United States Patent

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[33] **Switzerland**
[31] **4863/68 and 4268/69**

[54] **DOBBY MACHINE**
10 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **139/71**
[51] **Int. Cl.** **D03c 1/06**
[50] **Field of Search** ..... 139/71, 68, 71 A, 74, 66

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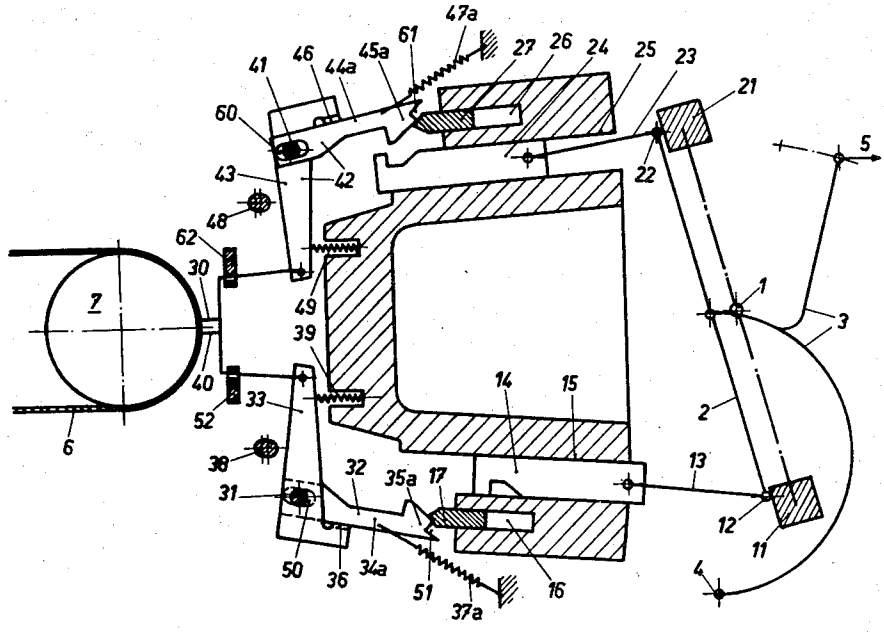
ABSTRACT: A dobby machine has retaining hooks which are guided for rectilinear reciprocal movement and are connected by pivoted links to opposite ends of a rocking member connected by linkage with a heald or dobby shaft. Each of two two-part levers comprises two lever parts which are pivoted about a common pivot and are movable relative to one another. One lever part has a hook portion and constitutes a holding hook engageable with the respective retaining hook. The other lever part carries a reading needle for sensing a pattern controlling the machine and has a portion engageable with the holding hook lever part to control whether or not the holding hook is in position to engage the respective retaining hook. When the hooks are engaged with one another, a locking member releasably engages the holding hook to hold it in engaged position. However, the holding hook is movable longitudinally relative to its pivot to free it from the locking member.



