



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : D05C 15/18	A1	(11) International Publication Number: WO 96/25544 (43) International Publication Date: 22 August 1996 (22.08.96)
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(21) International Application Number: PCT/IB96/00278

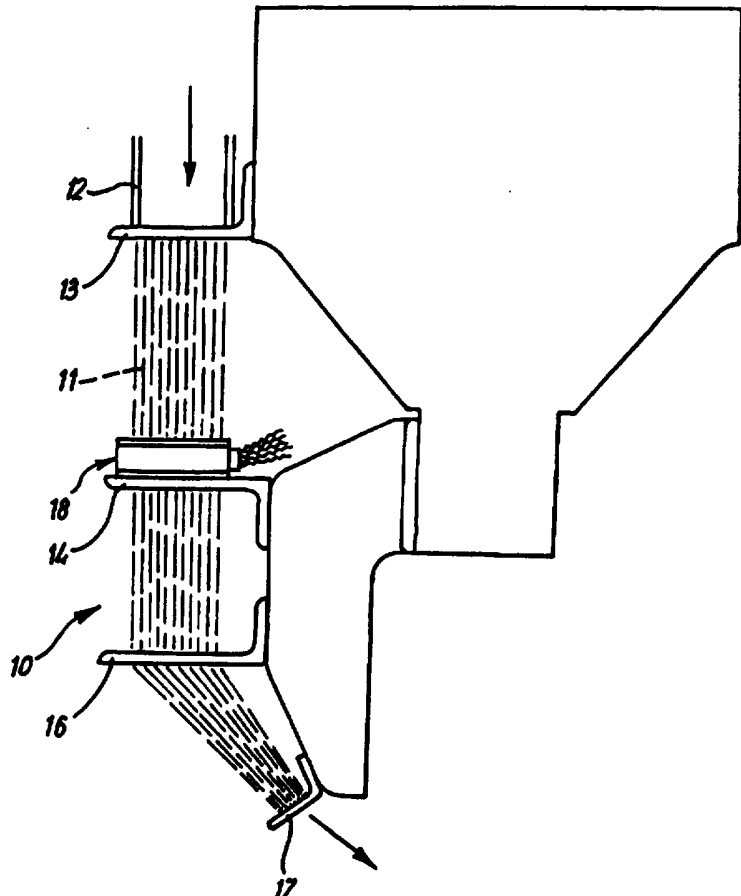
(22) International Filing Date: 16 February 1996 (16.02.96)

(30) Priority Data:
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Royal Exchange, Cross Street, Manchester M2 7BD (GB).(81) Designated States: CN, JP, European patent (AT, BE, CH, DE,
DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).**Published***With international search report.**Before the expiration of the time limit for amending the
claims and to be republished in the event of the receipt of
amendments.*

(54) Title: IMPROVEMENTS IN OR RELATING TO TUFTING MACHINES

(57) Abstract

A yarn feed arrangement (10) for a tufting machine is provided in which the feed of yarn to needles is directed by optical detectors (18). The detectors (18) are linked to a display providing a visual indication of whether there is a fault or no-fault in the feed to one or more of the needles. The display can be incorporated in a central control computer in which the stitching requirements to produce predetermined patterns can be stored and the signals produced by the detectors (18) compared with the standard requirements to ensure accurate production of the required pattern.



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IMPROVEMENTS IN OR RELATING TO TUFTING MACHINES

This invention relates to tufting machines and in particular to an improved yarn feed arrangement for tufting machines.

In tufting machines, a plurality of yarn carrying needles are mounted
5 on needlebars extending transversely across the machine and these
needlebars are reciprocated cyclically to penetrate and insert loops of yarn
into a backing material moving longitudinally beneath the needles. The loops
thus formed are seized either by loopers or hooks mounted on a hook bar
depending upon whether it is desired to produce loop or cut pile in the
10 material. If it is desired to produce more versatility in patterning in the
tufted fabric, it is known to provide a plurality of needles mounted above the
backing fabric and respective drive connection means therefor mounted
separate therefrom on the needlebar, each of the drive connection means
being selectively operable during reciprocation of the needlebar to drivingly
15 engage the needles and cause the needles selectively to penetrate the
backing fabric and sew a loop of yarn. With an arrangement of this type it
can be seen that more intricate and varied patterns can be sewn into a
tufted fabric since each respective needle can be individually controlled.

