Dec. 3, 1957 H. H. STÄUBLI 2,815,044

DOUBLE LIFT DOBBY

Filed Dec. 16, 1955 4 Sheets-Sheet 1

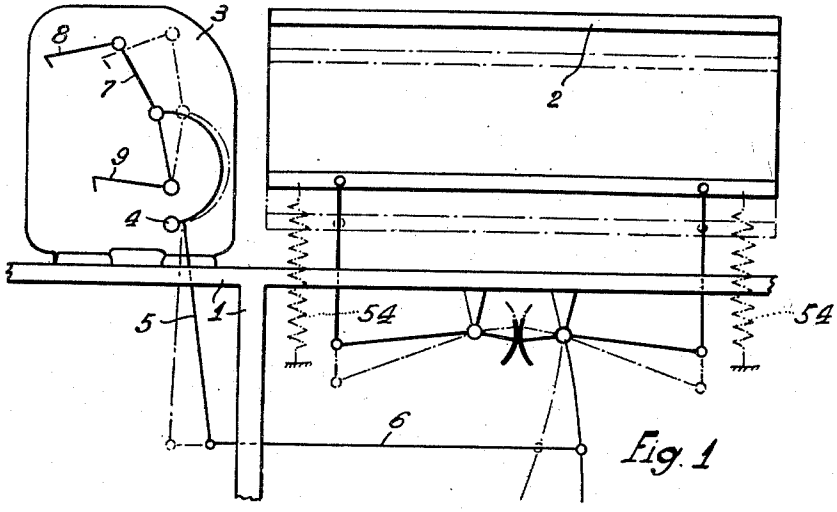


Fig. 1

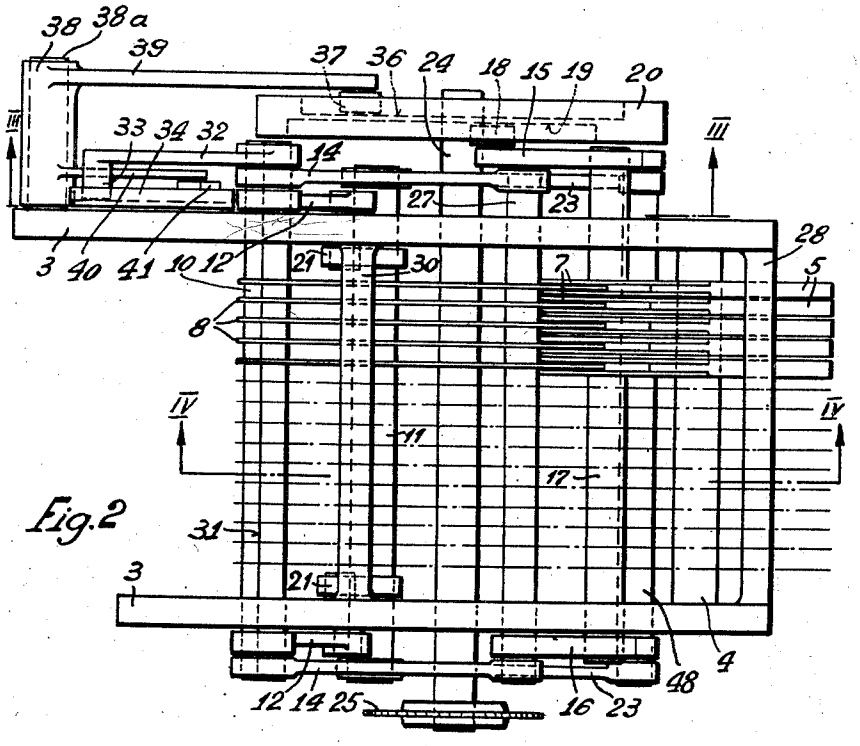


Fig. 2

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DOUBLE LIFT DOBBY

