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(54) Gripping and cutting device for the automatic changing of the thread colour in flat knitting machines.

(57) The thread (F) which is to be released by the carriage of the machine is captured by a hook (7) and drawn downwards when the corresponding thread guide (G) has reached the rest position (K), so that the length of thread (F2) between said hook and the thread guide in the rest position interacts with a conveyor (M) which is automatically activated to grip the thread. The other length of thread (F1) between the hook and the fabric (T) suspended from the needles of the machine engages with a cutting means (8) which operates automatically to produce the necessary separation between the fabric and the thread. To bring a thread back into use, the conveyor (M) simply has to be reactivated after said thread has been sufficiently firmly attached to the fabric. In a variant application which is specified, the thread is disengaged from the gripping conveyor (M) with the subsequent operation of the hook (7) and the cutting means (8).

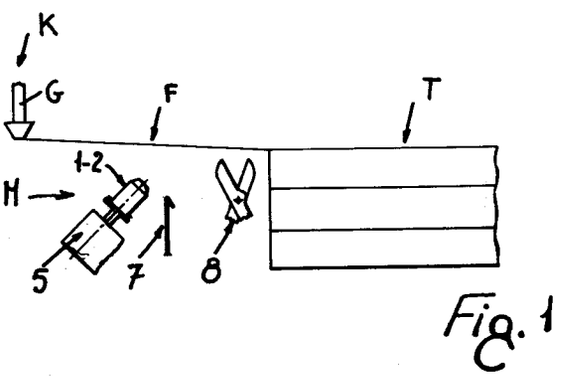

Fig. 1

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The invention relates to a simplified gripping and cutting device for the automatic changing of the colour of the thread in use in flat knitting machines.

This technical problem is currently solved by the provision of small gripping and cutting mechanisms which operate at one end of the beds of the machine, one mechanism being provided for each thread in use, which when necessary retain the thread to be released, cutting it in the length leading to the fabric being knitted. This mode of operation gives rise to problems of design in the arrangement of the said gripping and cutting mechanisms and problems of actuation, and makes for poor reliability, from the technological viewpoint, of the solution as a whole.

The invention is intended to overcome these and other disadvantages with the following idea for a solution.

The thread which is to be released by the carriage of the machine is captured by a hook and drawn downwards when the corresponding thread guide has reached the rest location, so that the length of thread between said hook and the thread guide in the rest position interacts with a conveyor which is automatically activated to grip the thread. The other length of thread between the hook and the fabric suspended from the needles of the machine engages with a cutting means which operates automatically to produce the necessary separation between the fabric and the thread.

When the cycle described is repeated with another thread, the conveyor grasps this thread also and withdraws corresponding lengths of thread from the other thread guides in the rest position.

When a thread is to be brought back into use, the conveyor simply has to be reactivated after said thread has been sufficiently firmly attached to the fabric. By changing the orientation of the reused thread with respect to the conveyor, said thread is disengaged from the conveyor as soon as the latter is activated.

According to a variant embodiment of the invention, it is possible to obtain the disengagement of the thread from the conveyor without reactivating said conveyor, but by reactivating the hook and the cutting means as soon as the thread guide concerned has been displaced towards the beds by an amount such that the thread can be captured by said hook.

Further characteristics of the invention and the advantages derived therefrom will be clearly seen from the following description of certain preferred embodiments of the invention, illustrated non-restrictively and purely by way of example in the figures on the two attached sheets of drawings, in which

- Figs 1, 2, 3 and 4 are schematic side elevations of the principal components of the device according to the invention, shown during certain important stages of their operating cycle;
- Fig. 5 is a schematic plan view from above of the thread capturing conveyor of the device shown in the preceding figures; and
- Fig. 6 illustrates the device according to the diagram in Figures 1 to 4 and according to a variant operation in the disengagement of the thread from the capturing conveyor.

With reference initially to Figs 1 and 5, it will be seen that the device according to the invention has, at least at one end of the beds of the knitting machine, a pair of parallel rollers 1 and 2, disposed parallel to each other, which are in contact with each other and which are carried at the same end by the shafts 3 and 4 respectively, which are associated with a single suitable motor and gear unit 5 which when commanded causes the said rollers to rotate in the direction indicated by the arrows R and at equal velocities.

