United States Patent

Hoenig

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[54] DOBBIES

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[73] Assignee: **Staubli Ltd.**, Zurich, Switzerland

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Related U.S. Application Data

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[52] **U.S. Cl.**.....**139/68,** 139/331

[51] **Int. Cl.**.....**D03C 1/00,** D03C 15/00

[58] **Field of Search**.....139/68, 66, 74, 71, 317, 329, 139/331

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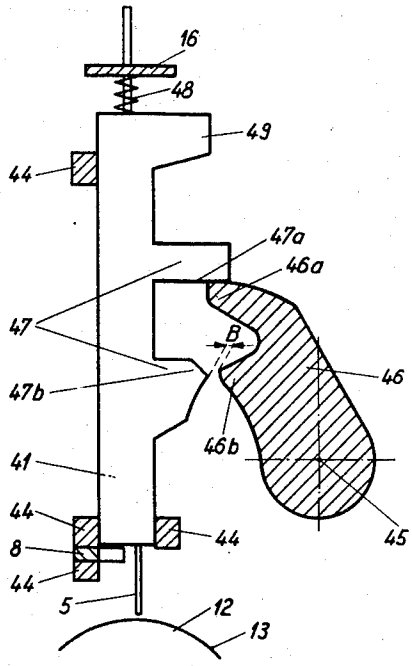
Primary Examiner—James Kee Chi

Attorney—Robert E. Burns and Emmanuel J. Lobato

[57] **ABSTRACT**

A dobby in which the reading needles are actuated into reading position of a perforated pattern card by a first system that applies a low value driving force to the needles so that the pattern card is not damaged if a perforation is not sensed by the needles as would be the case if too strong a force were applied to the reading needle. A second driving system operative in a series mode with the first system applies a stronger driving force to the needles in those instances where a perforation in the pattern card is read by the needles.

5 Claims, 9 Drawing Figures



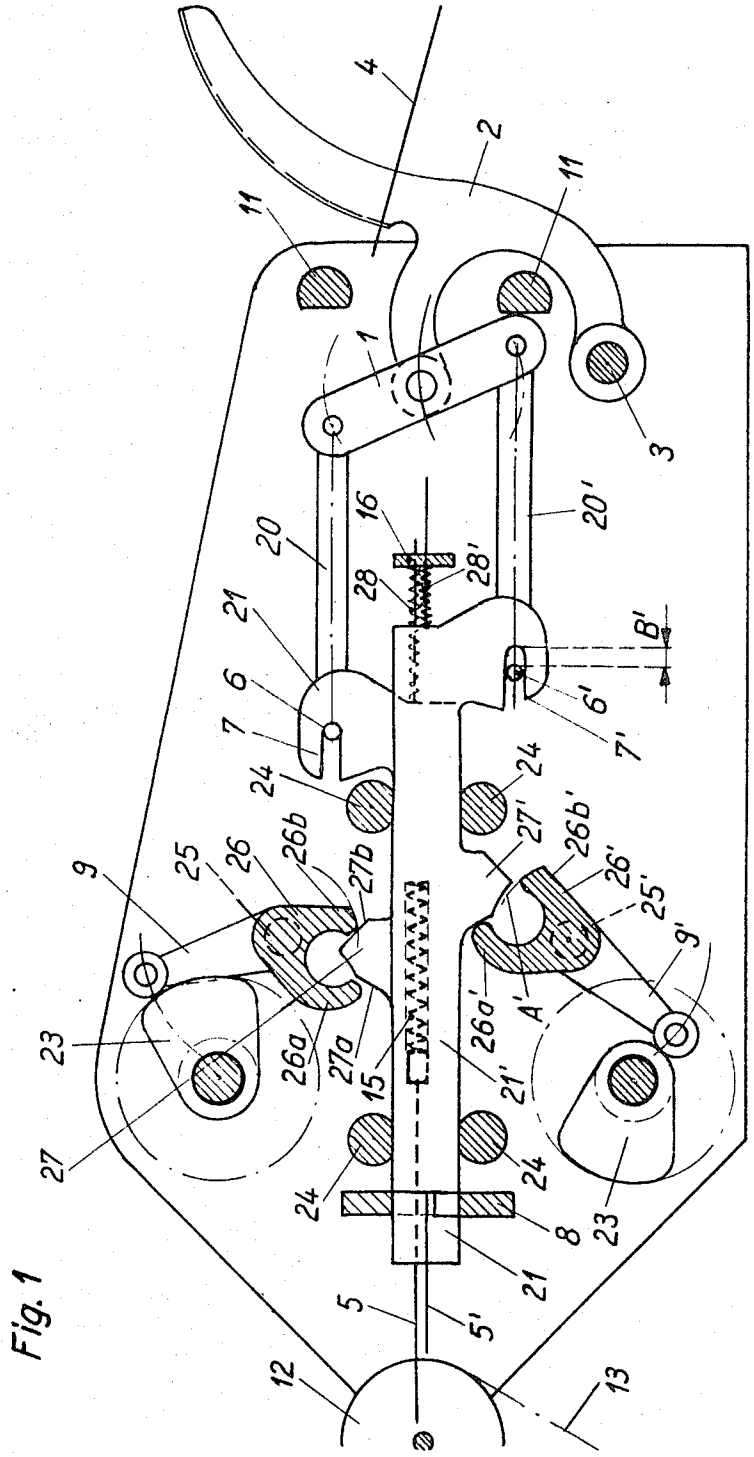

4
2
11
11
1
3
20'
16
20
28'
28
21
B'
6
6'
7
7'
24
24
27'
26b'
26'
25'
9'
9
25
26
26b
27b
26a'
A'
23
26a
27a
15
21'
27
24
24
8
23
21
5
5'
12
13

