

The grids, moreover, are provided with tip portions 18 formed at suitable offset positions (as it is clearly shown in Figure 4) so as not to interfere against one another during the crossing stroke

thereof.

Under the mentioned bottom guide 8 there is provided a height adjustable plate 19 which supports, adjoining each lifter, an electromagnet 20 at one pole shoe of which there is pivoted a lever 21 having at one end thereof a hook shaped portion 22.

This hook shaped portion is specifically designed for engaging in the bottom opening 6 of the lifter so as to hold it at a raised or up position.

The opposite end of the mentioned lever, which is resiliently biassed by a spring or other operatively equivalent element, can be engaged by a pin 23 formed on a horizontal rod 24 adapted to slide along quides 25 as driven by a cam machanism 26 and also resiliently biassed.

In this connection, it should be moreover pointed out that the bending of the lifters can also be indirectly obtained by means of said electromegnet 11.

More specifically, with reference in particular to Figures 11 and 12, said electromagnet can be arranged at the left instead that at the right of the related lifter.

In this case, on the electromagnet there will be arranged an armature 27 to be engaged by the mentioned side pusher element or pin 12 and ending with a cranck end portion 27′ adapted to engage the lifter.

Thus, owing to this constructional solution, the lifter is exclusively operated upon at the contact point of the cranck end of said armature and, accordingly, it will be not subjected to wear or magnetic hysteresis phenomena.

In operation, in order to bring the lifter to a raised position, the pin 12 is rightward said placed (Figures 5, 6 and 7), so as to cause the strip member 2, forming said lifter, to bend and contact the electromagnet 11 pole shoes, with the electromagnet in an energized condition.

Alternatively, as is shown in Figures 11 and 12, as the pin is displaced, the armature 27 will be correspondingly displaced so as to bend, with its end portion, the lifter while adhering to the pole shoes of the electromagnet.

In this condition, the tip portion of the grid 10 will engage the lifter so as to entrain it upwardly; the same lifter will be held in the raised position by the engagement between the hook portion of the lever 21 and the lower or bottom opening 6 of the strip 2.

These same operating conditions occur as the grid 9, during the raising movement, does not entrain upwardly the lifter, see Figure 8, 9 and 10.

Opposite conditions, on the other hand, occur as the grid 9, during the raising stroke, must entrain the lifter, whilst the grid 10, during this upwardly stroke, must leave the lifter at a lowered position.

Obviously, the lowering movement of a filter from a raised position is obtained by energizing the respective electromagnet 20 so as disengage the shaped end of the lever 21 from the bottom opening of said lifter.

In this connection it should be moreover pointed out that the actuating of the mentioned cam mechanism will depend on the energizing condition of the electromagnets and that these electromagnets, as well as said cam mechanisms, are advantageously controlled by a computer.

While the invention has been disclosed and illustrated with reference to a preferred embodiment thereof, it should be apparent that the disclosed embodiment is susceptible to several modifications and variations all of which will come within the scope and spirit of the appended Claims.

Claims

1. An improved weaving machine, of the double-doffing type, in which the grid movement is performed by substantially conventional mechanisms, said weaving machine being characterized in that it essentially comprises a plurality of lifters or hooks with each of which an electromagnet and a side pusher element cooperate, and lifters consisting of a flexible strip length made of a ferromagnetic material or of a plastic material including ferromagnetic material inserts, through the thickness of said strip length being formed, at the top, longitudinal latching and discharging slots and, at the bottom, a further latching opening, there being moreover provided eletromagnetic means for holding said lifters in their raised positions.

2. An improved weaving machine according to Claim 1, characterized in that with each of said lifters, which are engaged on top and bottom horizontal guides and are upwardly and downwardly driven by pair of grids, cooperate an electromagnet and e side pusher element consisting of a pin acting on said lifter from an opposite side of said electromagnet, said pin being mounted on a horizontal rod adapted to slide along support members and biassed by resilient means and driven by a cam mechanism.

