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(54) **Method and equipment for sucking off and automatically removing fly and dust in a bobbin winding station**

Verfahren und Vorrichtung zum Absaugen und zum automatischen Entfernen von Flug und Staub in einer Spulenaufwickelstation

Procédé et dispositif d'aspiration et d'enlèvement automatique de restes de fibres et de poussière dans un poste de bobinage

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Description

The present invention relates to a method for sucking off and automatically removing the fly and dust in a bobbin winding station.

More specifically it relates to a method which is capable of preventing the dispersion of fibrils and dust, produced in the unwinding pirn area, in the working environment and on the machine itself. Incidentally, it is well-known that in the area of the lower thread-feeding pirn, fly and dust are mainly produced in the winding process of a bobbin-winding station.

In the following description and claims, the term "thread" indicates any kind of material of wool or cotton fibre, and the term "bobbin" or "conical bobbin" indicates any form of said thread wound in substantially helical coils.

In addition, as is well-known, in the winding process of the thread onto a bobbin in formation, the thread is fed by unwinding it from a lower cop.

In textile machines such as automatic winders, there are suction pipes for a wide range of purposes, for example for cleaning certain parts of the machine, for catching and preparing thread-ends, for sucking off excess, or cut thread-ends, and the like. In this case it is customary to move the mobile pipe-end, for example to take the pipe-end to a certain point where it must carry out its sucking action to a considerable extent. It is also known that numerous suction pipes in textile machines operate only for short times and remain inactive for longer periods.

On this basis it is known that in thread-winding stations, the thread, composed of a mixture of fibres of different lengths, is subjected to strong tensile stress during unwinding, causing the detachment of a certain quantity of fibres, mainly short ones and the formation of dust. It is therefore necessary to remove flying fibres and fibrils and dust in the area surrounding the unwinding pirn. Pneumatic cleaning devices have already been proposed, composed of suction nozzles applied near the areas to be cleaned, and a trolley has also been proposed, carrying one or more cleaning pipes consisting of either suction or blowing pipes, which are moved alternatively along the winding front. In addition to other devices, cases near the pirn have been proposed, these cases being connected to a suction system according to DE-A-2919768.

The devices and methods for removing fly and dust near the unwinding pirn which are already known and commonly applied, are not completely satisfactory and have various disadvantages. First of all it should be noted that pneumatic devices composed of fixed suction nozzles become easily and frequently blocked, consequently their suction efficiency is greatly reduced after a few hours of operation and frequent maintenance and cleaning of the nozzles is therefore necessary. Incidentally, the maintenance and cleaning of the suction slots requires considerable attention on the part of the workers, who are compelled to intervene with no fixed frequency.

It is understandable that for casual operations which cannot be programmed in time, the efficiency of the workers is low.

The purpose of the present invention is to propose a method, and equipment for its embodiment, for removing the dust of fibres and broken threads in the bobbin-winding station, without the disadvantages mentioned above and capable of guaranteeing higher efficiency and duration, without requiring any intervention on the part of maintenance workers or those responsible for the functional efficiency of the equipment.

Another purpose of the present invention is to rationalize the suction equipment operating in the area surrounding the unwinding pirn, from the point of view of both its capacity and suction efficiency, to effectively remove the fibrils, the fly and dust produced by the rapid unwinding of the thread. A further purpose of the present invention is to provide a method for sucking off and automatically removing the fly and dust in a bobbin-winding station of a new design, which is at the same time simple and which offers the possibility of suction in the whole unwinding area using for the most part equipment and functions already present in the thread-winding process on the bobbin in formation.

These and other purposes of the invention, which will become more evident in the course of the description, are obtained by the method described and claimed hereunder which is capable of:

- sucking in the area surrounding the unwinding pirn during the whole operating time of collecting the thread wound onto the bobbin in formation, the fly and dust produced by the unwinding of the thread;
- withholding and accumulating the fly and dust in the suction pipe of the guide slot of the thread-end wound onto the bobbin in formation and said accumulation is withheld by a grate filter having suitable dimensions;
- removing the accumulation of fly and dust each time the winding is stopped and the suction pipe which holds and prepares the thread-end of the bobbin for restarting the production of the bobbin-winding station in a short period of time, is activated;
- moving said accumulation of fly and dust into the central pipe which is placed in depression by the central suction system of the whole winding machine.

The method for sucking off and automatically removing the fly and dust in a bobbin-winding station also includes the removal of the accumulation of fly and dust at each interruption of the thread being fed due to the bobbin end, or controlled cutting of the thread, or accidental breaking of the thread.