The axles of the two rollers may be fixed, and in this case at least one of the two rollers is made from any suitable yielding elastic material, for example rubber. Alternatively, the axle of one roller may be fixed while the axle of the other roller may move parallel to the axle of the fixed roller, the two rollers being caused by elastic means to remain in contact with each other. In this case, the two rollers may both be of rigid material, or at least one of them may be made from rubber as in the preceding case.

The rollers 1 and 2 may be driven individually by the motor and gear unit 5, or only one of the said rollers is motorised while the other roller may be driven by friction by the motor roller.

The free ends of the rollers 1 and 2 are of suitably conical form, as indicated by 101 and 102.

One of the two rollers, 1 in the example, carries on its rear end an integral annular collar which grazes the base of the other roller.

The rollers 1 and 2 are placed on the central vertical plane of the machine via their surface linear portion through which they are in mutual contact. The rollers 1 and 2 are orientated with their conical ends facing upwards and in the direction of the beds of the machine, as shown schematically in Figure 1. Said rollers 1 and 2 are placed beneath and in the intermediate part of the length of thread F between the fabric T suspended from the beds of the machine and the thread guide G in the rest position K.

Next to the conveyor M consisting of the rollers 1 and 2 and the associated motor drive 5, and between this conveyor and the beds of the machine, the device according to the invention has a

hook 7, placed vertically on the central plane of the machine, oriented to face upwards and connected to means of raising and lowering of any suitable type, for example to an electromagnet, to a cylinder and piston mechanism operated by fluid pressure, or to other suitable means not illustrated here since they may be imagined and easily constructed by experts in this field.

Finally, a cutting means 8, placed transversely on the central plane of the machine and driven by suitable means, is provided between the hook 7 and the beds of the machine.

The device designed in this way operates in the following manner.

The ends of all the threads originating from the various thread guides parked in the rest location K are held by the rollers 1 and 2.

When a thread guide reaches the rest position K after completion of an operation, a length of thread F still connected to the fabric T and placed above the device in question emerges from said thread guide. The hook 7 is made to rise and fall at the correct time so that this grasps the thread F and draws it downwards, causing it to adopt a bent configuration of which one length F1 is designed to engage with the cutting means 8, while the other length of thread F2 is inserted between the conical ends of the rollers 1 and 2, as illustrated in Figure 2. At the correct time, the rollers 1 and 2 are made to rotate in the direction indicated by the arrows R in Figures 3 and 5, in such a way as to clamp the length of thread F2, after which the said rollers stop. The hook 7 keeps the thread taut, but without damaging the structure of the fabric T. In the next stage, the cutting means 8 are made to operate and cut the length F1 of thread which is thus disengaged from the fabric T and held at its end by the conveyor with rollers 1 and 2.

A thread is brought back into use in the following manner. Figure 4 shows how a thread guide G, previously parked in the rest location K, has been captured by the carriage of the machine and brought into use. The length of thread between the rollers 1 and 2 and the fabric T is placed on the discharge side of the said rollers. When the thread F from the thread guide in use is incorporated in the fabric T, the rollers 1 and 2 are temporarily driven in the direction of the arrow R, to discharge the end of the said thread, while the said rollers withdraw a corresponding quantity of thread from all the thread guides (not illustrated) present at the rest location K.

Figure 6 illustrates a different operation of the device in the aforesaid final stage of disengagement of a thread from the rollers 1 and 2. When the thread guide G has been captured by the carriage of the machine and moved towards the beds, the hook 7 is made to rise and fall, preparing a length F1 of the thread, which extends from the said thread guide and is then brought into use for the formation of the fabric T, engaging with the cutting means 8. When the thread has been incorporated in the fabric T, the cutting means 8 is activated to separate said thread from the rollers 1 and 2 which remain stationary.

