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Nyman

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[54] **ARRANGEMENT FOR WEAVING WITH A HALF-CLOSED SHED IN A LOOM**

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[52] **U.S. Cl.** **139/72**

[51] **Int. Cl.** **D03c 1/06**

[58] **Field of Search** 139/66–75, 139/63, 64

[56] **References Cited**

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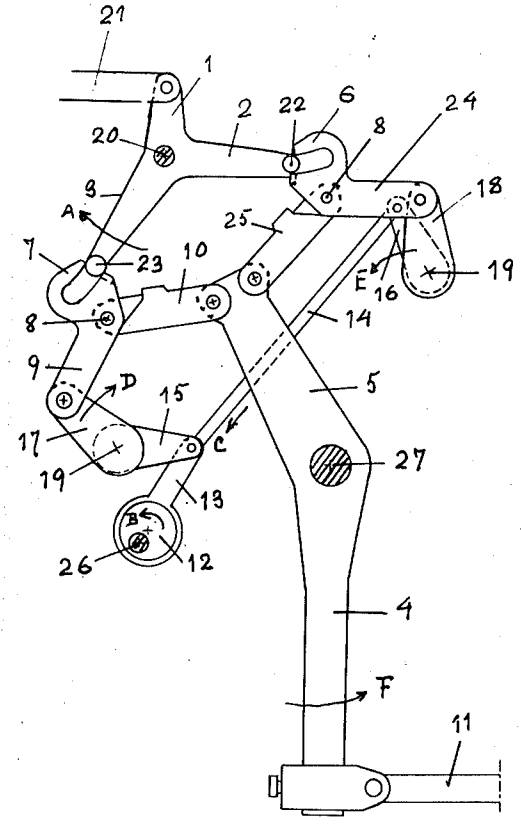
[57] **ABSTRACT**

In a loom, an arrangement for weaving with a half-closed shed i.e., an arrangement in which during a harness change, the warp threads are caused to cross and when there is no harness change, the warp threads are brought close together without reaching the plane of the cloth in which there is provided a series of levers and toggle linkages for converting a harness machine programme into required movements of the harness, with the toggle linkages also being controlled by a drive dependent on the shuttle movement.