Fig. 1

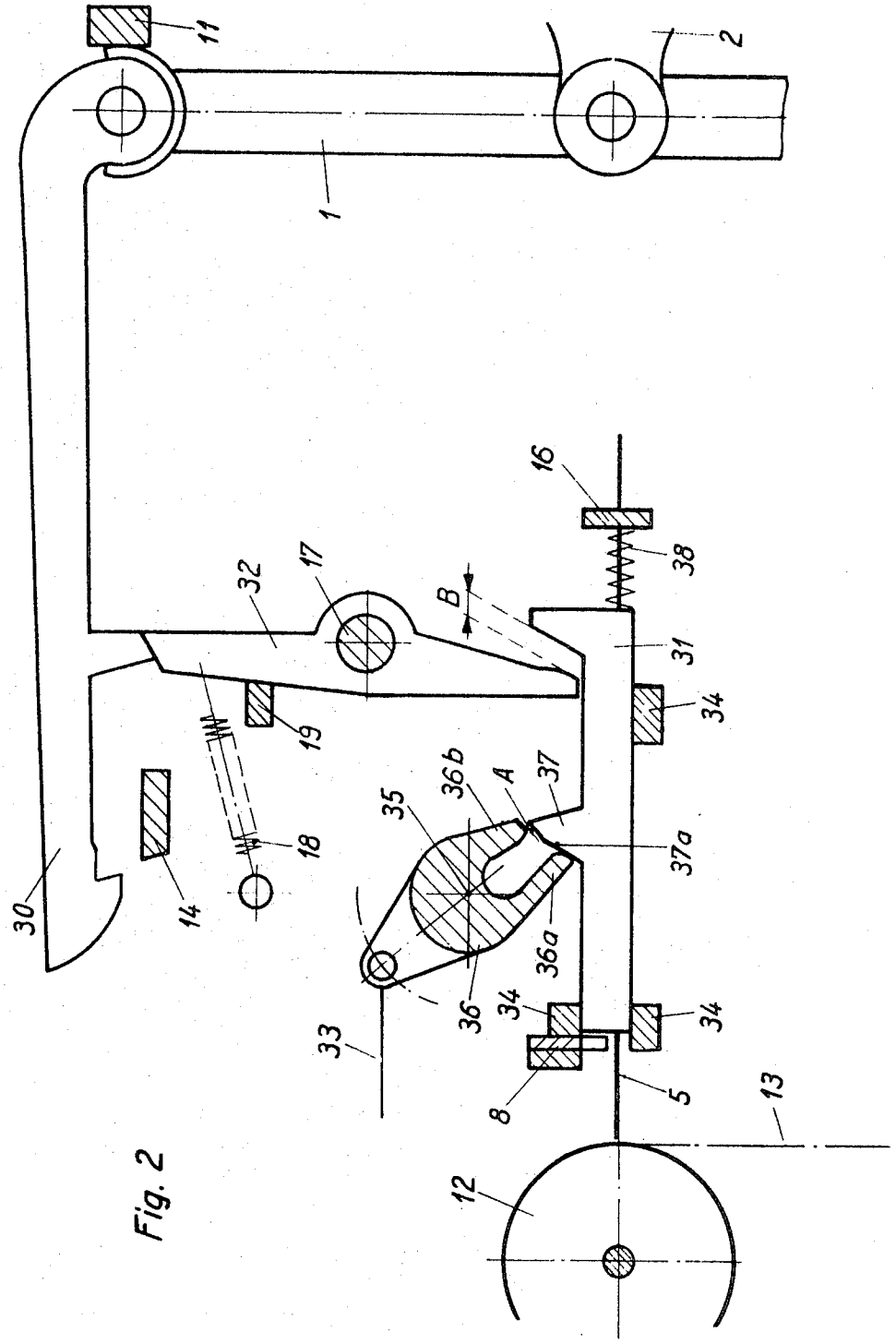

11
2
1
16
38
32
17
B
31
34
19
36b
A
37
35
18
37a
30
14
36a
36
34
34
33
8
5
13
12

Fig. 2

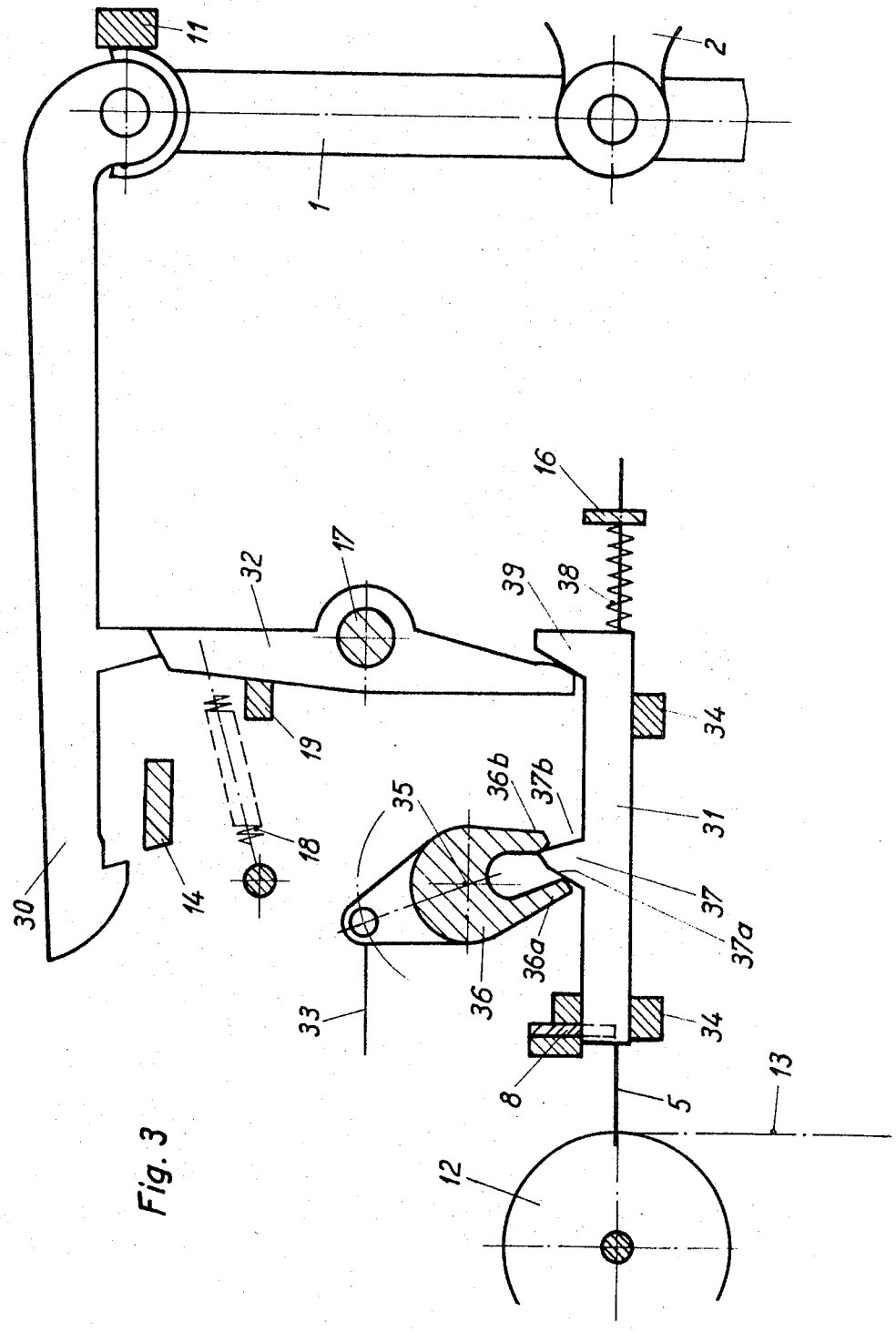

11
2
1
16
17
32
39
38
34
19
18
35
36b
37b
31
14
30
37
37a
36a
36
33
34