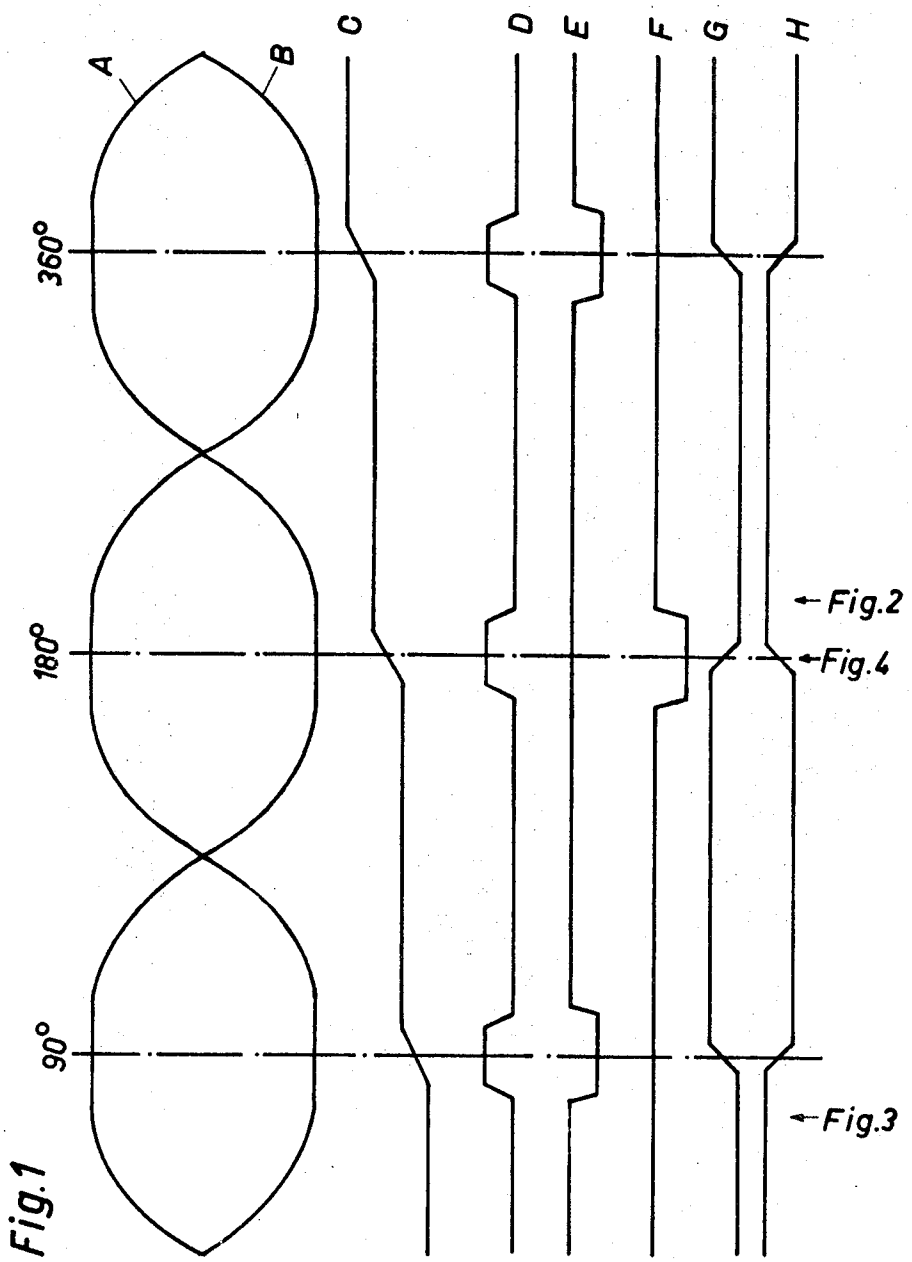


Fig.1

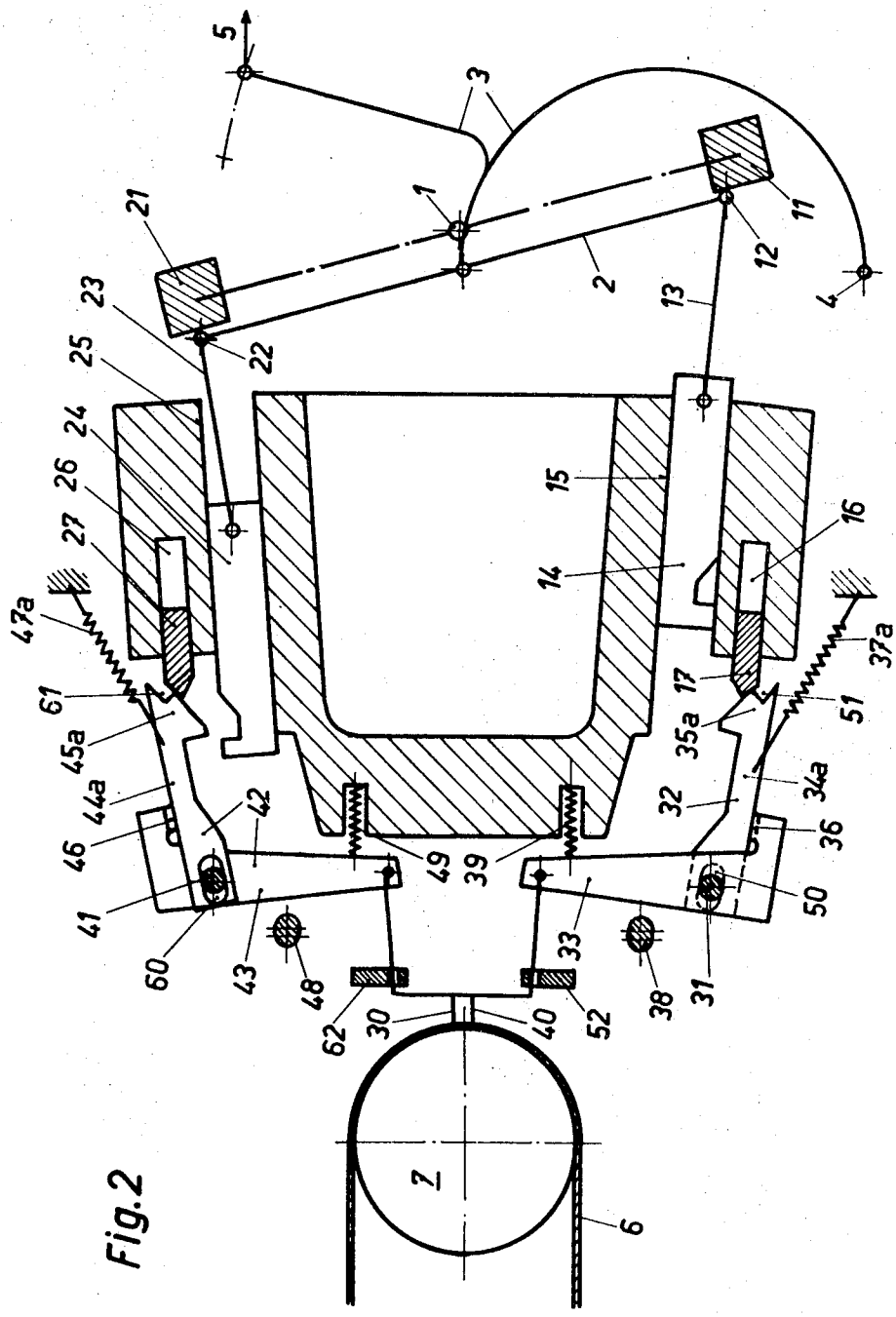

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Fig.2