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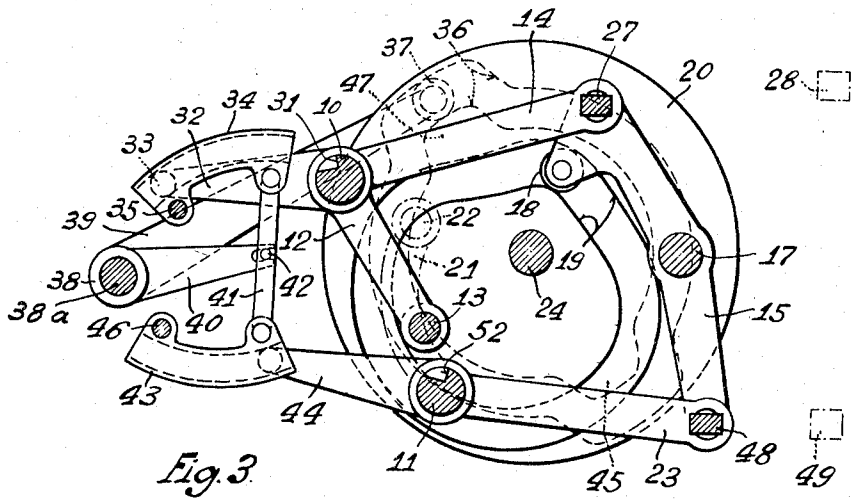


Fig. 3

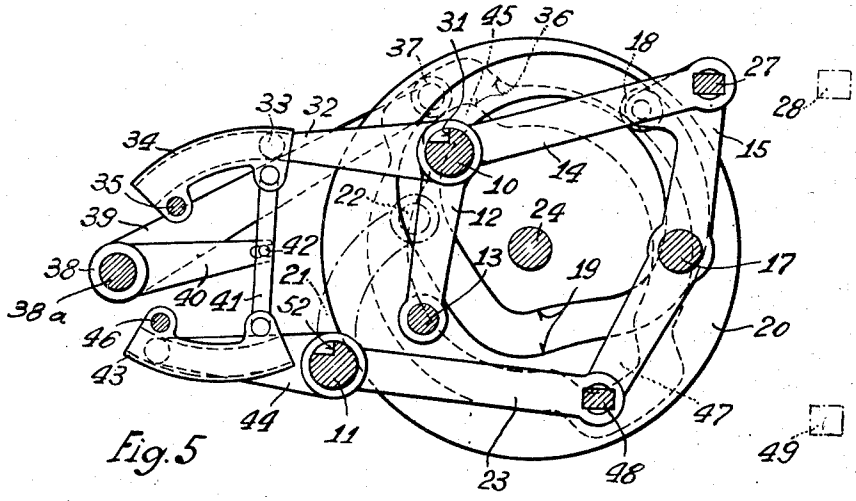


Fig. 5

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DOUBLE LIFT DOBBY

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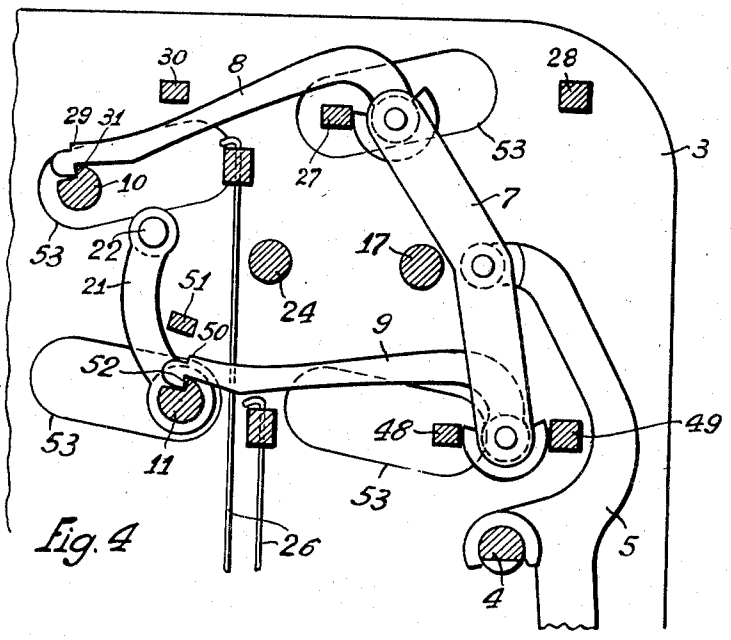