8
5
13
12

Fig. 3

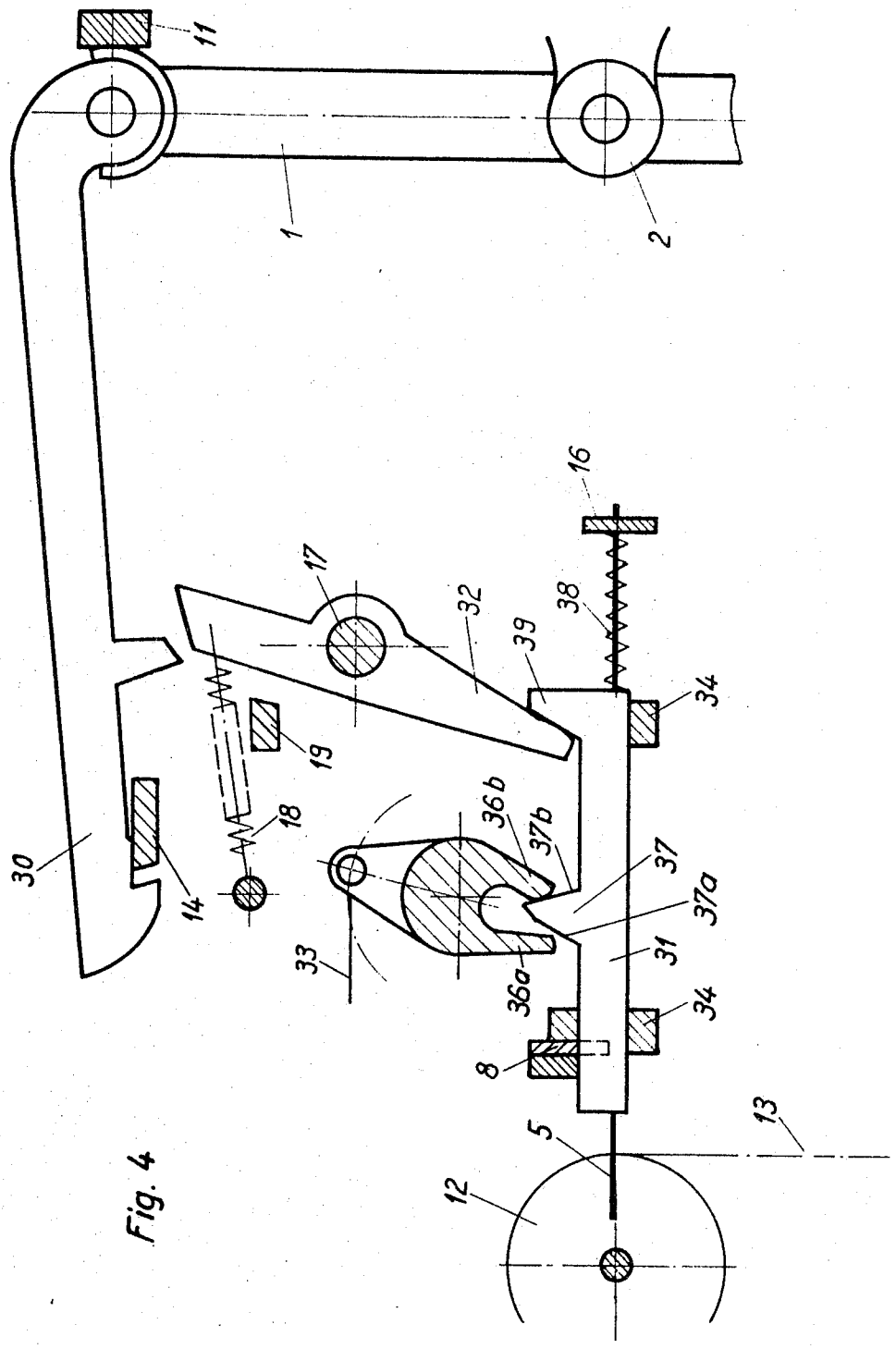

11
1
2
16
17
32
38
39
34
19
18
36b
37b
37
37a
30
14
33
31
36a
34
8
13
5
12

Fig. 4

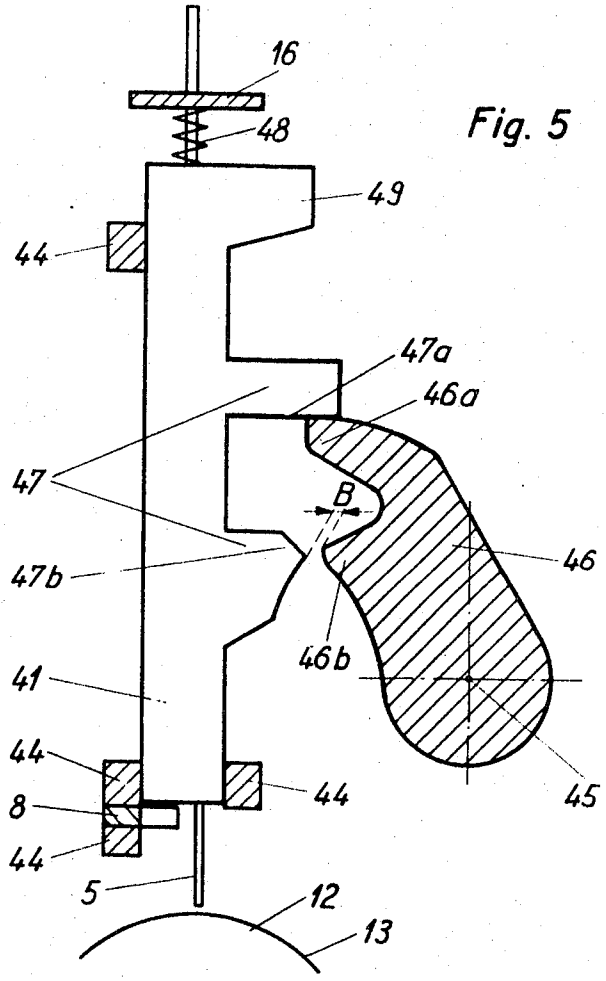


Fig. 5

Fig. 6

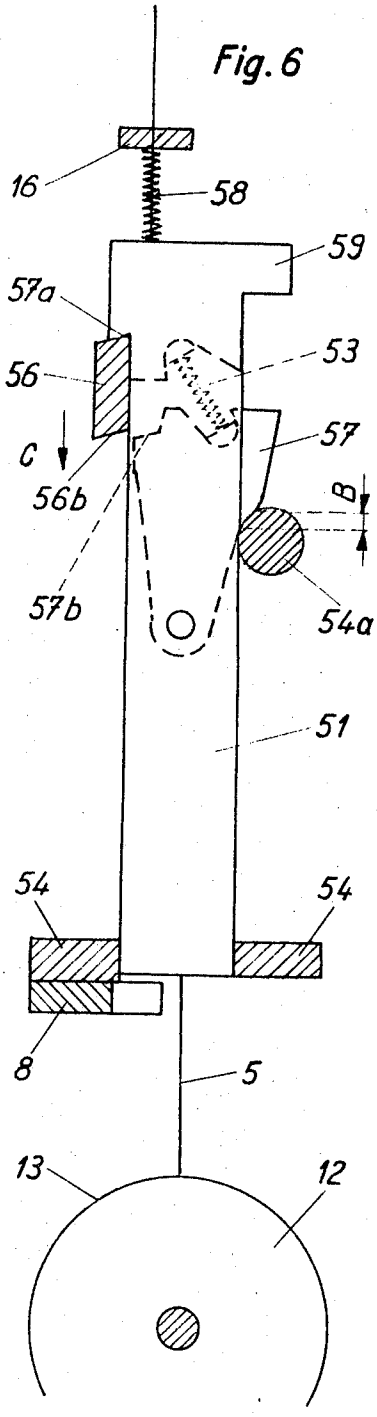

16
58