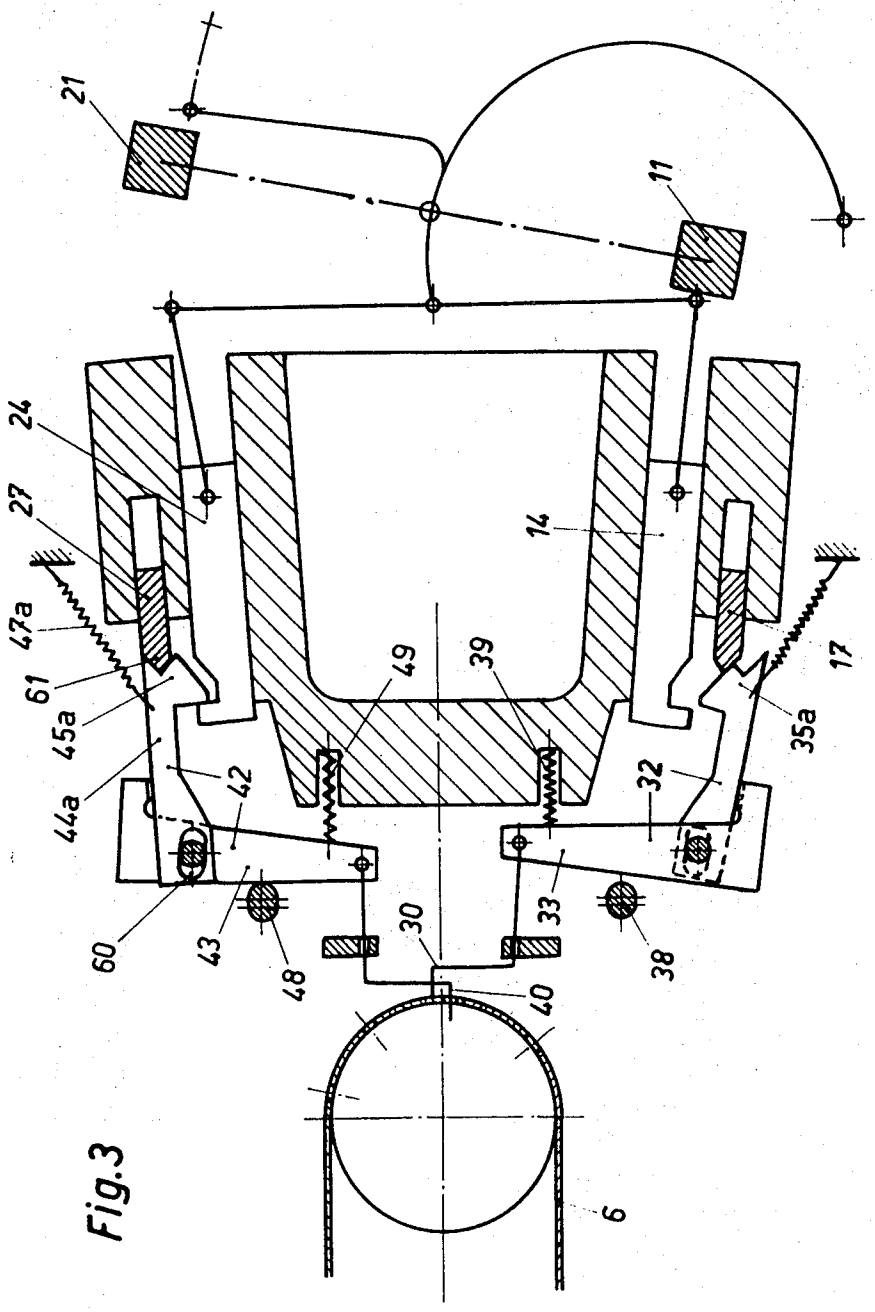
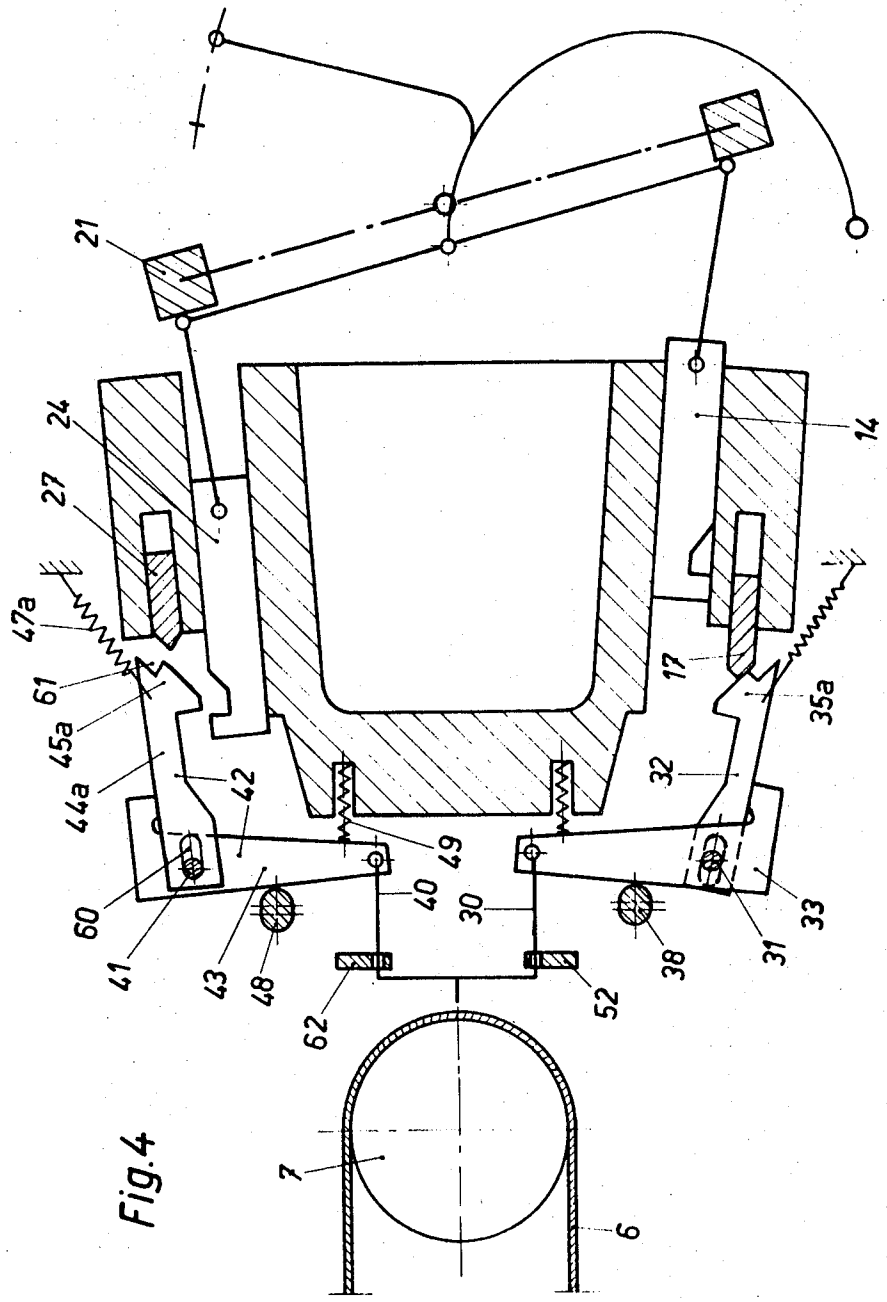


Fig.3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44a
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32
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35a
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Fig.4