Fig. 4

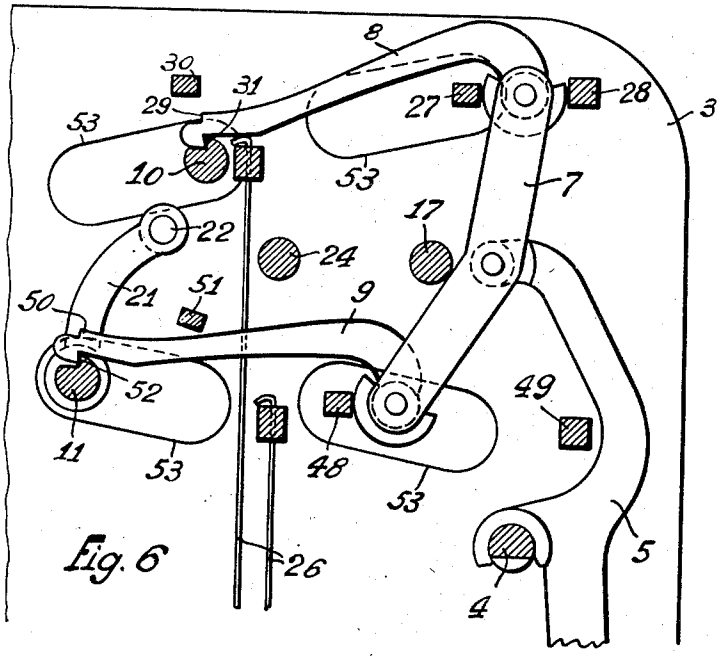


Fig. 6

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DOUBLE LIFT DOBBY

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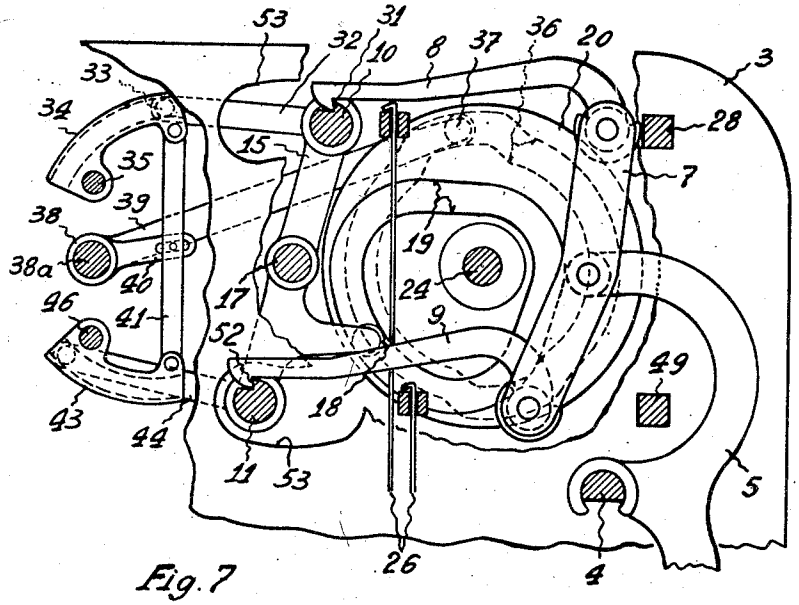


Fig. 7

United States Patent Office 2,815,044 Patented Dec. 3, 1957

2,815,044

DOUBLE LIFT DOBBY

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Application December 16, 1955, Serial No. 553,613

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10 Claims. (Cl. 139—71)

The present invention relates to a double lift dobby in in which for each heald shaft a baulk is operatively connected therewith and at the ends of which, draw hooks are pivotally connected and cooperate with draw knives. The draw hooks are selected according to the pattern card and transmit the movement of the knives to the heald shafts.