3. An improved weaving machine according to the preceding Claims, characterized in that said electromagnet is arranged at the left of said lifter and that on said electromagnet there is arranged an armature adapted to be engaged by said side pusher element, or pin, and ending with a cranck end portion adapted to engage said lifter.

4. An improved weaving machine according to one or more of the preceding Claims, characterized in that one of said grids is displaced along a vertical path whilst the other is displaced along a slanted path, said grids, moreover, being provided with tip portions formed at offset positions so as not to interfere one against the other during the crossing movement of said grids.

5. An improved weaving machine according to one or more of the preceding Claims, characterized in that, under said bottom guide there is arranged a height adjustable plate bearing, adjoining each lifter, an electromagnet, to one of the pole shoes of which there is pivoted a lever which ends at one end portion thereof with a hook shaped portion,said hook shaped portion being adapted to engage in the opening formed at the bottom of the lifter so as to hold said lifter at a raised position.

6. An improved weaving machine according to one or more of the preceding Claims, characterized in

that the opposite end portion of said lever, which lever is resiliently biassed by a spring, or other operational equivalent member, is adapted to be engaged by a pin formed on a horizontal rod able of sliding along sliding guides as driven by a cam mechanism and also resiliently biassed.

7. An improved weaving machine according to the preceding Claims, characterized in that said cam mechanisms and electromagnets are controlled by a computer.