It is to be understood that the description refers to certain preferred embodiments and operations of the device according to the invention, to which numerous variations and modifications, particularly as regards construction, may be made. For example, the use of a conveyor with opposing belts or tapes, or of another suitable type, in place of the conveyor with the rollers 1 and 2 is not excluded. Other modifications may relate to the method of driving the hook 7 which may be caused to engage with the thread F by oscillation. Also, the cutting means 8, schematically represented in the drawings by shears, may in fact consist of any suitable means. These and all other modifications and considerations which may be imagined by experts in this field do not depart from the scope of the invention as described above, as illustrated in the figures on the two attached sheets of drawings, and as claimed below.

Claims

1. Simplified gripping and cutting device for the automatic changing of the colour of the thread in use in flat knitting machines, characterised in that it comprises, on at least one of the ends of the beds of said machines, in the region of the rest location of the various thread guides carrying threads of different colours:
   - a small motorised conveyor (M), preferably with a pair of parallel rollers (1 and 2), or of another suitable type, appropriately disposed and oriented with reference to the machine and to the rest location (K) of the thread guides (G) and normally not interacting with the movement of the carriage and of said thread guides. The threads originating from the thread guides at rest have their ends held by the said conveyor and the orientation of the threads and conveyor with respect to each other is such that if the said conveyor is activated a corresponding length of threads is withdrawn from the thread guides at rest and is freely discharged by the said conveyor which continues to have the function of holding said threads;
   - a hook or other suitable means (7) of gripping the length of thread between the thread guide placed in the rest location

(K) and the fabric (T) suspended on the beds of the machine, and of disposing this length of thread in such a way as to form a bent configuration of which one length (F2) engages with the conveyor (M) mentioned in the preceding section, which is activated at the correct time to clamp the thread, while the other length (F1) of said thread engages with the means described in the following section;

- cutting means (8) which are activated at the correct time to cut the length of thread (F1) between the conveyor (M) and the fabric (T).

2. Device according to the preceding claim, characterised in that it comprises means to ensure that when a thread guide has been brought into use and the corresponding thread has been suitably firmly attached to the fabric being knitted, the conveyor (M) which holds the ends of the threads is temporarily activated to disengage itself from the end of the thread from the activated thread guide, while it withdraws a corresponding length of thread from all the thread guides in the rest position.

3. Device according to Claim 1, characterised in that it comprises means to ensure that when a thread guide is brought into use, and before the corresponding thread is firmly attached to the fabric being knitted, the hook (7) is activated to grasp the thread and cause it to form a bent configuration of which one length (F1) engages with the cutting means which subsequently, when the thread has been conveniently firmly attached to the fabric, operate to cut said thread and separate it from the connection to the capturing conveyor (M).

4. Device according to the preceding claims, characterised in that the parallel rollers (1 and 2) which form the thread capturing conveyor (M) have their free ends made suitably conical to facilitate the insertion of the thread between said rollers in the stage of release of a thread guide.

5. Device according to the preceding claims, characterised in that one of the two rollers (1 and 2) forming the thread capturing conveyor (M) is provided, on the end connected to the supporting axle, with an annular collar (6) which grazes the adjacent end of the other roller in such a way as to form a stop for the threads captured by the roller conveyor in question.

6. Device according to the preceding claims, characterised in that the rollers (1 and 2) forming the thread capturing conveyor (M) are elastically pressed against each other and/or are, in one or both cases, made of or covered with any suitable material which is sufficiently elastic and yielding.