In the case of well-known double lift dobbies with positive heald lifting motion i. e. where the ends of the baulks are moved in the drawn-out position by means of the draw hooks and brought back in the basic position by moving abutments fixed to the draw knives or by the draw knives themselves, the baulk ends are guided with play throughout their movement, this play is indispensable in the basic position for permitting the selection of the draw hooks and easy engagement with the draw knives. During the movement this play is, however, disadvantageous, as it is likely to involve an unsteady motion of the heald shafts.

Another undesirable motion in the heald shafts may occur e. g. also in the case of a double lift open shed dobby with negative heald lifting motion, i. e., where the heald shafts are pulled down by springs. If in the case of those machines, a heald shaft has to be kept in the upper shed during two subsequent picks, this heald shaft will immediately after the selecting of the hook for the second pick carry out a slight downward movement, as at that moment, only the movement of one of the draw knives can be transmitted to the heald shaft, whereas the other draw knife has first a dead motion movement, namely through the play indispensable for the selection of the hooks, before it can have an influence on the heald shaft, in order to keep the latter in the upper shed. This slight downward movement comprises an undesirable vibration of the heald shafts and occurs as well in the case of open shed dobbies with positive heald lifting motion.

It is now possible to eliminate these undesirable movements of the heald shafts if, according to the present invention, the knives are provided with the necessary means for producing an additional movement of the knives whenever they are in their basic position or initial position prior to their movement, in which the draw hooks concerned are selected in order to produce and eliminate the play between knives and hooks required for this hook selection.

The attached drawing gives a constructural example of the present invention, as follows:

Fig. 1 is a diagrammatic side view of a part of a double lift open shed positive dobby, mounted on a loom.

Fig. 2 represents a longitudinal section on an enlarged scale of one part of the design shown in Fig. 1.

Fig. 3 shows the driving mechanism of the draw knives in a given position according to section III—III in Fig. 2.

Fig. 4 represents the corresponding position of the actuating elements for a heald shaft placed in the upper shed according to section IV—IV in Fig. 2.

Fig. 5 shows the driving mechanism of the draw knives in another position.

Fig. 6 represents the corresponding position of the actuating elements of a heald shaft placed in the upper shed and

Fig. 7 gives parts of a similar machine working with negative heald lifting motion instead of those with positive heald lifting motion.

On the loom frame **1**, the heald shafts **2** are arranged in a known manner in order to be lifted or lowered, the dobby concerned is provided with two frames **3** mounted on the loom frame **1**. On a shaft **4** connecting the dobby frames, a plurality of levers **5** are pivoted and a push-and-pull rod **6** is articulated to each lever **5** for moving one of these heald shafts and a baulk **7**. On each end of the baulk a draw hook **8**, **9** is articulated cooperating with the draw knives **10** and **11** respectively in a manner later herein disclosed.

The upper knife **10** is mounted on two guiding arms **12**, outside the frames **3**; these guiding arms are pivoting on the studs **13** (Figs. 3 and 5), so that the draw knife **10** is moved to-and-fro by the push-and-pull rods **14** along a circular or arcuate path. The rods **14** are articulated to two-armed levers **15** and **16** which are both rigidly mounted on a shaft **17**, oscillating in the frames **3**. The two-armed lever **15** is provided with a guide roller **18** running in a cam groove **19** of a cam disc **20** (Figs. 2, 3, 5) which owing to its rotation, gives the lever **15** and through the shaft **17** also the lever **16**, an oscillating motion, transmitted to the draw knife **10**.

The lower knife **11** is mounted on two guiding arms **21**, arranged inside the frames **3**; these guiding arms pivot on the studs **22** in such a manner that the lifting knife **11** is moved to-and-fro along a circular or arcuate path by the push-and-pull rods **23**. The rods **23**, as well as the rods **14** are articulated to the two-armed levers **15** and **16**. The cam disc **20** is arranged outside of one of the frames **3** on a shaft **24** which is brought to rotation by a chain wheel **25** driven by the loom.