3 Claims, 8 Drawing Figures



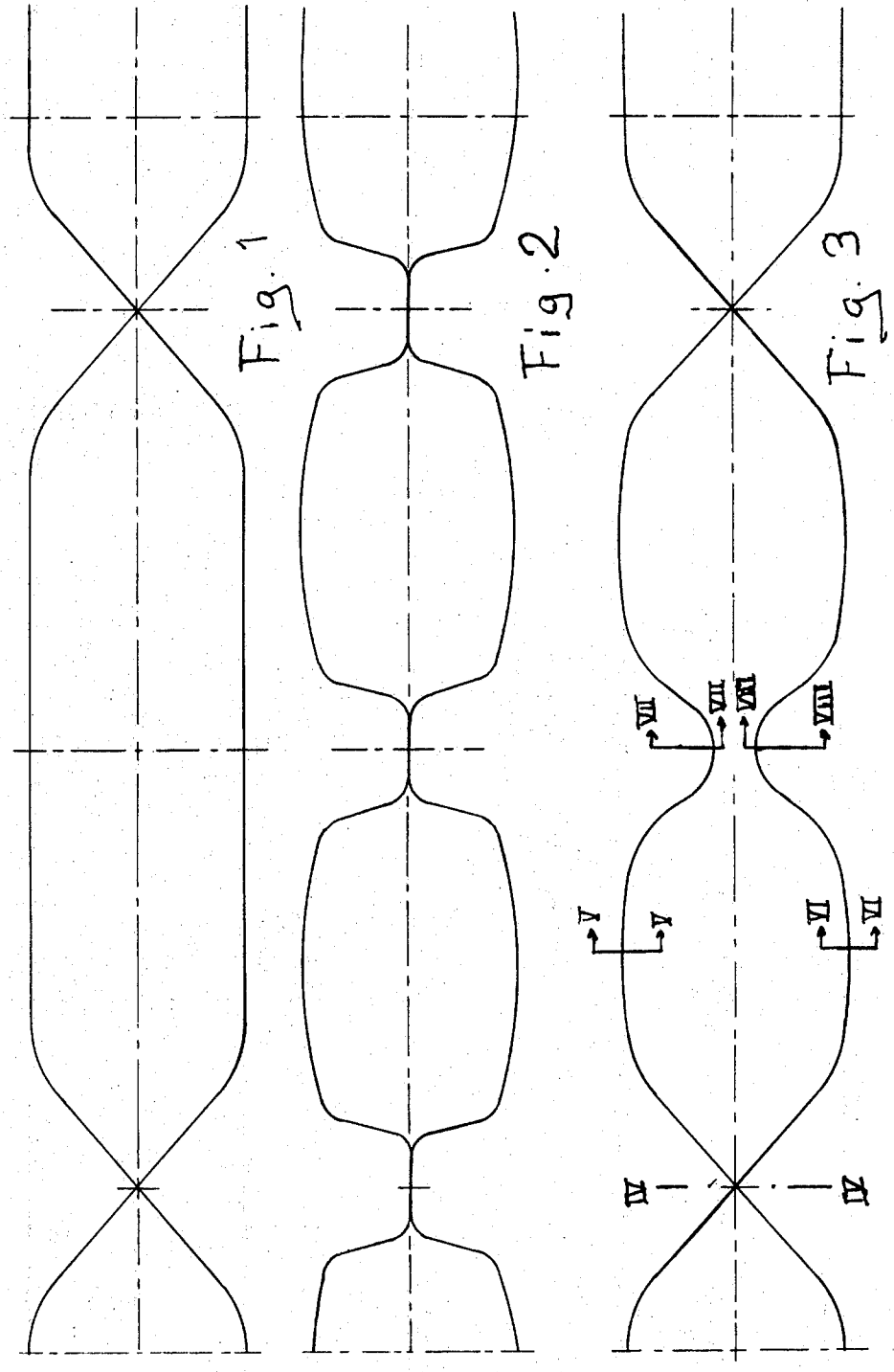


Fig. 1
Fig. 2
Fig. 3
III
III
III
III
IV
IV
II
II
II
II

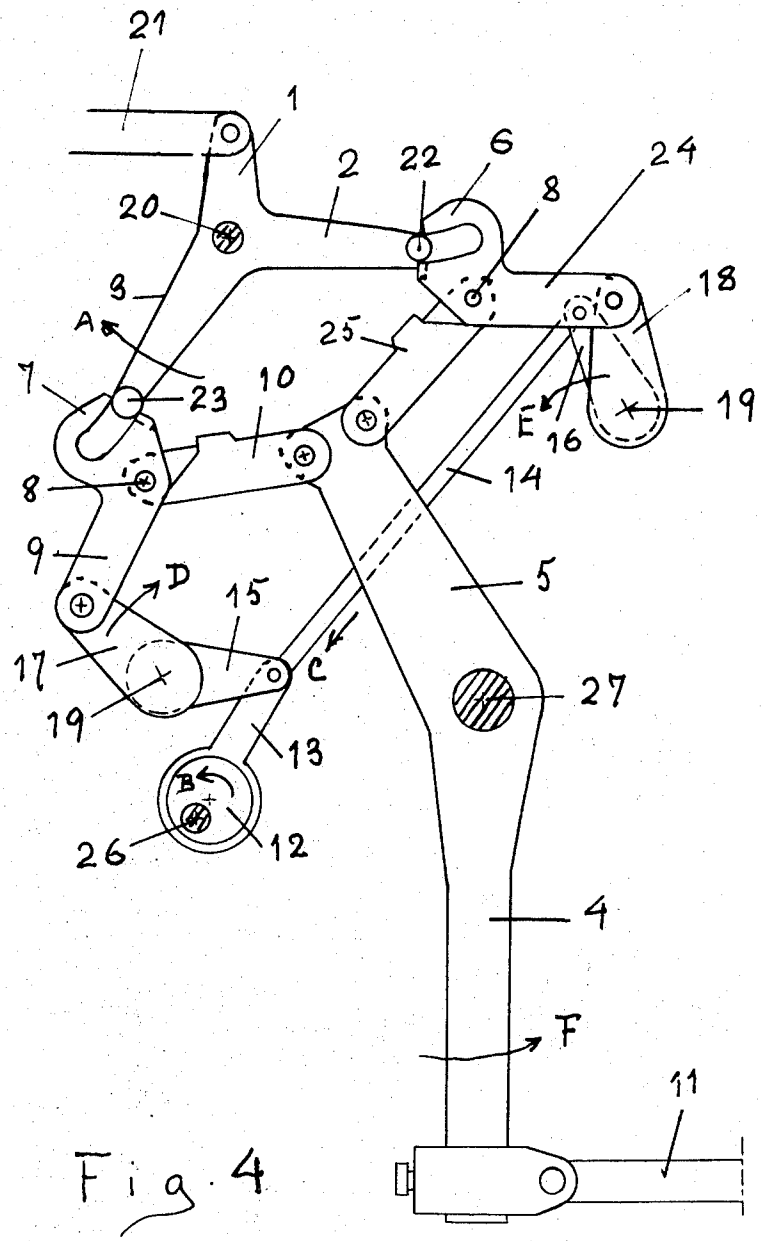

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Fig. 4

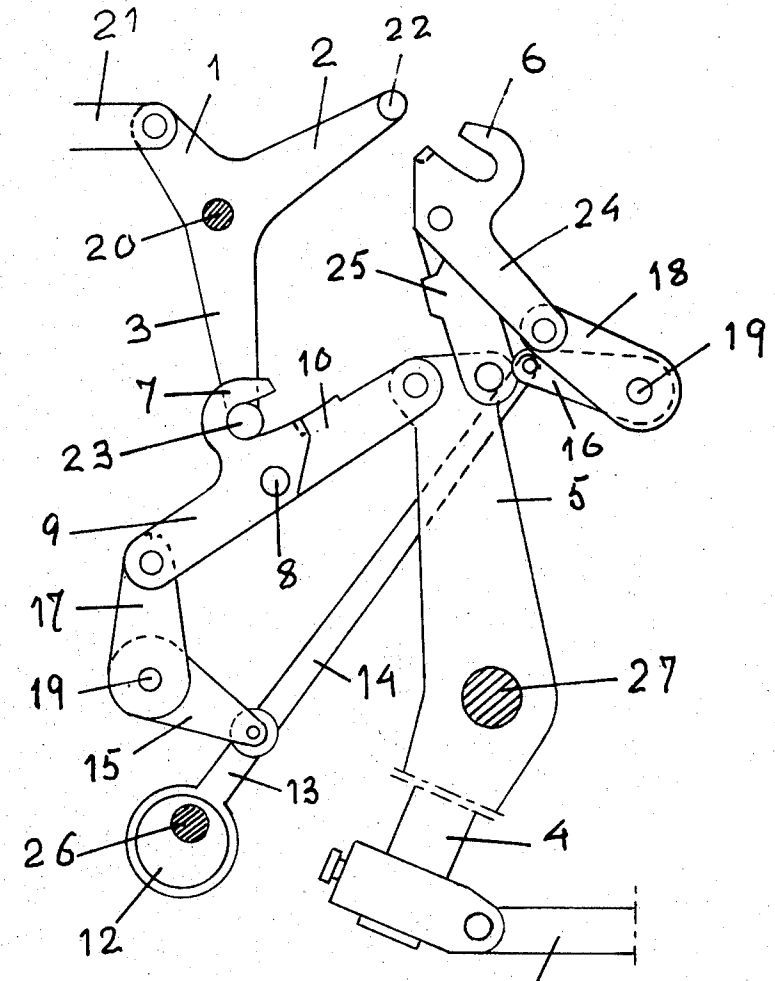

Fig. 5

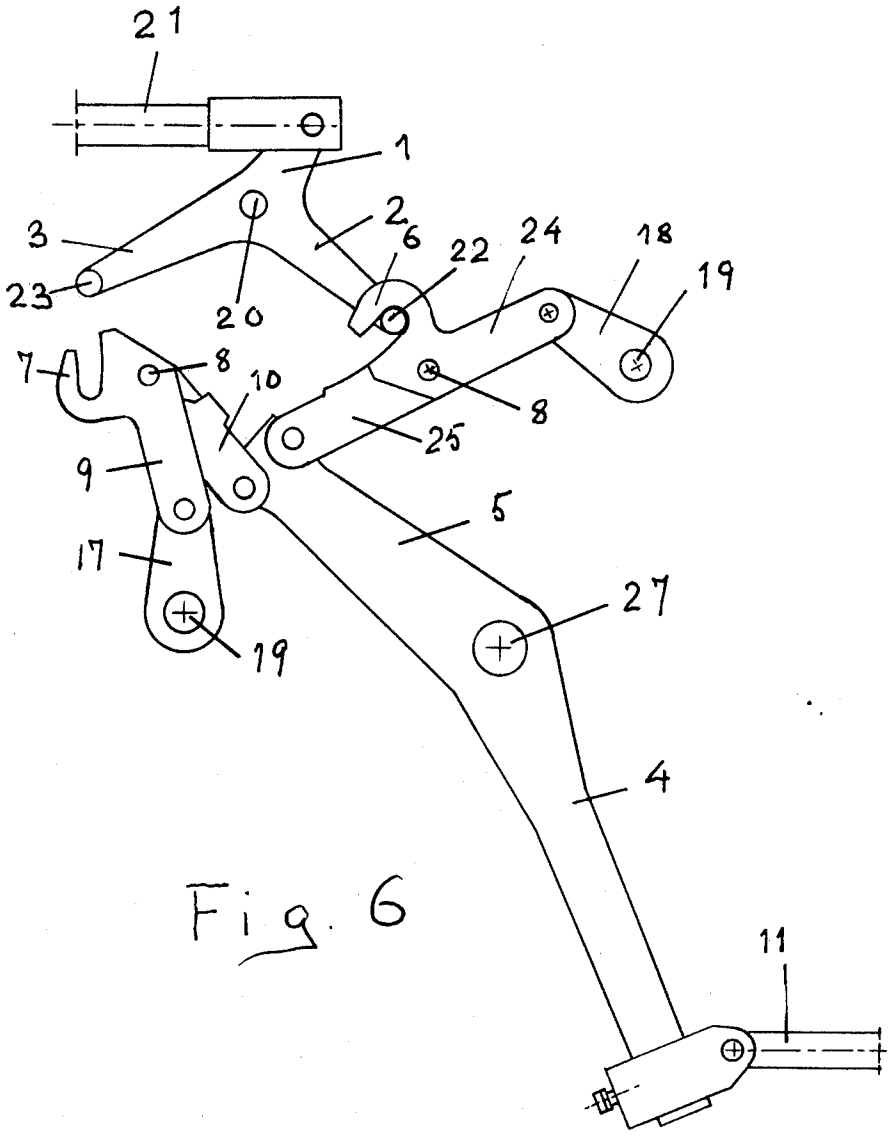

Fig. 6

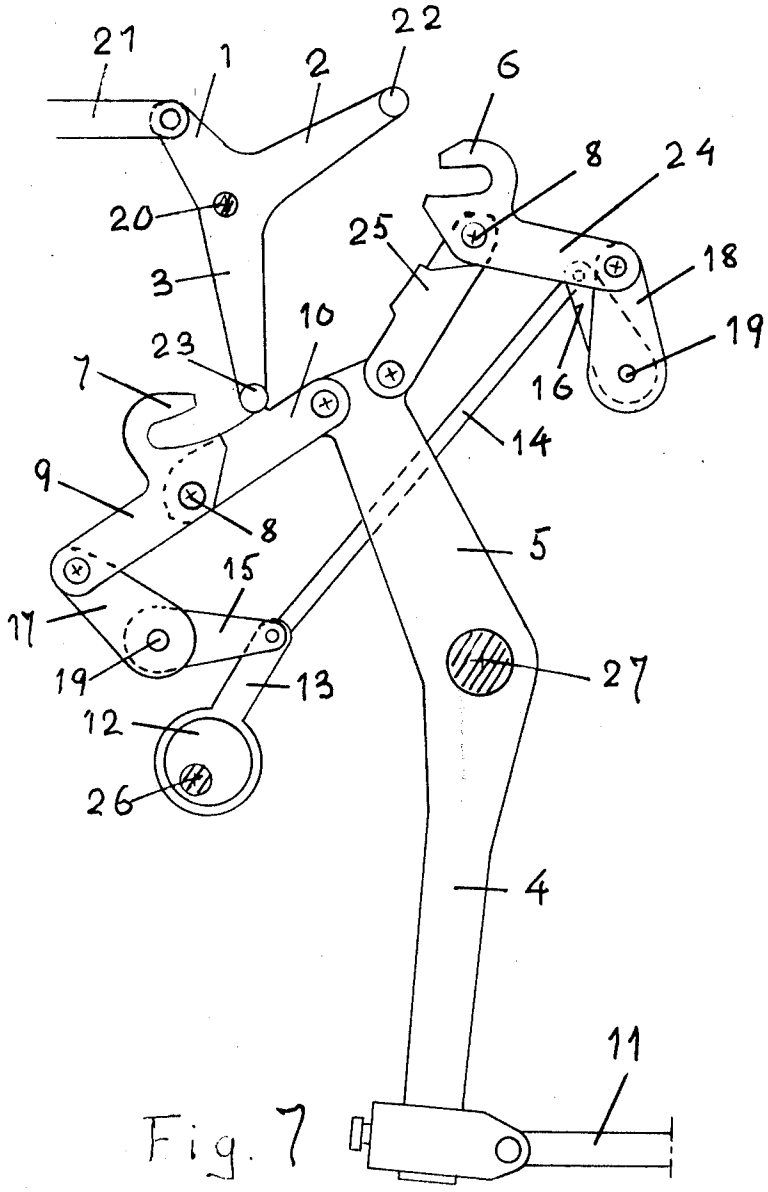

Fig. 7

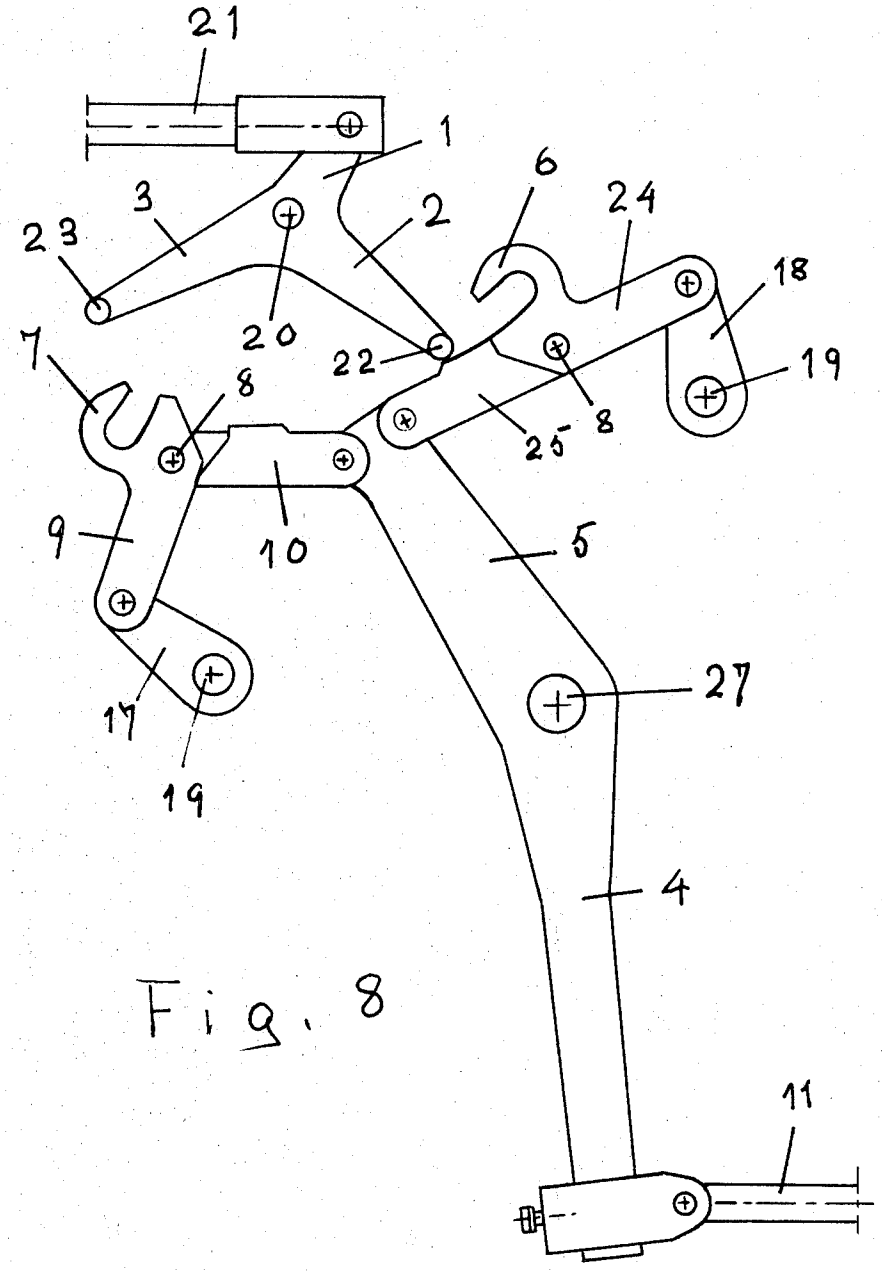