59
57a
53
56
57
C
56b
B
57b
54a
51
54
54
8
5
13
12

Fig. 7

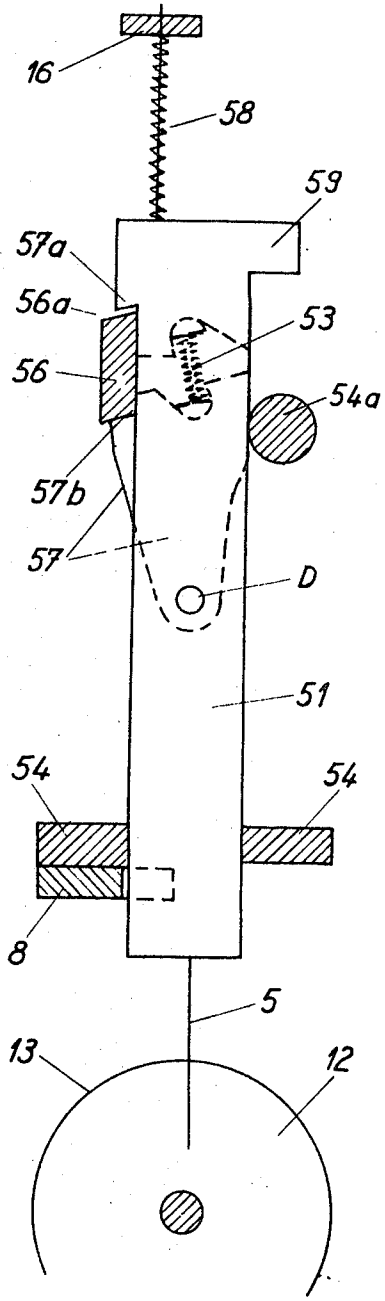

16
58
59
57a
56a
53
56
54a
57b
57
D
51
54
54
8
5
13
12

Fig. 8

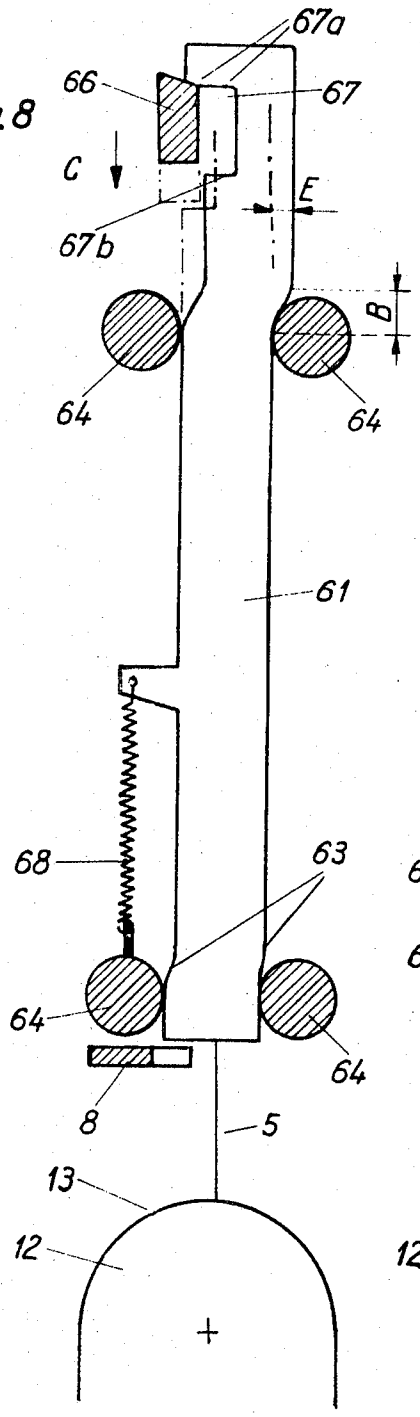
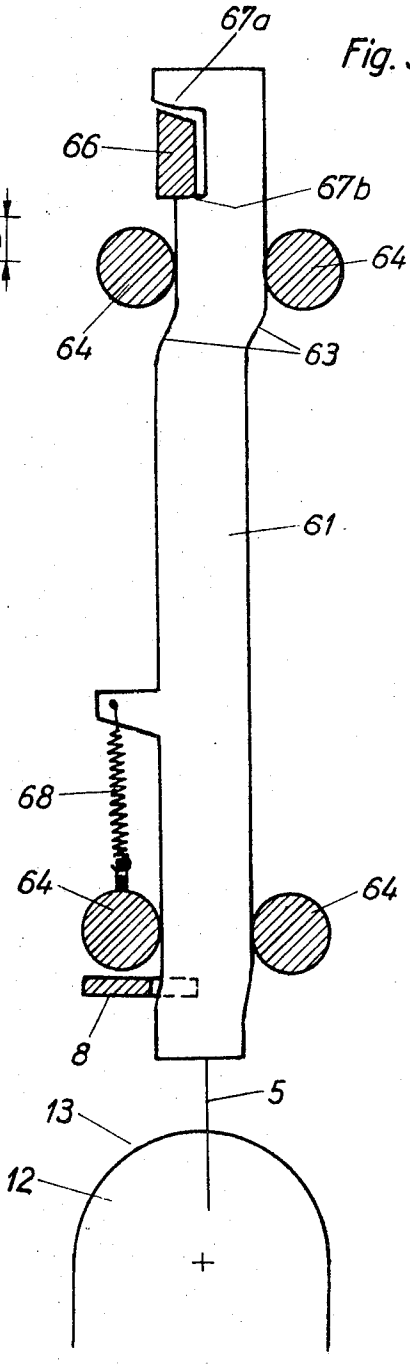

67a
66
67
C
E
67b
B
64
64
61
68
63
64
64
8
5
13
12
+

Fig. 9


67a
66
67b
64
64
63
61
68
64
64
8
5
13
12
+

DOBBIES

This is a divisional application of my application Ser. No. 723,527, filed Apr. 23, 1968, now U.S. Pat. No. 3,554,238 granted Jan. 12, 1971.