As is seen in Figs. 3 and 5, the described mechanism **12—25** guides the knives **10** and **11** alternatively to the left into the drawn-out position and then again to the right, back into the basic position where the corresponding hooks by means of the needles **26** (Figs. 4 and 6) according to a pattern card not reproduced, are selected in a well-known manner.

A moving abutment **27** is always simultaneously displaced with the knife **10**, as it is connected with the latter by the rod **14**. This moving abutment **27** engages with the upper ends of the baulk **7**, in order to bring these ends back to their basic position after having been brought into the drawn-out position by the hooks **8** and the corresponding knife **10**, so that the heald shafts concerned are brought into the upper shed; in the basic position the moving abutment **27** has to press the ends of the baulks against the fixed abutment **28** until the hooks **8** are selected by the needles **26** for the next pick. In this basic position the play between the knife **10** and the hook **8**, required for the selecting must be provided for (Fig. 6).

If for instance during the next pick, the hook **8**, represented in Fig. 6, is not to be moved or drawn by the knife **10**, it is lifted by the corresponding needle **26**, so that the nose **29** will be placed behind the fixed cross bar **30** and the upper end of the baulk in spite of the knife **10** and the moving abutment **27** being moved to the left, remains located against the fixed abutment **28**.

If however the hook **8**, according to the pattern card is not lifted, it is displaced by the knife **10** to the left into the drawn-out position (Fig. 4), whereby the play shown

in Fig. 6 between the hooks 8 and the knife 10, is first eliminated.

This elimination of the selecting play or its establishment is carried out by means of the mechanism as described below:

The knife 10 can perform an additional movement without interfering with the moving abutment 27 thanks to its oscillating in the guides 12 and the rods 14 on an axis parallel to its longitudinal direction in order to change periodically the distance between the abutment surface 31 intended to catch the draw hook 8 and the corresponding moving abutment 27. The knife 10 is provided with a lever 32 which has to transmit the oscillating movement on to the knife. The free end of the lever 32 carries a stud 33 which is guided in a cam path 34, in such a manner that during the entire forward and return movement of the knife 10, no rotation of the knife can take place. For this purpose the cam path 34 has the shape of a circular arc, the radius of which is equal to the length of the guiding arms 12, so that the stud 33 is moving accurately parallel to the way of the knife 10. The cam path 34 pivots on the stud 35, so that its oscillating movement makes the knife 10 turn or rotate by means of the lever 32. The oscillating movement of the guiding path 34 is taken from the cam disc 20, that is, by means of a roller 37 running in a groove 36 of the cam disc 20; the roller 37 being mounted on an arm 39 fixed on a sleeve 38. Another arm 40 is also attached to the sleeve 38, pivoting on the stud 38*a* on the frame 3. The free, forked end of this arm is engaged with the stud 42 fixed to the link 41. The latter is articulated both to the cam path 34 and to the cam path 43 intended for the lower knife 11; this knife is oscillating in a similar manner in the guiding arms 21 and rods 23 and can be turned by means of the lever 44 which in its turn is guided in the equally pivoting cam path 43.

If the cam disc 20 passes the position shown in Fig. 5, the knife 10 is in its basic position (see also Fig. 6). Since at that moment the roller 37 has run up against the cam 45 of the groove 36, the link 41 is slightly lifted and therefore the knife 10, is turned in clock-wise direction by the lever 32. The abutment surface 31 of the knife 10 is thus spaced from the hook portion of the draw hook 8 by a selected distance comprising a clearance space between the surface and the engaging surface of the hook 8, as shown in Fig. 6. If the cam disc 20 continues to move on, the link 41 is displaced a little downwardly, so that the knife 10 is turned counter-clockwise and the clearance space or play is eliminated. Then the shape of the groove 19 in the cam disc ensures that the knife 10 is pulled to the left, whereby the hook 8 throughout the entire drawing-out and return motion, is guided without play, since the moving abutment 27 is in constant contact with the upper end of the baulk 7 at the same time, throughout movement of the hook 8. After the knife 10 has returned to its basic position, it is turned temporarily by the action of the cam 45, in order to select the hooks 8 according to the pattern card.