The equipment used for the practical embodiment of the method of the present invention includes in reciprocal co-operation at least one fan rigidly wedged on the drive shaft of the bobbin-winding station, at least one encasing element which covers the unwinding pirn and forces the air surrounding it into a suction pipe, which is connected to the suction duct activated during the catching of the thread-end wound onto the bobbin in formation owing to an interruption in the feeding of the thread, at least one grate filter suitably dimensioned and shaped to make it an integral part of the internal surface of the suction duct for the catching of the thread wound onto the bobbin, a suction pipe which extends from the fan wedged onto the drive shaft and the previously mentioned grate filter, and closing and opening devices of the suction pipes to provide a better effect during each suction phase.

The equipment used for the practical embodiment of the present invention also includes programming devices for co-ordinating the sequence of activations of the various operating elements, as well as regulating devices of the depression values in the above suction pipes.

The invention will be described in detail hereafter on the basis of the embodiment example schematically represented in the drawings of the figures of the enclosed tables, and other particulars and characteristics will be explained, bearing in mind that there are numerous other forms of embodiment of the invention which can be used.

In the enclosed drawings:

- figure 1 shows a schematic side view in assonometrical perspective of a bobbin-winding station wherein a thread unwound from a lower feeding pirn is wound onto an upper winding bobbin, and this figure shows the exact moment when the winding is in process and consequently also the suction action in the whole area surrounding the unwinding pirn,
- figure shows a partial front view of an upper part of the bobbin-winding station which schematically illustrates the engine with the fan wedged onto its shaft to put a pipe in depression, which includes at least one grate filter;
- figure 3 shows a schematic side view in assonometrical perspective of a bobbin-winding station at the exact moment when the winding is blocked owing to interruption of the thread and the accumulated fly and dust are removed along the suction pipe.

In the figures the same elements have the same references. In addition, to provide an overall clearer view, in the figures the parts which are not necessary for understanding the invention are omitted or being already known, are shown schematically.

In the enclosed figures:

1 is a three-phase engine, or similar, which activates the single bobbin-winding station 20; 2 is the accumulated fly and dust withheld by the grate filter 6 which is situated between the upper duct 4 and lower duct 23, both sucking due to the depression generated by the fan 3 wedged onto the drive shaft; 18 is the known control cylinder which supplies the rotating movement to the bobbin 16 in formation; 8 is an encasement with suitably shaped layers, which cover the unwinding pirn 11 and which force the surrounding air 14 into the suction duct 4; 12 is a peg which holds the pirn 11, which feeds the thread being wound; 21 is a roller blind closing and opening device of the suction pipe 23 and said 23 is moved by the sucking action of the air. Said device 21 can be closed and opened by any electromechanical or electropneumatic activator of the known art; 19 is a roller blind closing and opening device of the suction pipe 4 and said device 19 has the same function as the device 21; 7 is the collecting duct which extends along the whole winding front, which, as is known, is composed of numerous bobbin-winding stations situated next to each other. Said duct 7 is placed in depression from the known central sucking complex at the head of the machine (not shown); 5 is a suction pipe, which joins duct 7 each time there is an interruption of the thread being fed owing to the bobbin 11 end, or controlled cutting of the thread, or accidental breaking of the thread. Said suction pipe 5 communicates with duct 7 by means of a lever mechanism, or roller-blind device, or similar known elements, which activate the opening and closing of said ducts 5 and 7; 10 is the suction pipe at the end of which is a guide slot of the thread end wound onto the bobbin in formation 16. Said suction pipe 10, which is already known, is activated each time there is an deliberate or accidental interruption of the thread; 9 is an articulated suction duct, which with its angular rotation enables pipe 10 to be connected as a single suction duct to suction pipes 9 and 5 which are both open to the sucking action 22 of duct 7; 15 is a simple known lever mechanism which activates the angular rotation of duct 9 each time the winding of the thread is interrupted.

The description of the principle of operation which follows, with reference to the figures indicated, mainly refers to what is new and therefore only describes the equipment of the present invention, which embodies a method for sucking off and automatically removing the fly and dust in a bobbin-winding station, bearing in mind that complementary devices are necessary for its functioning, which will not be included in the description as these are already known to experts in the art.

In addition, the functioning of the equipment which embodies the method of the present invention can be easily understood by observing the figures of the enclosed tables.