Fig.5

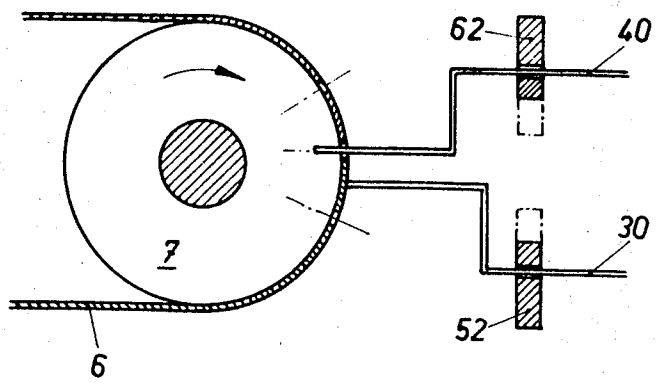
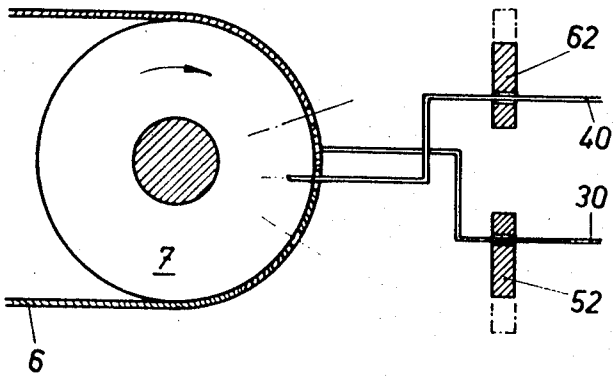


Fig.6



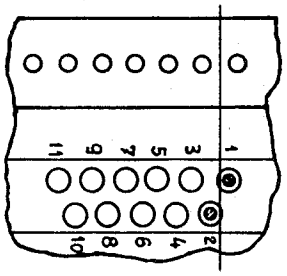


Fig.7

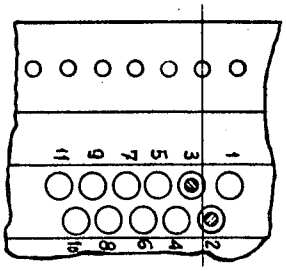


Fig.8

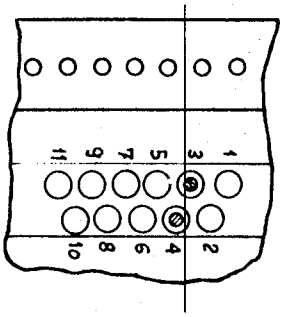


Fig.9

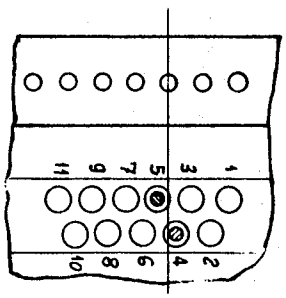


Fig.10

DOBBY MACHINE

In known dobby machines for controlling the movement of loom shafts, reading of a perforated pattern card takes place in a time interval during which a shaft is being raised or lowered, and a preliminary needle system is normally required. An object of this invention is the provision of a direct-acting reading system, which may be applied to a known kind of dobby machine mechanism and in which the ends of a rocker element are alternately struck by cross pieces; retaining hooks are secured in position according to a particular pattern being used and a shift in the reading action takes place in a time interval during which the loom shed is stationary.

The invention provides a dobby machine in which the position of at least one retaining hook, which is connected to an associated shaft or to a heald by way of a mechanical linkage, is adapted to be controlled by a perforated card, by means of a two-part lever whose two constituent parts are mounted on a common pin and are angularly moveable relative to one another; under the action of a spring, each of the lever parts abutting a stop element on the other lever part; and machine being characterized in that a first part of the lever carries a reading needle which, together with the first lever part, is adapted to be periodically lifted by a drive member from the pattern card against the biasing force of a spring, and the first lever part is adapted to be released so that it can move towards the pattern card; and the other part of the lever, is adapted to control the position of the retaining hook either by releasing the hook or, by engaging under or in the hook.

Theoretical and practical tests on the above-described dobby machine have shown that there is obtained—by reason of a reading clearance between retaining hook and holding hook which is necessary for satisfactory functioning—a stationary condition of the shed over an angular range of 58–62° in respect of the drive crankshaft. In the case of a reading clearance of 3–5 mms. this corresponds to an angular range of about 19–31°on the camshaft of the dobby machine.

An embodiment of the invention is illustrated by way of an example in the accompanying drawings, in which:

FIG. **1** is a diagram representing the movements of the driven parts of a dobby machine;

FIG. **2–4** each show, diagrammatically, a different position of the dobby machine;

FIGS. **5** and **6** show details relating to the movement of reading needles, in two respective positions of the needles and on an enlarged scale; and

FIGS. **7–10** are each plan views of a section of a pattern card with reading needles in position.

Before any movement of the dobby mechanism is described, and before reference is made to the associated diagram, the principle features of the structure of the dobby machine will be explained with reference to FIG. **2**.