It is with the latter type of machine with which the present invention
20 is primarily concerned, although it is to be understood that the arrangement
of the present invention is not restricted to its use in relation to machines of
this type.

A problem is encountered in relation to machines of the

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abovementioned type insofar as if the feed of yarn to one or more needles is not correct, for example due to yarn breakage, unthreading of the yarn from the needle or exhaustion of the supply of yarn from which the yarn is fed, it is not normally possible to detect such fault conditions to prevent errors in sewing the tufted fabric and therefore prevent either a reduction in quality of the finished tufted fabric or indeed even the production of commercially useless finished tufted fabric.

It is an object of the present invention to provide a yarn feed arrangement in which such fault conditions can be sensed and therefore, if necessary, corrective action can be taken.

According to the present invention there is provided in or for a tufting machine, a yarn feed arrangement for feeding yarn from a supply thereof to the needles of the machine, said feed arrangement including fault detection means which is operable to detect a change in the yarn take up by one or more of said needles from said supply.

With this arrangement it is possible to detect simply and conveniently a fault in the yarn feed to one or more of the needles of tufting machine.

Preferably said fault detection means, upon detection of a fault, is operable to cause said tufting machine to stop.

Preferably said fault detection means includes a detector placed in a path of said yarn from said supply to each said needle. Each detector may be positioned to detect the yarn requirements of one or more needles in the machine. For example, a single detector may detect the yarn requirements

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for an amount of 10 or 20 needles. Alternatively, a separate detector may be provided to detect the yarn requirements of each needle.

5 Preferably each said detector provides a signal indicative of the detection of a fault, where detected, or indicative of non-detection of a fault and said detector may be coupled to a display means upon which a suitable display of the indication can be made. More than one detector may be linked to a single display means and in a particularly preferred embodiment, all detectors are linked to a single display means, which display means is operable to provide a display showing the detection or non-detection of a
10 fault indication in yarn feed to each needle of the machine.

Preferably the fault detection means comprises an optical detection means which detects whether yarn passing the detector is moving or stationary which is indicative of whether a needle is sewing yarn loops accurately into the backing cloth.

15 The one or more detector means may be linked to a central control means which includes a suitable display, the said control means being operable to receive said fault indication signals from said detection means and provide one or more displays of said indications in a suitable form. Said control means may be adapted to store information relating to the production
20 of predetermined patterns. Said control means may also be operatively linked to a needlebar of said machine whereby a particular pattern of tufted fabric to be produced can be selected from patterns stored in said control means, and needles of the machine can be operated by said control means

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to produce a selected pattern in the tufted fabric. In this case, the signals provided to the needles to cause them to operate to produce the desired pattern can be compared with the signal produced by the detector or detectors to ensure that the selected pattern is being produced correctly and accurately by the machine. In a preferred embodiment the control means comprises a microprocessor or computer incorporating a visual display unit (VDU).

In order to avoid spurious detection, the control means may be adapted such that faults must be detected on multiple successive occasions in the feed of yarn to said needle or needles prior to causing said machine to stop to allow remedial action to be taken.

The invention will now be described further by way of example only and with reference to the accompanying drawings, of which:-

Fig. 1 shows a schematic representation of one form of yarn feed arrangement of the present invention; and
Fig. 2 shows an enlarged sectional view of a detector of the arrangement of Fig. 1.

Referring now to the drawings, there is shown in Fig. 1 a yarn feed arrangement 10 for a tufting machine which in use feeds yarn 11 from one or more supplies or creels thereof (not shown) to needles (not shown) of the machine. The yarn is fed from the supply down a supply tube 12 and is guided into the region of the needles by a series of fixed yarn guides 13, 14, 16 and 17.