During the rotation of the knife 10 when in its basic position, the knife 11 is in the drawn-out position (see Figs. 5 and 6). If at that stage, the link 41 is lifted and therefore the cam path slightly displaced, this has practically no effect on the knife 11, as the free end of the lever 44 of the knife 11 is placed very close to the stud 46 around which cam path 43 is pivoting.

The same movements take place when the cam disc 20 is passing the position shown in Fig. 3, whereby the cam 47 is placed underneath the roller 37. The lower knife 11 alone is temporarily turned in order to provide for the required selecting play, whereas the upper knife 10 is not turning.

A moving abutment 48 is also connected to the lower knife 11 by means of the rods 23 and cooperates with the lower ends of the baulks 7 which it can press against the fixed abutment 49. In this basic position, the lower hooks 9 are selected for the following pick. A hook 9 is either lifted by the corresponding needle 26, so that its nose 50 is placed behind the fixed cross bar 51 and the ends of the baulk therefore adhere during the next pick to the fixed abutment 49 or this hook is taken along by the knife 11 to the left into the drawn-out position. As in the case of the upper knife 8, the play shown in Fig. 4 between the abutment surface 52 of the knife 11 and the hook 9 is eliminated.

Due to this elimination of the play a steady heald shaft motion is obtained, because the ends of the baulks during their oscillation movement are constantly guided in a positive manner and without play.

The openings 53 in the frames 3 enable the knives 10 and 11 and the moving abutments 27 and 48 to reciprocate without any obstacle.

The construction as described, eliminates every possible vibration of the heald shafts, which as mentioned before occurs in case of well-known machines, as soon as a heald shaft has to remain in the upper shed during two subsequent picks since the alternative movement of the two knives 10 and 11 is only taken up again after elimination of the selecting play by means of the additional movement of the knife in its basic position, so that the lever 5 and the corresponding heald shaft remain absolutely steady.

This oscillating movement of the heald shafts is of course also eliminated in case of a double lift open shed dobby with negative heald lifting motion, as shown in Fig. 7. The parts corresponding to the above described machine are provided with the same indications of reference. The presence of the springs 54 shown in Fig. 1 by dash-dotted lines make the moving abutments 27 and 48 superfluous and the knives 10 and 11 pivot directly on the double arm levers 15 and 16. Also the fixed cross bars 30 and 51 are not longer required. Besides the machine is working in the same manner as the above described positive dobby.

Moreover it is clear that the ends of the baulks e. g. also in the case of a double lift closed shed positive dobby during their entire oscillating movement, can be guided positively and without play. Such dobbies are for instance described in the U. S. Patents No. 2,635,644 and No. 2,727,538. The additional movement of the knives in the form of a rotation can in this case also be used to produce and to eliminate the selecting play required for the control of the hooks in the basic position of the reciprocating movement of the knives.

What is claimed is:

1. In an improved dobby, in combination at least one draw knife, means to impart an oscillating movement to said knife along an arcuate path from a first position to a second position and back to said first position, a plurality of draw hooks for selectively engaging said draw knife and being selectively moved along therewith during said oscillating movement, means to select and engage and disengage selected draw hooks with said draw knife while said knife is at said first position, means to position said draw knife in a first selected angular position while at said first position and prior to engagement or disengagement with a selected draw hook and for sequentially positioning said hook in a second angular position after engagement with a draw hook prior to said oscillating movement, said first angular position corresponding to a position for permitting play between the draw knife and the selected draw hooks so as to permit easy selection of the hooks and easy engagement and disengagement between the knife and the hooks and said second angular position corresponding to a position wherein the selected draw hooks and said draw knife are engaged without play, whereby said draw hooks are oscillatively moved along by said draw knife without play and substantially without relative movement between it and the draw hooks.