Lower and upper thruster cross pieces **11** and **21** respectively adapted uniformly to swing to and fro about a pin **1**, lie against the respective ends **12, 22** of a rocker member **2**. Articulated to the center of the rocker member **2** is a pivot lever **3** which is supported from a shaft **4** and is connected, by way of pull rod **5**, to a dobby shaft, not shown. Retaining hooks **14, 24** are respectively articulated, by way of connecting bars **13, 23** to the respective ends **12, 22** of the rocker member. Under the effect of impact by the thruster cross pieces **11, 21**, the retaining hooks **14, 24** slide in respective guides **15, 25** which ensure that they are accurately guided.

A perforated pattern card **6** serves to control the movement and in particular the position of the dobby shaft, this pattern card **6** being driven by card cylinder **7**, with reading needles **30, 40** reading the holes constituting the pattern. Two-part levers **32, 42** are mounted on respective pins **31, 41**; the first lever parts **33, 43** carrying the respective reading needles **30, 40**, and the second lever parts **34***a*, **44***a* being formed as holding hooks **35***a*, **45***a*.

In the inoperative position, that is to say when no external force acts on the levers **32, 42**, the first and second lever parts lie against one another in the region of stops **36, 46** under the biasing force of tension springs **37***a*, **47***a* and of compression springs **39,49**. The second lever parts **34***a*, **44***a* are not only rotatably mounted but also slidably mounted, by way of slots **50, 60**, on pins **31, 41**. To raise levers **32, 42**, that is to say to lift the reading needles from out of the pattern card, use is made of rotating cams **38, 48**, while the compression springs **39, 49** press the first lever parts **33, 43** respectively against their associated cams.

Slidable locking members **17, 27**, which are actuated by the machine drive (not shown), are capable of executing reciprocating movement. The points or tips of the holding hooks **35***a*, **45***a*, which face towards the slidable locking members **17, 27**, each comprise a notch **51, 61** whose shape is complementary to that of the wedge-shaped tip of the slidable locking members **17, 27**.

In a known manner FIG. **1** relates the points of time at which the movements of the various driven members of the dobby machine occur in relation to the angular movements of the camshaft. Thus:

A is a curve representing the movement of the lower thruster cross piece **11**, B is a curve representing the movement of the upper thruster cross piece **21**,

C is a curve representing the movement of the control cylinder **7** of the pattern card **6**,

D is a curve representing the movement of the cams **38, 48** for lifting the needles from the pattern card,

E is a curve representing the movement of the lower slidable locking member,

F is a curve representing the movement of the upper slidable locking member,

G is a curve representing the movement of the needle guide **62** for the even-numbered picks (weft),

H is a curve illustrating the movement of the needle guide **52** for the odd-numbered picks (weft).

The diagram, taken in conjunction with FIGS. **3** and **4**, illustrates the points of time at which the positions illustrated in the FIGS. are assumed. FIGS. **2** and **4** illustrate the lower shed position of the dobby shaft, and FIG. **3** the upper shed position thereof.

The manner of operation of the dobby machine will now be further elucidated with reference to the different FIGS. In FIGS. **3** and **4** only those parts are referenced which are necessary for illustrating the functioning of the machine, the reference numerals corresponding to those of FIG. **2**.

In the position illustrated in FIG. **2** the upper cross piece **21** is shown moving to the rear after it has struck against the retaining hook **24**. The needle **40** lies against the pattern card **6**, as no hole is present for reading at that point. The holding hook **45***a* is raised and is secured in position by the slidable locking member **27**, so that the retaining hook **24** follows the crosspiece **21** to the right, this movement being initiated by the tensioning force of the pull rod **5**. The lower retaining hook **14** is also in the inward position and the holding hook **35***a* is held in position by the slidable locking member **17**. The dobby shaft is in the lower shed position.

In the position illustrated in FIG. **3** the upper retaining hook **24** is—as determined by the configuration of the pattern card—held in its outwardly thrust position by the holding hook **45***a*, in which the tip of the slidable locking member **27** firmly engages in the notch. Subject to the biasing force of spring **49**, the reading or sensing needle **40** of lever **42** has penetrated a hole in the pattern card **6**, and the holding hook **45***a* is secured in position by slidable locking member **27**. This position of the upper hooks **24, 45***a* remains unaltered until the next but one reading action performed by the needles. The lower thruster cross piece **11** is about to assume its most forwardly advanced position, that is to say the lower retaining hook **14** is also in its outwardly thrust position. As the upper hooks **24, 45***a* are in interlocking connection with one another, the dobby shaft is about to assume the upper shed

position. Movement of lower holding hook **35***a* is still prevented owing to the presence of slidable locking member **17** which engages the notch **51** in its tip. At the next instant of time the slidable locking member **17** will be withdrawn so that the holding hook **35***a* will be freed for the following control action, as determined by the pattern on the pattern card. The cams **38, 48** then come into operation, that is to say both first parts **33, 43** of the two-part levers **32, 42** are pivoted, by rotation of the cams, into the position shown in FIG. **4**, so that the reading needles **30, 40** are lifted from the pattern card.