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The detection means 18 is positioned directly in the feed path of the yarn from the supply or creel to the needles and is shown more clearly in Fig. 2.

5 The detection means 18 comprises a body 19 having a through bore 21 through which yarn from the supply passes. A detector 22 is mounted in a recess 23 in a wall of the body 19, the recess 23 opening out into the through bore 21. The detector 22 is connected to control circuitry 24 which can be conveniently mounted on a printed circuit board (PCB) mounted behind the detector 22 and held in position between two rearwardly
10 extending arms 26 of the body 19. In the embodiment shown, the detector 22 comprises an optical detector, although it will be appreciated that any suitable form of detector can be used as desired or as appropriate. As an alternative to the arrangement shown in Fig. 2, the control circuitry can be mounted remote from the detector 22 or body 19, whilst remaining
15 electrically connected thereto.

The control circuitry 24 is connected to a control computer (not shown) which is able to send signals to the control circuitry 24 and receive signals from the detector 22. The signals received from the detector can be displayed on a suitable display (not shown). The control computer 15 may
20 also be operable to control operation of the tufting machine in accordance with pattern requirements for the finished tufted fabric and instructions for the production of predetermined patterns are stored in the computer or may be entered by an operator.

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In use, in operation of the tufting machine, yarn 11 is fed from the supply or creel through the through bore 21 of the detection means 18 and to the needles of the machine. Movement of the yarn through the through bore 21 is detected by the detector 22 and a signal is fed back to the control computer via control circuitry 24 indicating that the yarn is moving or stationary. In the embodiment shown in the drawings, a single detector 22 is used to detect movement of a number of yarns 11, although it should be appreciated that, if desired or appropriate, a number of detectors 22 may be provided, each detecting movement of a number of yarns 11 or alternatively a separate detector 22 may be provided for each yarn 11.

The signal received from the detector 22 can be displayed on a display which may or may not be associated with the control computer.

In a preferred embodiment of the invention, if a signal is received from a detector 22 indicating that a particular yarn 11 is not moving as required, or is moving when not required, the control circuitry 24 or control computer is operable to cease operation of the tufting machine so that any fault can be rectified in order to avoid deterioration in the quality of a finished tufted fabric. If desired, in order to prevent shut down of the machine upon spurious detection of the yarn, the control computer may be programmed such that the machine will only be shut down upon actuation of multiple successive faults in the yarn feed to the same needle or needles.

Where instructions for producing predetermined selectable patterns in the finished tufted fabric are stored in the control computer, in order to

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ensure that the needlebar, or individual needles, are operated during operation of the machine to produce a predetermined pattern in the finished tufted fabric, the signal received from the or each detector 22 can be compared with the stored instructions to ensure that a particular needle
5 sews loops in the backing fabric in accordance with the requirements of the particular pattern to be produced at the appropriate time by sensing the movement of yarn caused by the sewing.

Furthermore, it may be possible to identify each detector 22 in a suitable manner such that if a fault occurs, the display may indicate the
10 identification of the detector 22 which has sensed the lack of movement of yarn in order that the location of the fault in the machine can be readily identified.

It will be appreciated that with the arrangement of the present invention, faults in sewing of loops and yarn feed to needles can be detected
15 and remedial action taken to rectify the faults whereby the quality of a finished tufted fabric can be improved.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only.

CLAIMS

1. In or for a tufting machine, a yarn feed arrangement for feeding yarn from a supply thereof to the needles of the machine, said feed arrangement including fault detection means which is operable to detect a change in the yarn take up by one or more of said needles from said supply.
2. A yarn feed arrangement according to claim 1 characterised in that said fault detection means, upon detection of a fault, is operable to cause said tufting machine to stop.
3. A yarn feed arrangement according to claim 1 or claim 2 characterised in that said fault detection means includes a detector placed in the path of said yarn from said supply to each said needle.
4. A yarn feed arrangement according to claim 3 characterised in that each detector is positioned to detect the yarn requirements of one or more needles in the machine.
5. A yarn feed arrangement according to claim 4 characterised in that a single detector detects the yarn requirements of either 10 or 20 needles.
6. A yarn feed arrangement according to claim 4 characterised in that a separate detector is provided to detect the yarn requirements of each needle.
7. A yarn feed arrangement according to any one of claims 3 to 6 characterised in that said detector provides a signal indicative of the detection of a fault, where detected or indicative of the non-detection of a fault in the supply of yarn to a particular needle or multiplicity of needles.
8. A yarn feed arrangement according to claim 7 characterised in that