2. In a dobby cooperating with a pattern card, in com-

bination, a plurality of pivotally mounted reciprocable draw hooks, at least one draw knife adapted to engage with selected hooks and to perform a reciprocating movement with the selected hooks engaged with it, means to impart a reciprocating movement to said knife from a first position to a second position, means adapted to be operated according to the pattern card in such a manner so as to select hooks and permit the selected hooks to engage said knife while at said first position and for disengaging them upon return of said knife to said first position, said hooks and said draw knife each having surfaces for engaging, means to impart a rotational movement to said draw knife to provide a clearance space between the hook and draw knife engagement surfaces when initially engaged and sequentially disengaged at said first position and successively to the engagement of the selected hooks to impart a counter rotational movement to said knife for eliminating said clearance space and engaging said engagement surfaces in close abutting relationship, whereby said draw hooks are reciprocated together with said knife without play and substantially without movement relative one another while engaged.

3. In a dobby cooperating with a pattern card, in combination, a plurality of heald shafts, a plurality of baulks operatively associated one each with each heald shaft, a plurality of reciprocably mounted draw hooks at least one each operably connected to each baulk, at least one draw knife adapted to engage with selected draw hooks and to perform a reciprocating movement with the selected hooks engaged with it, means to impart a reciprocating movement to said knife between a first basic position and a second position corresponding to a drawn out position of said selected hooks, means adapted to be operated according to the pattern card in such a manner so as to select hooks and permit the selected hooks to engage said knife while positioned at said basic position and for disengaging them upon return of said knife to said basic position, said hooks and said knife each having surfaces for engaging, means to impart a selected rotational movement to said draw knife to provide a selected clearance space between the hook and draw knife engagement surfaces before said hooks are engaged and when sequentially disengaged at said first position and successively to the engagement of the selected hooks to impart a counter rotational movement to said knife for eliminating said clearance space and positioning said engagement surfaces in close abutting relationship, whereby said clearance space permits easy engagement of said selected hooks and said knife and its elimination permits said hooks to be drawn out by said knife substantially without relative movement between the hooks and knife so as to move said baulks and heald shafts in a positive manner.

4. A dobby according to claim 3, including a movable abutment cooperating with said knife in reciprocating said knife in a positive manner, means connecting said abutment to said knife and said abutment being disposed between the knife and said baulk and a selected distance

from said knife, and the rotation of said knife varies the distance between the abutment and the knife engagement surfaces so that when said clearance space is eliminated said selected draw hooks are held in fixed relationship between the abutment and the knife engagement surfaces while said hooks are reciprocably moved by the knife.

5. A dobby according to claim 3, in which said means to impart a reciprocating movement to said knife is provided with means for imparting reciprocating movement to said knife along an arcuate path.

6. A dobby according to claim 5, in which said means to impart reciprocating movement to said knife comprises a rotative cam disc provided with at least one cam path and a pivoted lever operably connected to said knife and having a cam follower guided on said cam path.

7. A dobby according to claim 3, in which said knife is reciprocated in a selected arcuate path, and in which said means to impart a selected rotational movement to said draw knife comprises a lever operably connected to said knife and having a free end, a pivotally mounted arcuate path for guiding the free end of said lever in an arcuate path corresponding to the arcuate path in which said knife is reciprocated, and means operable by said means to impart reciprocating movement to said knife for pivoting said arcuate path between two positions corresponding to the rotational movement of said knife and said counter rotational movement.

8. A dobby according to claim 3, further including another draw knife reciprocably and alternately driven by said means to impart reciprocating movement to said first mentioned knife, additional draw hooks for selectively engaging said other knife and additional means adapted to be operated according to the pattern card in such a manner so as to select some of said additional hooks to engage said other knife.

9. A dobby according to claim 8, in which said means to impart a selected rotational movement to said draw knife is provided with means for rotatively moving said other knife separately from the first mentioned knife without the rotation of either knife substantially effecting any rotation of the remaining knife.

10. A dobby according to claim 3, including means cooperating with said means to be operated according to the pattern card for holding said draw hooks out of engagement with said knife.

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