During the operation of the bobbin-winding station 20, the unwinding of pirn 11 continually generates a certain quantity of fibres, mainly short, and dust and, consequently fly, which is advantageously withheld by

encasement 8 to be immediately sucked off into duct 4. The latter is placed in continuous depression by the rotating action of fan 3, which sucks-in the air and the dust suspended therein.

The fibres, or fibrils or cut thread and the dust in general suspended and carried by the current of air are intercepted by grate filter 6 and are accumulated and withheld on said filtering element for as long as the winding continues. The above operating description is represented in a perfectly understandable way to experts in the field by figures 1 and 2.

At the exact moment the winding stops by the controlled or accidental interruption of the thread, engine 1 stops and also fan 3 wedged thereon and, consequently, the sucking action along ducts 4 and 23 ends and said ducts are intercepted in a closing position by roller-blind devices 21 and 19.

Immediately after this the thread-ends are knotted to restart the cycle of continuous thread. The end of guide slot 10 is positioned, as is known, near bobbin 16 to catch and prepare the upper thread-end to re-continue the winding of the bobbin-winding station. Said position is activated by the angular rotation of the articulated suction duct 9 using element 15. The considerable sucking action is obtained by connecting pipe 5 with duct 7 by known lever mechanisms and the accumulation of fly 2 is removed from filter 6 to be sent by the sucking air flow into collecting duct 7 (see figure 3).

The continuity of the thread is restored and the winding of the thread restarted together with the gradual accumulation of fly on filter 6 and said accumulation will be removed at the next interruption of the winding of the thread.

It is clear that minor modifications can be made to the equipment proposed in the present invention remaining however within the limits of the invention.

Claims

1. Method for sucking off and automatically removing the fly and dust in a bobbin-winding station (20) wherein a thread unwound from a lower feeding pirn (11) is wound onto an upper winding bobbin (16) and said method is characterized by:

   - sucking in the area surrounding the unwinding pirn, during the whole operating time of the collection of the thread wound onto the bobbin in formation, the fly and dust produced by the unwinding of the thread;
   - withholding and accumulating the fly and dust in the known suction duct (10) of the guide slot of the thread-end wound onto the bobbin in formation and said accumulation is withheld by a suitably sized grate filter (6);
   - removing the accumulation of fly and dust each time the winding is stopped and the suction duct, which catches and prepares the thread-end of the bobbin, is activated, to restart in a short time the productive functioning of the bobbin-winding station;
   - sending said accumulation of fly and dust into a central duct (7), which is placed in depression by the centralized sucking system of the whole winding machine.

2. Method for sucking off and automatically removing the fly and dust in a bobbin-winding station (20) according to claim 1, characterized in that the accumulation of fly and dust is removed at each interruption of the thread, either controlled or due to the accidental breaking of the thread.

3. Equipment for the embodiment of the method according to claim 1, for sucking off and automatically removing the fly and dust in a bobbin-winding station (20), characterized in that it includes in reciprocal co-operation at least one fan device (3) rigidly wedged onto the driving shaft of the bobbin-winding station, at least one encasement (8) which suitably covers the unwinding pirn (11) and forces the air surrounding it into a suction duct (4), which leads into the suction pipe (23) activated during the catching of the thread-end wound onto the bobbin (16) in formation owing to an interruption in the feeding of the thread, at least one grate filter (6) suitably shaped and sized to make it an integral part of the internal surface of the known suction pipe (10) for catching the thread wound onto the bobbin, a suction duct (5) which extends from the fan wedged onto the driving shaft and grate filter mentioned above towards a central duct, and opening and closing devices (19, 21) of the suction ducts (4, 23) to make each operating suction phase more effective.

Patentansprüche

1. Verfahren zum Absaugen und automatischen Abführen des Flugstaubs in einer Spulstation (20), in der ein von einer unteren Zuführspule (11) abgewickelter Faden auf eine obere Wickelspule (16) gewickelt wird, welches **gekennzeichnet** ist durch:

   - Absaugen des beim Abwickeln entstehenden Flugstaubs aus dem die Abwickelspule umgebenden Bereich während der gesamten Aufwickelzeit des Fadens auf die sich bildende Spule;
   - Zurückhalten und Ansammeln des Flugstaubs in dem bekannten Saugrohr (10) des Führungsspalts für den auf die sich bildende Spule aufgewickelten Faden und wobei der angesammelte Flugstaub durch ein geeignet bemessenes Gitterfilter (6) zurückgehalten wird;
   - Austragen des angesammelten Flugstaubs

immer dann, wenn das Aufwickeln angehalten und der Saugkanal, der das Fadenende der Spule ergreift und vorbereitet, aktiviert wird, um nach kurzer Zeit den produktiven Betrieb der Spulstation wieder aufzunehmen;

- Übergeben des angesammelten Flugstaubs an einen Hauptkanal (7), der durch das zentrale Absaugsystem der ganzen Spulmaschine unter Unterdruck gesetzt wird.