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said detector is coupled to a display means upon which a suitable display of the fault or no-fault indication can be made.

9. A yarn feed arrangement according to claim 8 characterised in that more than one detector is linked to a single display means.

5 10. A yarn feed arrangement according to claim 9 characterised in that all detectors are linked to a single display means, which display means is operable to provide a display showing the detection on one detector of a fault indicative in yarn feed to each needle of the machine.

10 11. A yarn feed arrangement according to any one of claims 1 to 10 characterised in that said fault detection means comprises an optical detector means which detects whether yarn passing the detector is moving or stationary which is indicative of whether a needle is sewing yarn loops accurately into the backing cloth.

15 12. A yarn feed arrangement according to any one of claims 1 to 11 characterised in that said one or more detector means are linked to a central control means which includes a suitable display, the said control means being operable to receive the fault indication signals from said detection means and provide one or more displays of said indications in a suitable form.

20 13. A yarn feed arrangement according to claim 12 characterised in that said control means is adapted to store information relating to the production of predetermined patterns.

14. A yarn feed arrangement according to claim 12 or claim 13

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characterised in that said control means is operatively linked to a needlebar of said machine whereby a particular pattern of tufted fabric to be produced can be selected from patterns stored in said control means, and needles of the machine can be operated by said control means to produce a selected
5 pattern in the tufted fabric.