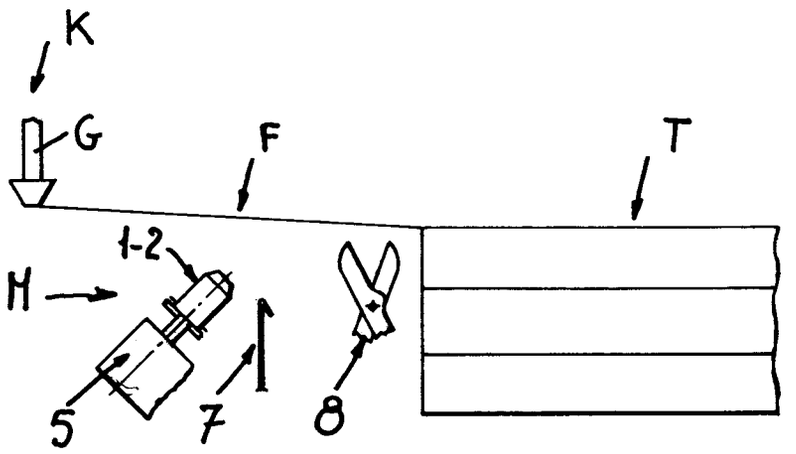

Fig. 1

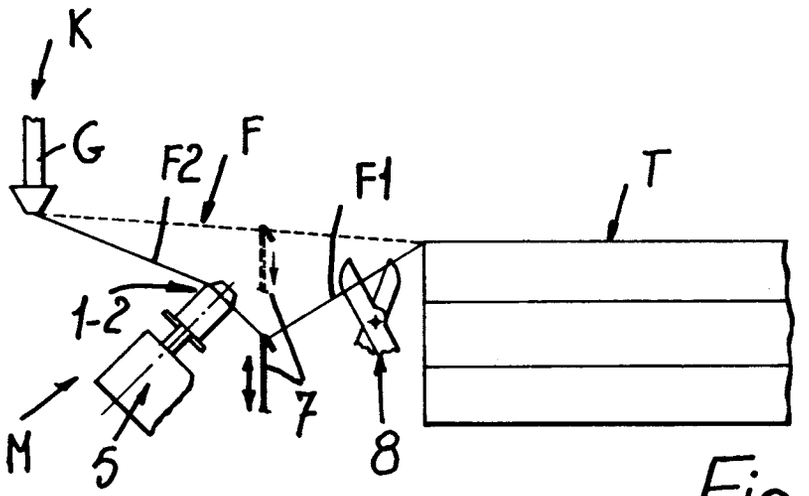

Fig. 2

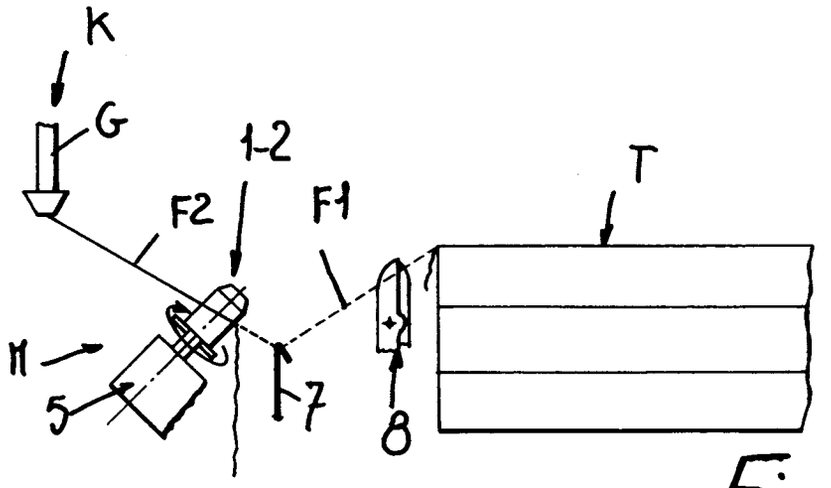

Fig. 3

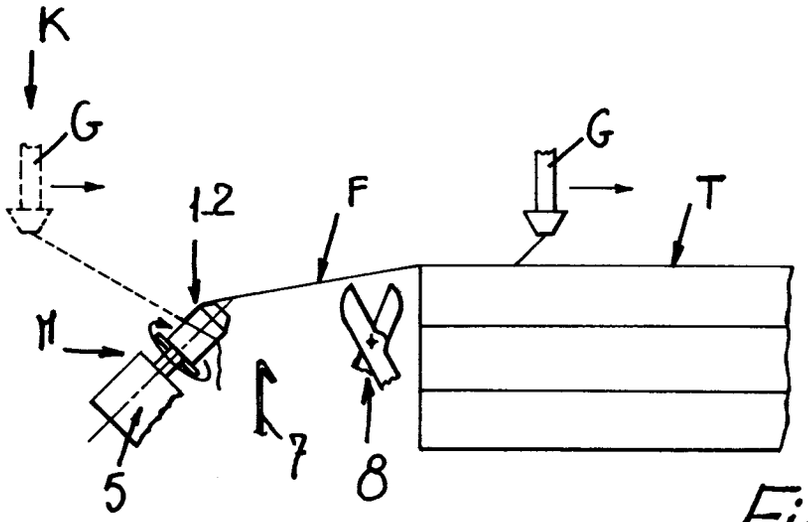

Fig. 4

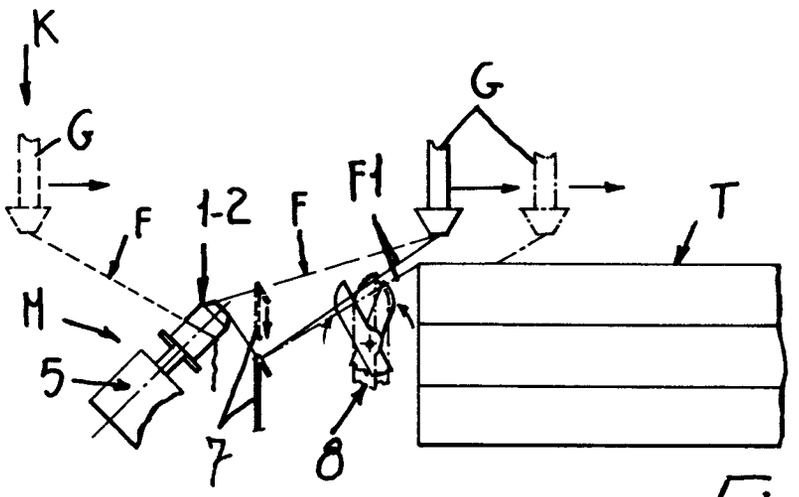

Fig. 6

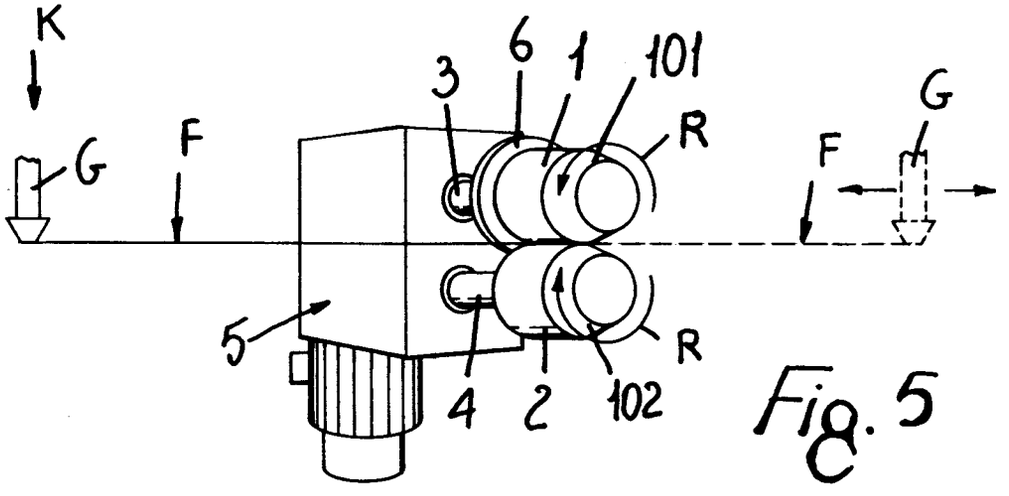

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 0315

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-1 585 356 (SCHUBERT & SALZER MASCHINENFABRIK AG) * page 5, line 11 - page 7, line 6; figures 1-4 *	1,3	D04B15/56
A	DE-B-1 086 388 (COBERT)		
A	US-A-2 674 866 (DYJAK)		
A	EP-A-0 293 956 (H. STOLL GMBH & CO.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D04B
D03C
B65H
D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 MAY 1993	VAN GELDER P.A.

CATEGORY OF CITED DOCUMENTS

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