This invention relates to looms and more particularly dobbies.

Dobbies are known which have an interposed needle system, which reads the pattern from a perforated pattern card and accordingly controls draw-hooks which are attached to baulks and which work in conjunction with draw-blades. In order to prevent heavy wear and tear of the pattern cards, in particular at the reading points which are not provided with holes, the reading needles must be brought into contact with the pattern cards with as little force as possible. On the other hand, the movement of the heald shafts, which is carried out as quickly as possible, requires great effort which is exerted by specific traction or impact means. The transmission of sensed control commands until the shaft reaches the desired position on the one hand creates the possibility of error, and on the other hand requires the exact cooperation of the individual elements, an inclusion of safety periods and additional safety precautions. In addition to this, the many intermediate elements increase the sluggishness of the operating sequence. With every additionally inserted element there occurs wear and tear at the points of contact due to absorption of the necessary play and the reciprical movement of the elements.

The object of the invention is a most direct transmission of the reading-action for controlling the heald shafts, and retention of the sensitivity during reading and retention of the strong action of force at the beginning of the movement of the heald shafts.

A dobby with at least one needle which reads a perforated pattern card is characterized according to the invention by two driving systems which apply force directly and sequentially to the needle or its holder. The first system works with a low force, brings about the reading of the pattern card by means of the needle, and when there is a slight drop of the needle into a perforation of the pattern card, the needle or holder reaches the range of action of the second driving system, which works with greater force. The second system continues insertion of the needle and drops it deeper into the perforation of the pattern card, the operative movement obtained in this way serving for the direct or indirect control of the movement of the shaft.

Various embodiments of the invention are shown in the drawings.

FIG. 1 is a diagrammatic view of a shaft control mechanism with a baulk and direct exertion of force by the needle holder on the draw-hooks.

FIGS. 2–4 are diagrammatic views of a control and actuation mechanism of a draw-hook in a dobby of the Hattersley type illustrated in three different positions.

FIG. 5 is a diagrammatic view of a modification of the needle holder with a pivoted drive.

FIGS. 6 and 7 are diagrammatic views of modifications of the needle holder with a drive which moves in a straight line, in two different positions; and

FIGS. 8 and 9 are diagrammatic views of a further modification of the needle holder with a drive which moves in a straight line, in two different positions.

In FIG. 1, in the center of a baulk 1 a jack-lever 2 is attached, which is mounted to rotate on the stationary pivot pin 3, and which by means of a pull member 4 raises the heald shaft, not shown, into the high position, or allows it to sink into the low position in spring retraction machines. At each end of the baulk 1 there is attached a pull rod 20,20'. The pins 6 of these pull rods each engage in a slot 7,7' of the needle holder which carries the reading needle 5. The needle holder 21 is guided by means of a rack 8 and lateral guides 24. The parts which have primed reference numerals are associated with the pull rod 20'. The needle movement or the movement of the needle holder 21 is brought about by a double lever 26 which swings to and fro on the stationary pivot pin 25, and is moved by an arm 9, which rolls over a continuously rotating cam 23.

The two arms 26*a*, 26*b* of the double lever 26 cooperate with two stop faces 27*a*, 27*b* of the cam 27 of the needle holder. A spring 28 presses on the needle holder and is supported on the block 16. The dobby comprises stationary impact bars 11 for the ends of the baulk 1.

To explain the method of operation of the dobby, a beginning is made at its initial position, as shown in FIG. 1 for the pull rod 20' and its associated parts. As soon as the cylinder 12 has rotated a perforated pattern card 13 thereon by one perforation, then the double lever 26' begins its swinging movement in a counterclockwise direction. The arm 26*a*' releases a cam 27' so that the needle holder 21' is guided under the action of a weak spring 28' with its needle 5' against the pattern card 13 and probes lightly for a perforation. If there is no hole beneath the needle, then the needle rests on the pattern card. When the double lever 26' swings further, the arm 26*b*' swings past the cam 27', according to a curve A' and there is no further movement of the needle holder 21'. Since there is some clearance B in the slot 7' between the pull rod 20' and the needle holder 21' which corresponds to the movement of the needle holder until the needle engages lightly in a hole, the pull rod is not affected.

If there is a hole in the pattern card beneath the needle 5, then the needle holder sinks in further until the base of the slot 7 contacts the pin 6. For further movement of the needle holder, the force of the spring 28 is no longer sufficient. This short additional movement is sufficient, however, to bring the stop face 27*b* in front of the arm 26*b*, so that when the double lever 26 swings further it entrains the cam and also the needle holder as far as the position of the holder 21 shown in FIG. 1.