Fig. 8

AN ARRANGEMENT FOR WEAVING WITH A HALF-CLOSED SHED IN A LOOM

BACKGROUND OF THE INVENTION

In weaving on machine weaving looms it has hitherto been general practice to employ a so-called open shed, i.e., at each harness change, the warp threads are either made to cross over, or, in some cases where there has been no harness change, have remained in their assumed position.

The open shed entails a simple harness arrangement but when the harness change is omitted, the warp threads stay stretched with the risk of breakage.

Attempts have been made to eliminate this drawback by using a so-called closed shed, which means that the warp threads still cross over during a harness change, but stay parallel for a short while at the points of intersection. If there is no harness change, the warp threads are made to lie parallel in the plane of the cloth without crossing over. The tension of the warp threads is maintained in this way, but the threads slide past each other, so that friction between the threads may produce burls in the fabric, especially in the case of delicate yarns. The method also results in slower weaving. In both cases, the harness change is controlled by means of a special harness machine, which is controlled by a so-called pattern card, usually a pattern chain or a series of punched cards.

OBJECT AND SUMMARY OF THE INVENTION

The present invention proposes a new arrangement in a machine weaving loom with a harness machine for carrying out weaving with a half-closed shed, meaning that when the harness change is omitted, the warp threads are brought close together without reaching the plane of the cloth.