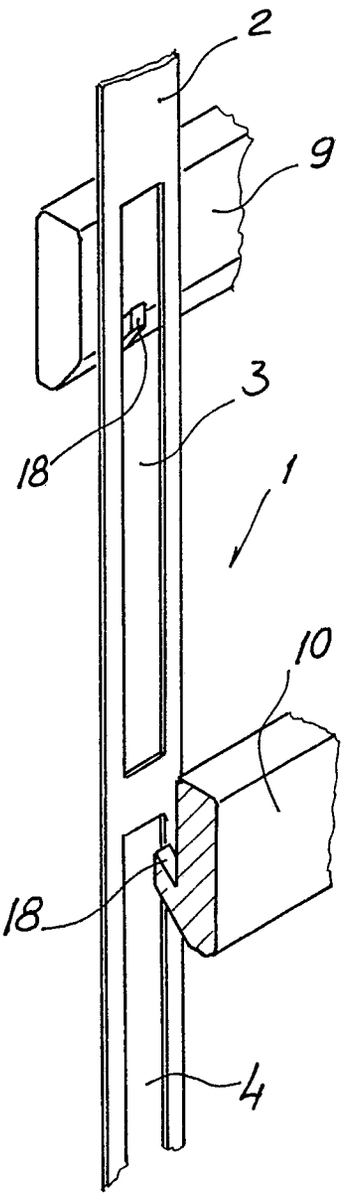


Fig.1

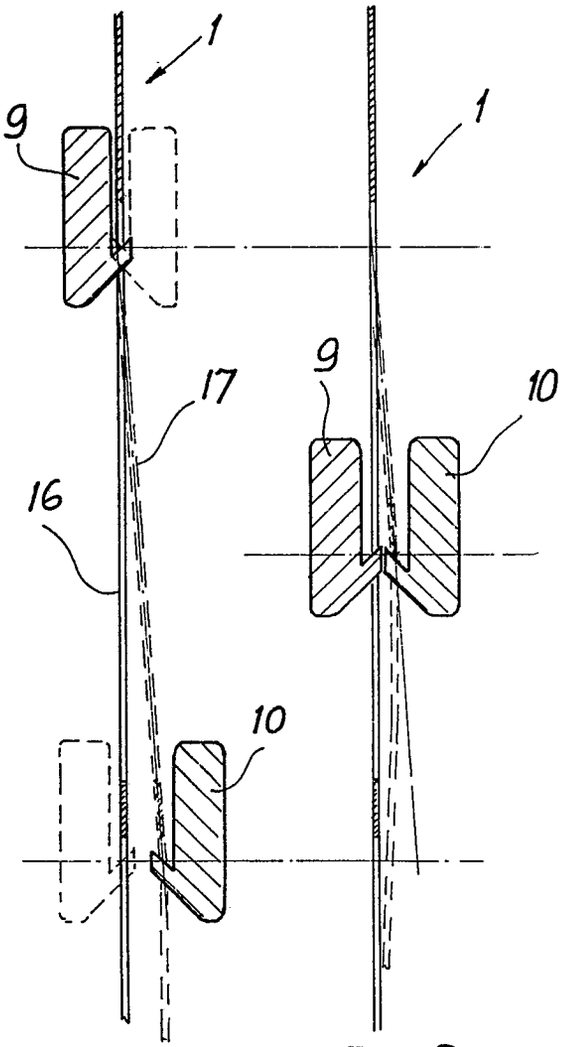


Fig.2

Fig.3