Due to its movement the needle holder 21 entrains the pull rod and thus controls the heald shaft, not shown, in a known way. At the same time the needle 5 penetrates the cylinder 12, which has no functional effect. The return movement of the extended needle holder is again effected positively due to the arm 26*a* engaging the stop face 27*a* The pull rod 20 follows this return movement under the action of the shaft spring. Naturally a transverse bar can be arranged in the slot 7 which makes this return movement positive.

If for some reason, for example heavy vibration in the loom, the arm 26*b* entrains the cam 27 and also the needle holder, without there being a perforation in the pattern card 12 in the range of the needle 5, then the spring 15 arranged in the needle holder 21 provides protection against penetration of the pattern card. The needle rests on the pattern card, which is strong enough to absorb this unique and exceptional thrust.

In FIGS. 2–4 part of a dobby of the Hattersley type is shown diagrammatically. The following parts are shown and some have reference numerals corresponding to similar parts of the embodiment in FIG. 1: An upper draw-hook 30, which is attached to one end of a baulk 1, a rocker arm 2, a bar 11 and a draw-blade 14 which swings to and fro in an approximately straight line. The control of the position of the draw-hook takes place with respect to the draw-blade of an arrangement according to the invention, as shown e.g. in FIG. 1 and as described.

The three most important positions are shown to give a better indication of the method of operation: FIG. 2 shows the initial position, in which the draw-hook 30 does not lie within the range of the draw-blade 14, i.e. the reading needle 5 is lifted and has just read the pattern card and ascertained that the heald shaft must remain in the low position and that the pattern accordingly has no hole. FIG. 3 shows the reading of a hole in the pattern card by the reading needle 5 and FIG. 4 shows the situation in which the draw-hook 30 is in contact with the draw-blade 14, so that the latter can draw the heald shaft into the high position during its swinging movement.

A needle holder 31 with the reading needle 5 lies in guides 34 so that it can slide endwise with the rack 8 as a limit for lateral movement. A compression spring 38, which is supported on the block 16, serves for exerting the first low force for reading. As soon as the double lever 36, which swings to and fro at the pivot point 35, begins its swinging movement, an arm 36a releases a cam 37 of the needle holder 31 and the probing of the pattern card can begin.

If there is no perforation under the needle, then the arm **36***b* swings past the cam according to a curve A (position according to FIG. 2). A support lever **32** which can swing about a shaft **17** away from a rail **19** against the force of the spring **18**, remains unaffected i.e. it has lifted the draw-hook **30** so that it is not entrained by the blade **14**. A rod **33** serves for effecting the swing drive of the double lever.

If there is a hole in the pattern card **13** beneath the needle **5**, then the needle penetrates the cylinder **12** under the action of the spring **38**, FIG. 3. A stop face **37***b* of the cam **37** is now in the path of swing of the arm **36***b* of the double lever, and the latter drives the needle holder positively by means of the cam **37** i.e. the great force of the double lever **36** is exerted on the needle holder. On its movement from the position according to FIG. **4**, the needle holder **31** entrains by means of a rear prolongation **39** the support lever **32** and swings the latter away from the draw-hook **30**. The draw-blade can now drive the draw-hook during its linear swinging movement and bring the heald shaft into the high position. It is evident from FIG. **3** that the prolongation **39** only comes into contact with the support lever **32** when the needle **5** has penetrated a perforation of the pattern card and the arm **36**b can exert its force on the cam **37**. Only the force for reading a perforation is required of the springing **38**, while the actual drive is exerted by the double lever.

The positive return movement of the holder and therefore the release of the support lever takes place due to the return swing of the double lever **36**, the arm **36***a* acting on the stop face **37***a*.

FIG. **5** shows a modification of the needle holder in the initial position with its driving systems. Parts have reference numerals corresponding to those of similar parts in the embodiments described. It shows: the cylinder or drum **12** with the pattern card **13**, the reading needle **5**, a needle holder **41**, guides **44**, a rack **8**, and a weak compression spring **48**, the block **16**, a double lever **46** with a pivot point **45** and the arms **46***a* and **46***b* and a prolongation **49**. The functional operation is the same as in the previously described examples, however two stop faces **47***a* and **47***b* are disposed on two cams **47**. The arm **46***a* with the stop face **47***a* serves for relieving the holder and for the release for reading as well as for the positive return impact of the holder. The arm **46***b* with the stop face **47***b* serves for the pushing movement and the connected control movement of the shaft lever.

Instead of a double lever which swings to and fro, the arms of which describe a circular path as shown in the embodiments of FIGS. 1–5, the more powerful driving system for the movement of the holder can consist of a blade-like lever which swings to and fro in a straight line. Modifications of this kind are shown in FIGS **6** and **7** and FIGS. **8** and **9**, which each have the same holder in the initial position and the extended position.

The path of movement of the needle holder **51** is determined by guides **54** and **54***a* and the rack **8**. The entire arrangement is completed by the reading needle **5**, the compression spring **58** with the block **16** and the cylinder **12** with the pattern card **13**. An arrow C indicates the direction of movement in a straight line of a blade **56** having a lower face **56***b*. As soon as the blade **56** moves in the direction of arrow C, a holder **51** follows under the force of the springs **58**. If the reading needle does not find a perforation, then the holder and its needle remain stationary. If the reading needle does find a perforation, then the holder **51** sinks further. The guide **54***a* tilts the plate bar **57** at the pivot point D, so that a stop face **57***b* comes to lie in front of the blade **56**. On further movement the blade **56** entrains the holder **51** by means of the plate bar **57**. Tilting back of the plate bar is not possible in this case, since the guide **54** serves to prevent this. In order to strengthen the tilting movement of the plate bar, a known snap action amplifier **53** is arranged, consisting of two cups and a spring. The blade **56** drives with a face **56***a* the needle holder back into the initial position by means of the stop face **57***a*. The prolongation **59** is used in a known way for the transmission of the movement of the needle holder to the actuating elements of the heald shaft.