FIG. **4** shows the dobby mechanism at another instant of the working cycle and reads a different pattern on the pattern card from that which was read in the case of FIGS. **2** and **3**. As determined by the pattern card the lower holding hook **35***a* does not interlockingly engage with retaining hook **14**. It is however secured by the slidable locking member **17** in the nonengaging position. The upper crosspiece **21** has struck against the upper retaining hook and the slidable locking member retracted, so that the two hooks **45***a*, **24** are ready to enter into locking engagement as soon as the reading needle **40** lies in front of a hole in the pattern card **6**. The reading needles **30** and **40** are lifted, as the cams **38, 48** have pivoted their carrier levers **33, 43** about the pins **31** and **41** respectively. The pattern card can be moved forward by the cylinder **7** to the extent of one further pick. At the same time the needles **30, 40** are caused, by the needle guides **52, 62**, to execute a further movement which will be described below.

The pivotal movements, initiated by the cams **38, 48**, of the parts **33, 43** may take place independently of the position of the holder hooks **35***a*, **45***a* and irrespective of the fact that these hooks **35***a*, **45***a* are retained in position by the slidable locking members **17, 27**, because the levers **32, 42** are constructed as double levers which can execute pivotal movements relative to one another. If part **33** in FIG. **4** is relieved by the further rotation of cam **38**, then lever **32** will remain in its original position, as it is maintained in position by the slidable locking member **17**. In the course of further rotation of cam **48**, however, spring **49** pivots lever **42** against the biasing force of spring **47***a*, so that the reading needle **40** lies against the pattern card **6**. If a hole is present in the pattern card **6**, then lever **42** assumes the position shown in FIG. **3**; if no hole is present in the pattern card in front of the needle, then the lever **42** assumes the position shown in FIG. **2**.

After interlocking engagement has taken place between holding hook **45***a* and retaining hook **24** (the position illustrated in FIG. **3**), the tip of the slidable locking member **27** engages, in the course of its forward movement, into the notch **61** and at the same time shifting part **44***a* to the left, so that the reading clearance between the two hooks **45***a* and **24** is eliminated. The mounting of part **44***a* in the elongate hole **60** enables this movement to take place against the tensioning effect of spring **47***a*. The thruster cross piece **21** only commences its rearward pivotal motion when the holding hook **45***a* is held in position by the slidable locking member **27**. Thus, the mechanism illustrated enables elimination of the known reading play between the contact surfaces of the holding hooks and the retaining hooks, this play being necessary for correct functioning; consequently, the dobby shaft can operate substantially without jolts or shocks.

The sequence of actions described below applies both to the upper and lower mechanisms, although they are only described in relation to the upper mechanism. THe elongate hole in part **44***a* is made sufficiently long to ensure that it serves as a securing means when the machine is not operated in the correct sequence, for example when the pattern card is being changed or when the machine is incorrectly handled. If the retaining hook **24** should in this way be unexpectedly thrust forward by its thruster cross pieces **21**—the corresponding holding hook **44***a* being held in the position of interlocking engagement (FIG. **3**)—then this would lead **3**)—damage being inflicted on the machine. In the present instance, however, the head of the retaining hook **24** presses against the holding hook **45***a* and shifts it further to the left—this being permitted by the elongate hole **60**—until it is pulled round the tip of the slidable locking member **27** by the spring **47** *a*.

With the above described arrangement, the slidable locking member **27**—when the holding hooks and retaining hooks are in mutual retaining engagement—assumes the function of holding the dobby shaft in the raised position. It is now the slidable locking member **27**, and no longer the mounting pin **41**, which bears the weight of the dobby shaft. It is thus possible, firstly, to make the part **44***a* and the bearing **41** lighter than in conventional machines and, secondly, to reduce the friction at the bearing **41**. The result of this is that friction and inertia no longer reduce the reading speed to the same extent as with conventional machines so that an increase in the operating speed is possible. At the same time this arrangement enables lighter compression springs **49** to be used, which causes the reading needle **40** to bear with less weight on the pattern card and thus cause less wear thereto.