The invention provides an arrangement for weaving with a half-closed shed in a loom in which the harness change is controlled by a programming device, whereby the warp threads, which are made to cross over during a harness change, are if there is to be no harness change brought by the harness close to each other without reaching the plane of the cloth, said arrangement comprising at least one pair of two-armed levers mounted on a common shaft, one arm of each of which levers is adapted to control the movement of the harness through an independent push rod and each lever having associated therewith;

a. a pair of toggle linkages with one link of each linkage being pivotally connected to the other arm of the lever;

b. a pair of arms attached to separate rotatable shafts adapted to rotate with each shuttle movement in mutually opposite directions between two end positions, each said arm being pivotably connected to the other link of one of said toggle linkages;

c. and transmission means adapted, under the action of harness machine programme, alternately to straighten one of the toggle linkage while folding the other toggle linkage so that if there is harness change, a change will take place between the two linkages but there will be no such change between the linkages if there is no harness change.

The invention will now be described by way of an example with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows diagrammatically the thread course with an open shed;

FIG. **2** shows the thread course with a closed shed;

FIG. **3** shows diagrammatically the thread course with an arrangement according to the present invention, called a half-closed shed;

FIG. **4** is a diagrammatic side view of a device for harness changing according to the present invention at the line IV—IV in FIG. **3**;

FIG. **5** shows the device of FIG. **4** at the line V—V in FIG. **3**;

FIG. **6** shows the device of FIG. **4**, at the line VI—VI in FIG. **3**;

FIG. **7** shows the device of FIG. **4** at the line VII—VII in FIG. **3**, and

FIG. **8** shows the device of FIG. **4** at the line VIII—VIII in FIG. **3**.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. **4–8** show different stages in a harness change on a weaving loom with underpass harnesses, where the movements of each harness are controlled by a two-armed lever **4, 5**, whose movements themselves are determined by a programming device, for example, an endless roll-card chain, and whose movements are transmitted to the harness, for example, by a push rod **11**. The two-armed levers **4,5** are set into a reciprocating oscillation upon a common shaft **27** under the action of an eccentric **12**, which rotates synchronously with the shuttle upon a shaft **26**. The eccentric **12** acts upon an arm **13**, acting upon two arms **15, 16** of equal length, joined to each other by means of an articulated rod **14**, and each fixed on its own shaft **19**, with the shafts **19** being mutually parallel and rotatably mounted upon a frame. The free end of each lever **5** is hingedly connected via equal length toggle linkages **9**, 10, 24, 25 to two equal length levers **17, 18** which are attached to the shafts **19**. Each toggle linkage consists of two links **9, 10**, or **24, 25**, which are of substantially the same length and are joined to each other by a toggle joint **8**.

Each member **9, 24**, pivotably connected to the arms **17, 18**, is provided at the joint **8** with a hook **6, 7**, the openings of said hooks **6, 7** facing towards each other.

A three-armed lever **1, 2, 3** for each harness is pivotably mounted upon a shaft **20**, fixed to the frame parallel to the shafts **19**. One arm **1** of the lever is adapted to be operated by the programming device in such a way, for instance, through an articulated rod **21**, as to swing between two end positions, one of which is shown in FIGS. **5** and **7** and the other in FIGS. **6** and **8**, while FIG. **4** shows an intermediate position.

The other two arms **2, 3** of the lever are provided at their free ends with pins **22, 23**, parallel to the shaft **20** and each of which is adapted to engage the corresponding hook **6, 7**.

The toggle joint **8** is so shaped that the links **9, 10** and **24, 25** can be folded up on the one but not on the other side. The arms **15, 16** are so connected to the arms **17,** 18 as to make the latter arms **17, 18** pivot under the action of the movement of the eccentric **12** in opposite directions between two end positions, one of which is shown in FIGS. **5** and **6** and the other in FIGS. **4, 7** and **8**.