2. Verfahren zum Absaugen und automatischen Abführen des Flugstaubs in einer Spulstation (20) gemäß Anspruch 1, **dadurch gekennzeichnet**, daß der angesammelte Flugstaub bei jeder Fadenunterbrechung, sei sie gesteuert oder durch einen zufälligen Fadenbruch erzeugt, abgeführt wird.

3. Vorrichtung zur Durchführung des Verfahrens nach Anspruch 1 zum Absaugen und automatischen Abführen des Flugstaubs in einer Spulstation (20), **dadurch gekennzeichnet**, daß sie umfaßt in gegenseitiger Wechselwirkung wenigstens eine Gebläsevorrichtung (3), die starr mit der Antriebswelle der Spulstation verkeilt ist, wenigstens eine Abdeckung (8), die die Abwickelspule (11) in geeigneter Weise abdeckt und die sie umgebende Luft in einen Saugkanal (4) lenkt, der in einen Saugkanal (23) mündet, der aufgrund einer Unterbrechung der Fadenzufuhr für das Aufnehmen des Fadenendes des auf die sich bildende Spule (16) gewickelten Fadens aktiviert wird, wenigstens ein geeignet geformtes Gitterfilter (6), um es ein integrales Teil der Innenfläche des bekannten Saugrohrs (10) zu machen, für das Aufnehmen des auf die Spule gewickelten Fadens, einen Saugkanal (5), der sich von dem auf die Antriebswelle aufgekeilten Gebläse und dem oben erwähnten Gitterfilter zu einem Hauptkanal erstreckt, und Öffnungs- und Schließvorrichtungen (19, 21) der Saugkanäle (4, 23), um jede betriebliche Saugphase wirksamer zu machen.

Revendications

1. Procédé d'aspiration et d'enlèvement automatique de restes de fibres et de poussière dans un poste de bobinage (20), dans lequel un fil déroulé d'une cannette d'alimentation inférieure (11) est enroulé sur une bobine d'enroulement supérieure (16), ce procédé étant caractérisé par le fait de :

   - aspirer dans la zone entourant la cannette de déroulement, pendant toute la durée de fonctionnement du rassemblement du fil entouré sur la bobine en formation, les restes de fibres et la poussière produits par le déroulement du fil ;
   - retenir et accumuler les restes de fibres et la poussière dans la conduite d'aspiration (10) connue de la fente de guidage du bout de fil enroulé autour de la bobine en formation, cette accumulation étant retenue par un filtre à grille (6) de taille adaptée ;
   - enlever l'accumulation de restes de fibres et de poussière chaque fois que l'enroulement est arrêté et que la conduite d'aspiration, qui attrape et prépare le bout de fil de la bobine, est activée, pour redémarrer peu après le fonctionnement productif du poste de bobinage ;
   - envoyer cette accumulation de restes de fibres et de poussière dans une conduite centrale (7), qui est mise en dépression par le système d'aspiration centralisé de l'ensemble de la machine à bobiner.

2. Procédé d'aspiration et d'enlèvement automatique de restes de fibres et de poussière dans un poste de bobinage (20) selon la revendication 1, caractérisé en ce que l'accumulation de restes de fibres et de poussière est enlevée à chaque interruption du fil, soit de façon commandée, soit du fait de la rupture accidentelle du fil.

3. Dispositif de mise en oeuvre du procédé selon la revendication 1, pour aspirer et automatiquement enlever les restes de fibres et la poussière dans un poste de bobinage (20, caractérisé en ce qu'il comprend, en coopération mutuelle, au moins un dispositif de ventilation (3) monté de façon rigide sur l'arbre d'entraînement du poste de bobinage, au moins une enveloppe (8) qui recouvre avantageusement la cannette de déroulement (11) et force l'air l'entourant à pénétrer dans une conduite d'aspiration (4), qui conduit dans le tuyau d'aspiration (23) activé lorsqu'est attrapé le bout de fil entouré sur la bobine (16) en formation, du fait d'une interruption de l'alimentation du fil, au moins un filtre à grille (6) de forme et de taille adaptées pour qu'il fasse partie intégrante de la surface interne du tuyau d'aspiration (10) connu, afin d'attraper le fil entouré autour de la bobine, une conduite d'aspiration (5) qui s'étend à partir du ventilateur monté sur l'arbre d'entraînement et du filtre à grille mentionné ci-dessus, en direction d'une conduite centrale, et des dispositifs d'ouverture et de fermeture (19, 21) des conduites d'aspiration (4, 23), afin que chaque phase d'aspiration fonctionne de façon plus efficace.