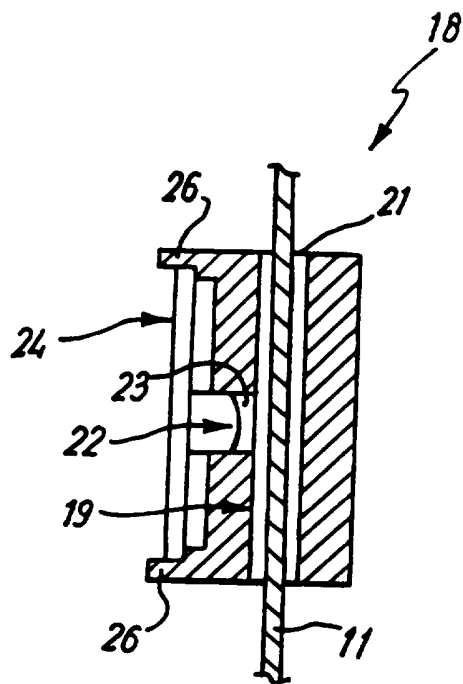
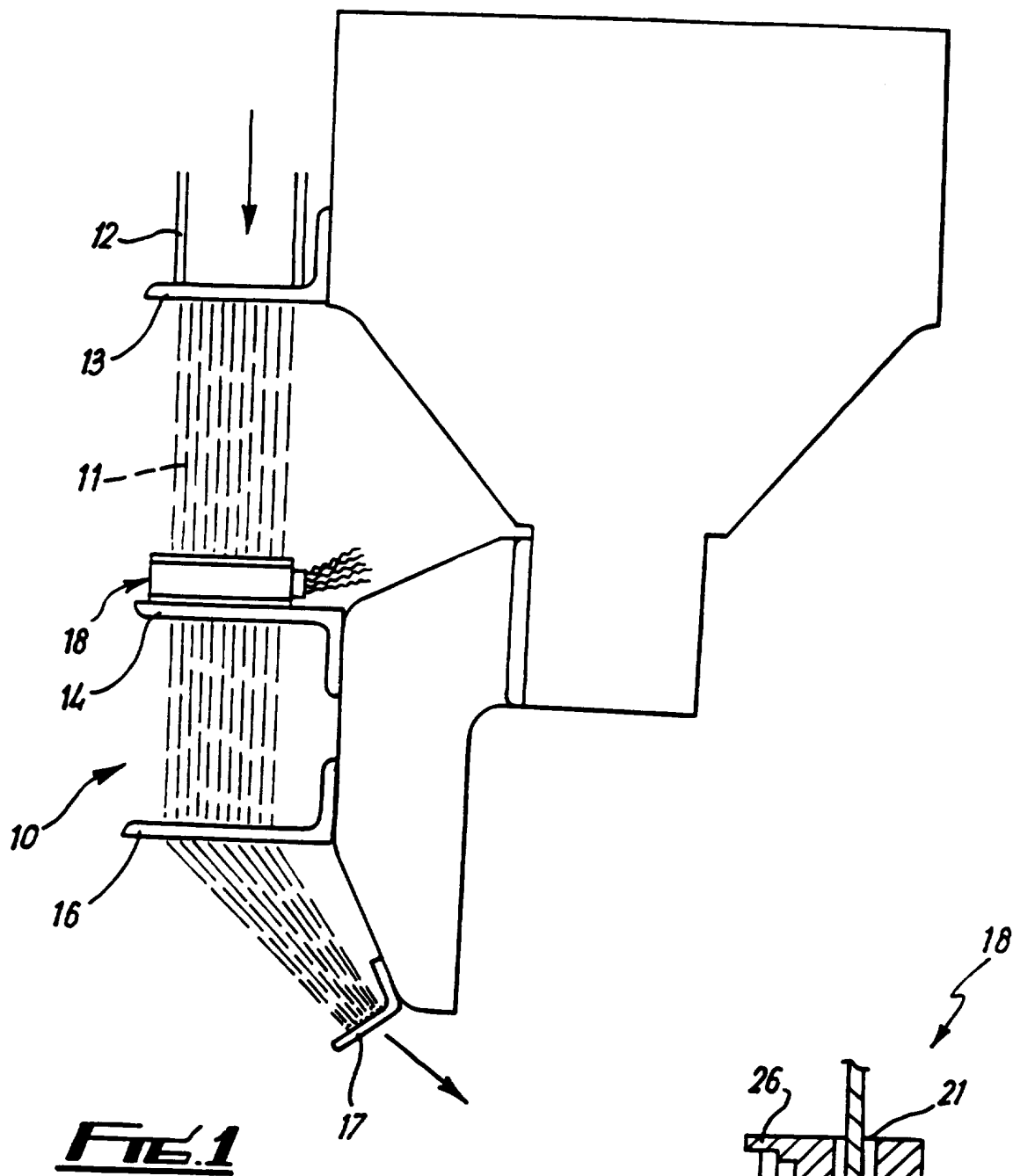
15. A yarn feed arrangement according to claim 14 characterised in that signals provided to the needles to cause them to operate to produce the desired pattern can be compared with the signal produced by the detector to ensure that the selected pattern is being produced correctly and
10 accurately by the machine.

16. A yarn feed arrangement according to any one of claims 12 to 15 characterised in that said control means comprises a microprocessor or computer incorporating a visual display unit (VDU).

17. A yarn feed arrangement according to any one of claims 2 to 16
15 characterised in that said fault detection means is operable to cause the machine to stop only upon detection of multiple successive faults in the same needle or needles.

18. In or for a tufting machine, a yarn feed arrangement substantially as hereinbefore described with reference to the drawings.

20 19. A tufting machine incorporating a yarn feed arrangement according to any preceding claim.



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB 96/00278

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D05C15/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D05B D05C D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	GB,A,2 217 737 (BARUDAN K.K.) 1 November 1989	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

12 July 1996

Date of mailing of the international search report

22.07.96

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INTERNATIONAL SEARCH REPORT

International application No PCT/IB 96/00278

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