The eccentric **12** is adapted to make one revolution for every move of the shuttle, while the three-armed lever **1, 2, 3** alters its position only at the change of the harness positions, effected synchronously with the shuttle move in accordance with the pattern of the programming device (not shown).

The arrangement operates in the following way:

At the point of time indicated by the line IV—IV in FIG. **3,** the three-armed lever **1, 2, 3** is swung in the direction shown by the arrows A in FIG. **4.** At the same time, the eccentric **12** will rotate, for example, in the direction of the arrow B and make the articulated rod **14** move in the direction of the arrow C, whereby it causes the arm **17** to swing in the direction of the arrow D and the arm **18** to swing in the direction of the arrow E.

Since the arm **3,** as it swings, will release the hook **7,** the linkage **9, 10** will be able to fold about its toggle joint **8,** while the arm **2** will, as it swings, urge the toggle joint **8** of the linkage **24, 25** into a position in which the linkage **24, 25** is straight. In this way, the linkage **24, 25** will cause the lever **4, 5** to pivot in the direction of the arrow F and through the push rod **11** assume its harness change position. The movement described above results in the position which corresponds to the line VI—VI in FIG. **3** and is shown in FIG. **6.**

Simultaneously, another three-armed lever **1, 2, 3** is being slewed in the opposite direction, and as a result of which, the constituent parts assume the position which is shown in FIG. **5** and corresponds to the line V—V in FIG. **3.**

The above sequence applies to the operation in an ordinary harness change.

If a harness change is not to take place according to the programming, the pair of three-armed levers **1, 2,** 3 remains in its position shown in FIGS. **5** and **6,** while the eccentric **12** continues to turn through one revolution for every shuttle move. Thus, it makes the devices associated with a harness briefly assume the position shown in FIGS. **7** and **8,** whereby the corresponding warp threads simultaneously come to assume the positions that correspond to the lines VIII—VIII and VII—VII in FIG. **3.**

Although only one embodiment has been shown and described, other forms are possible within the scope of the invention. At the cost of minor modifications in the shape of the arm **4, 5** and the push rod **11** the arrangement can be applied also to harnesses operated from above. Similarly the levers **1, 2, 3** and the hooks **6, 7** may be formed in several different ways.

I claim:

1. An arrangement for weaving with a half-closed shed in a loom in which a harness change is controlled by a harness machine programme of a programming device, whereby the warp threads, which are made to cross over during a harness change, are if there is to be no harness change, brought by the harness close to each other without reaching the plane of cloth in the loom, said arrangement comprising at least one pair of two-armed levers mounted on a common shaft, one arm of each of said levers being adapted to control the movement of the harness through an independent push rod and each two-armed lever having associated therewith

a. a pair of toggle linkages with one link of each linkage being pivotably connected to the other arm of each of said two-armed levers;

b. a pair of arms attached to separate rotatable shafts adapted to rotate with each shuttle movement of the loom in mutually opposite directions between two end positions, each arm of said pair of arms being privotably connected to the other link of each of said toggle linkages;

c. and transmission means adapted, under the action of the harness machine programme, alternatively to straighten one of said pair of toggle linkages while folding the other one of said toggle linkages so that if there is a harness change, a change will take place between said pair of linkages, but there will be no such change between the linkages if there is no harness change.

2. The arrangement according to claim **1,** wherein said transmission means includes a hook mounted on each of said toggle linkages with the hooks facing each other and, a pivotal three-armed lever, one arm of which is hingedly connected to the programming device, and the two other arms of said three-armed lever being provided with pins adapted to respectively engage said hooks depending on the angular position of said three-armed lever, the programming device, being adapted to swing the lever during a harness change from one end position to another, but leave the angular position of said three-armed lever unaltered if there is no harness change.

3. The arrangement according to claim **2,** including an eccentric adapted to make one revolution for each shuttle move of the loom thereby to rotate said separate shafts through a further linkage connected therebetween, and hence to move said pair of arms connected to the other links of each of said pair of toggle linkages.

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