Also in the embodiment according to FIGS. **8** and **9** all the essential parts of the arrangement can be ascertained. They are a needle holder **61** with its guides **64** and the rack **8**, the reading needle **5**, the driving cylinder **12** with the perforated pattern card **13** and a spring **68**, which initiates the reading by the needle. When the blade **66** moves in a straight line in the direction of an arrow C, then the needle holder immediately follows due to the action of the spring **68**. If the needle **5** rests on the pattern card **13**, then the blade **66** carries out its to and fro movement without any effect on the holder and the connected parts. On the other hand if the needle is in front of a perforation then the holder follows the movement of the blade **66**. In this way the needle holder **61** carries out a lateral movement of an amount indicated by E with respect to its axis of movement, owing to the offsets **63** of the lateral guide edges. In the initial position these offsets are near to the guides **64**. At the same time as the lateral movement, the holder engages with its notch **67** over the blade **66**, so that the latter now positively controls the movement of the holder. A stop face **67***a* for the return of the holder to the initial position, and a stop face **67***b* for the extending movement are provided.

Since the principal movement of the needle holder occurs positively, in single-lift dobbies the heald shafts can be directly attached to the holder, i.e. no connection by way of pull rods or draw-hooks and baulk is necessary.

From all the embodiments which have been described it can be seen that first a weak force is exerted on the needle **5**, caused by the springs **28**,**38**,**48**,**58** and **68**, and only when the needle has ascertained that a perforation is present in the pattern card **13** and when the needle has covered the distance indicated by B, does the greater force undertake the movement of the needle and also the movement of the shaft, by means of a lever **26**, **36**, **46**, **56** and **66**.

What I claim and desire to be secured by Letters Patent is:

1. A dobby with at least one needle for reading a perforated pattern card comprising, two driving means for applying force to the reading needle sequentially, a first one of said driving means having means to apply a low value force to initiate the reading of the pattern card by the reading needle and initiate entry of said needle into a perforation, and a second one of said driving means effective to apply force to the reading needle to continue insertion of said needle into a perforation when there is a slight movement of the needle into a perforation of the pattern card, the second driving means having means comprising a positively driven lever mechanism applying greater force than the force of the first driving means to move the needle deeper into the perforation of the pattern card, a needle holder, said lever mechanism comprising a double lever having first and second lever arms driven so that it swings to and fro, a cam on the needle holder, the cam and lever arms being so arranged that the first arm, during the movement of the double lever away from the pattern card lifts the needle out and away from the pattern card against the force of the weaker first means, and during its movement toward the pattern card, releases the needle for reading the pattern card, and the second arm entrains the needle holder, during its movement towards the pattern card, if the needle has moved slightly into a perforation which has been read, and the cam having a face cooperating with the second arm to allow during this movement the arm to slide past the cam and does not entrain the needle holder, if the needle only rests on the pattern card and has not read any perforations, said needle holder comprising a second cam, the first mentioned cam cooperating with the first arm of the double lever, and the second cam cooperating with the second arm of the double lever.

2. A dobby with at least one needle for reading a perforated pattern card comprising, two driving means for applying force to the reading needle sequentially, a first one of said driving means having means to apply a low value force to initiate the reading of the pattern card by the reading needle and initiate entry of said needle into a perforation of said pattern card, and a second one of said driving means effective to apply force to the reading needle to continue insertion of said needle into a

perforation when there is a slight movement of the needle into a perforation of the pattern card, a needle holder, the second driving means having means applying a greater force than the force of the first driving means to move the needle deeper into the perforation of the pattern card, said second driving means comprising a positively driven lever mechanism acting to drive the needle, said lever mechanism comprising a blade swinging in operation to and fro approximately in a straight line and cooperating with said needle holder to drive the needle upon the movement exerted by the low value force for reading a perforation.

3. A dobby according to claim 2, including a guide cooperating with the needle holder which has at least one offset so that when there is longitudinal movement of the needle a small lateral displacement occurs to cause engagement of a notch of the holder with the blade.

4. A dobby according to claim 2, including a pawl swingably attached to the needle holder, which upon the slight longitudinal movement of the needle engages in the path of movement of the blade and transmits the swinging movement of the blade to the needle.

5. A dobby with at least one needle for reading a perforated pattern card comprising, two driving means for applying force to the reading needle sequentially, a first one of said driving means having means to apply a low value force to initiate the reading of the pattern card by the reading needle and initiate entry of said needle into a perforation, and a second one of said driving means effective to apply force to the reading needle to continue insertion of said needle into a perforation when there is a slight movement of the needle into a perforation of the pattern card, the second driving means having means for applying a greater force than the force of the first driving means to move the needle deeper into the perforation of the pattern card, said dobby comprising a Hattersley-type dobby having a baulk and draw-hook attached to ends thereof, including a needle holder having an extension, a draw-blade operative to and fro and a tilting lever actuated by said extension to place the draw hook in and out of contact with said draw-blade, a pull rod for actuating said needle holder having some play, and means to reduce the play when said needle reads a perforation in said pattern card under control of said low value force.

* * * * *