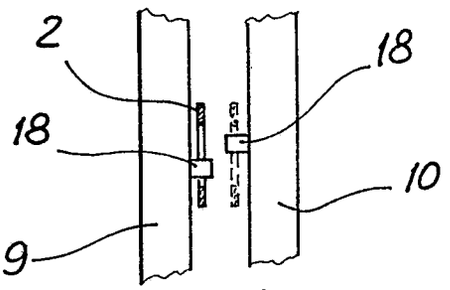


Fig.4

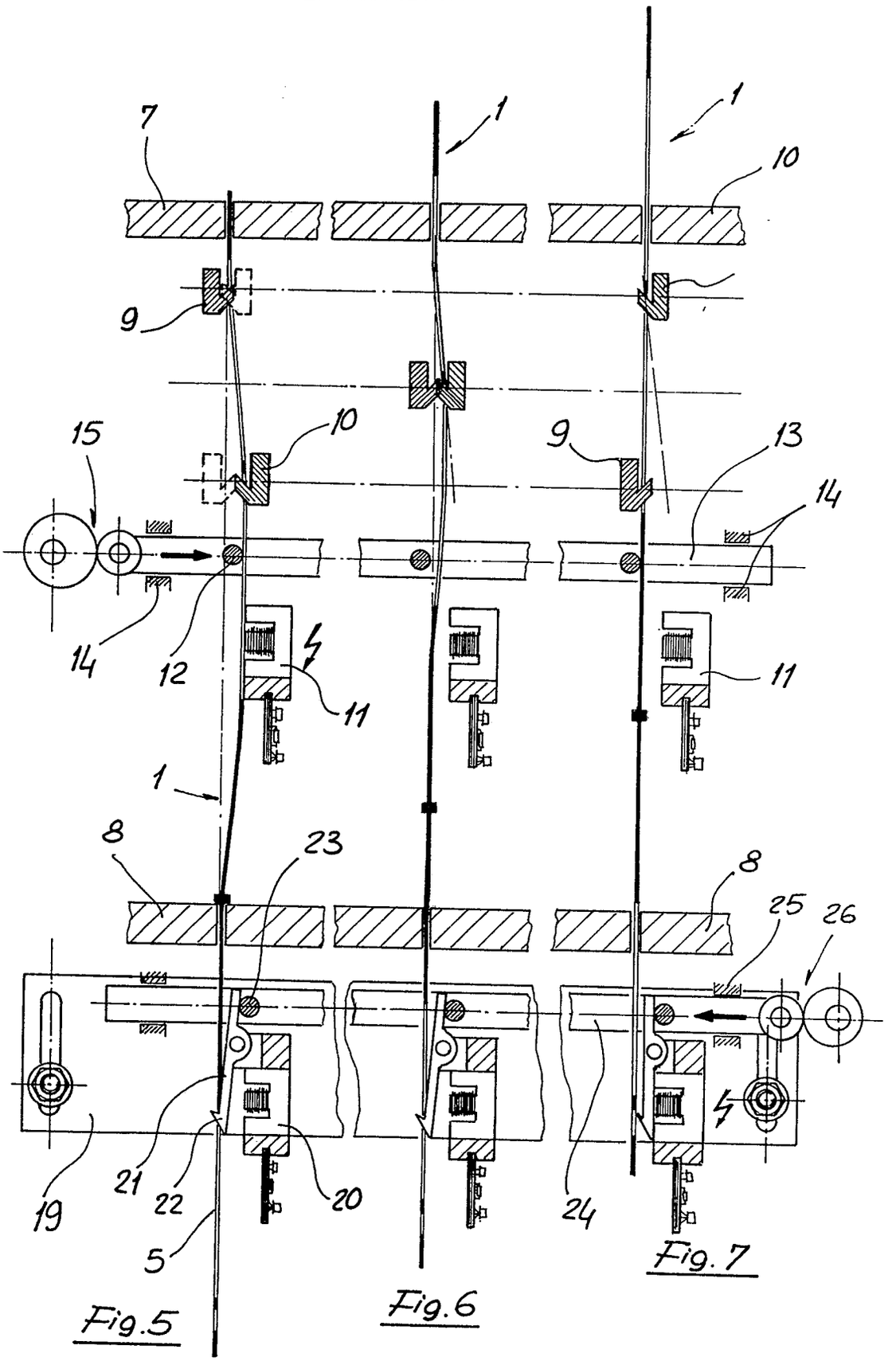


Fig.5

Fig.6

Fig.7