To enable the above described dobby machine with two reading needles per dobby shaft to function automatically, that is to say in the correct working sequence, in both forward and backward motion, the reading needles **30, 40** are connected to the double levers **32, 42** in an articulated manner and are guided in guides **52, 62** (FIGS. **5** and **6**). The needle **40** reads the even-numbered pick and the needle **30** the odd-numbered pick. One and the same pick, for example an even pick in this instance, is thus successively read twice by the needle **40**, despite the fact that the cylinder has moved on. The movement of the guides is so controlled that the pattern card is read by the needles in accordance with the following table and in the manner illustrated in FIGS. **7–10**.

In FIGS. **7–10** the reading points (holes) of the pattern card are numbered as **1–11**.

According to FIG. **7** the second pick is read for the forward motion V, and the first pick is read for the rearward motion R.

According to FIG. **8** the third pick is read for the forward motion V, and the second pick is read for the rearward motion R.

According to the FIG. **9** the fourth pick is read for the forward motion V, and the third pick is read for the rearward motion rearward motion R.

According to FIG. **10** the fifth pick is read for the forward motion U, and the fourth pick is read for the rearward motion R.

Instead of cams **38, 48** it is possible to use, in a known manner, a reciprocating bar. The lifting of the needles **30, 40** and of the slidable locking members **17, 27** may be controlled from a single camshaft. Instead of using a compression spring **39, 49** for each two-part lever, it is possible to use a single spring between the parts **33** and **34**.

With the above described dobby machine direct reading and direct control of the needles is rendered possible. Also, two needles suffice per shaft for controlling both the forward and backward motion. It is possible to increase the working speed owing to the direct control exercised. As only the position of the holding hooks **35***a*, **45***a*, and not their force-locking action, is controlled by the reading needles **30, 40**, the pattern card is not subjected to excessive loading.

What we claim is:

1. In a dobby machine having a dobby shaft and means for feeding a perforated pattern, the combination of a reciprocable retaining hook, linkage means connecting said retaining hook with said dobby shaft, a two-part actuating lever comprising first and second lever parts pivotal about a common pivot and movable relative to one another, said second lever part having hook means and constituting a holding hook selectively engageable with and disengageable from said retaining hook, said fist lever part having sensing means for sensing a pattern fed by said feed means and means engageable with said second lever part to move said holding hook in position to engage said retaining hook and means engageable with said second lever part to lock said holding hook stationary in engagement with said retaining hook.

2. A combination according to claim 1, in which said second lever part is pivoted at one end and has said holding hook at the opposite end, and in which said locking means comprises a movable locking member engageable with said second lever part at the holding hook end thereof.

3. A combination according to claim 2, in which said second lever part is longitudinally movable relative to said pivot to disengage said second lever part from said locking member.

4. A combination according to claim 1, in which said locking means is engageable with said second lever part to hold said holding hook out of engagement with said retaining hook.

5. A combination according to claim 1, in which said first lever part is pivoted at one end and in which said sensing means comprises a pattern reading needle engageable with said pattern and connected directly with the other end of said first lever part.

6. In a dobby machine having a frame, a dobby shaft and means for feeding a pattern, the combination of a reciprocable retaining hook, linkage means connecting said retaining hook with said dobby shaft, a holding hook pivotally movable about a pivot on said frame between an engaged position in which said holding hook is in engagement with said retaining hook and a disengaged position in which said holding hook is out of engagement with said retaining hook, means for reading a pattern fed by said feeding means, means connecting said pattern reading means with said holding hook to move said holding hook between said disengaged position and said engaged position in accordance with said pattern, and means for locking said holding hook in engaged position, said holding hook being movable longitudinally relative to its pivot to disengage said holding hook from said locking means.

7. A combination according to claim 6, in which said pivot comprises a pivot pin and in which said holding hook has an elongated opening receiving said pivot pin to provide for both pivoted and translatory movement of said holding hook relative to said pivot pin.

8. In a dobby machine having a frame, a dobby shaft, a rocker member connected with said dobby shaft and means for feeding a pattern, the combination of a reciprocable retaining hook, means on said frame for guiding said retaining hook in a rectilinear path of reciprocation, linkage means connecting said retaining hook with said rocker member, a holding hook pivotally mounted on said frame for pivotal movement between an engaged position in which said holding hook is in engagement with said retaining hook and a disengaged position in which said holding hook is out of engagement with said retaining hook, means for reading a pattern fed by said feeding means, means connecting said pattern reading means with said holding hook to move said holding hook between said disengaged position and said engaged position in accordance with said pattern and means for releasably locking said holding hook stationary relative to said frame in said engaged position.

9. A combination according to claim 8, in which said holding means is movable longitudinally relative to its pivot by said retaining hook to disengage said holding hook from said locking means.

10. A combination according to claim 8, in which said means connecting said pattern reading means with said holding hook comprises a lever pivoted on said frame coaxially with said holding hook and having abutment means engageable with said holding hook to move it between said disengaged and engaged positions.