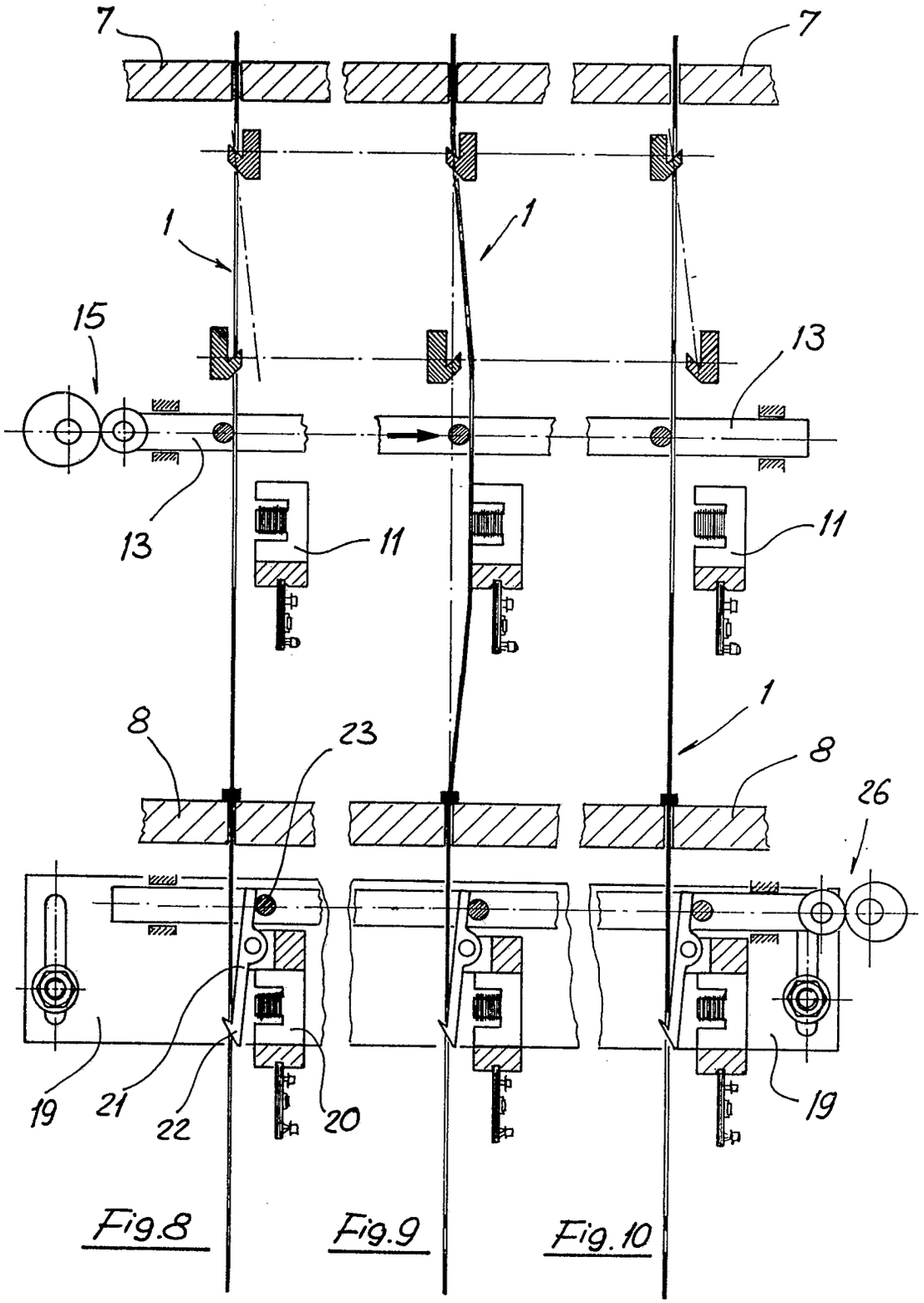


Fig.8 Fig.9 Fig.10

Fig.11

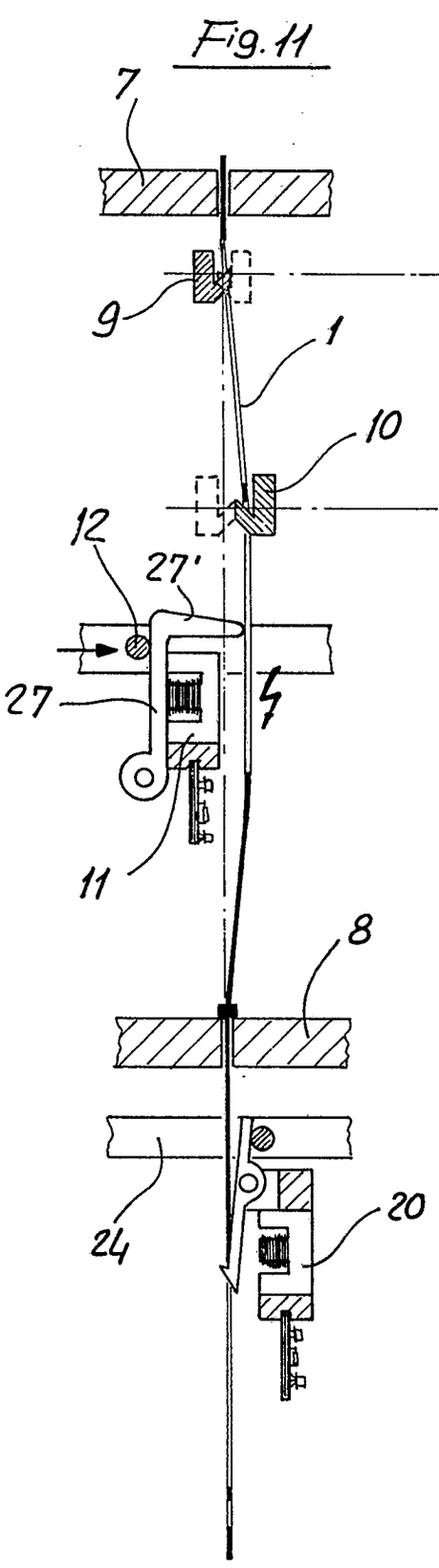


Fig.12