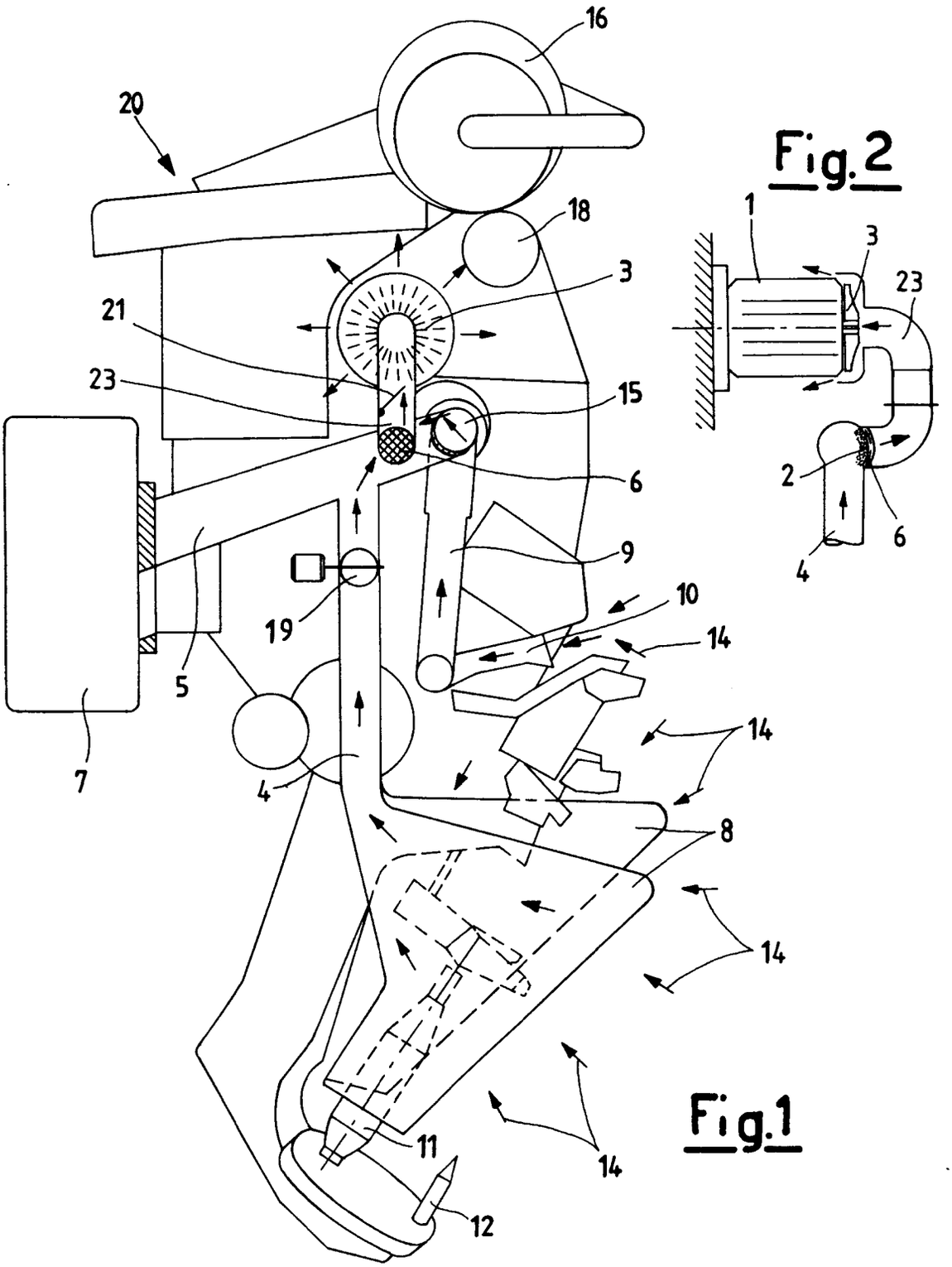


Fig.1

Fig.2

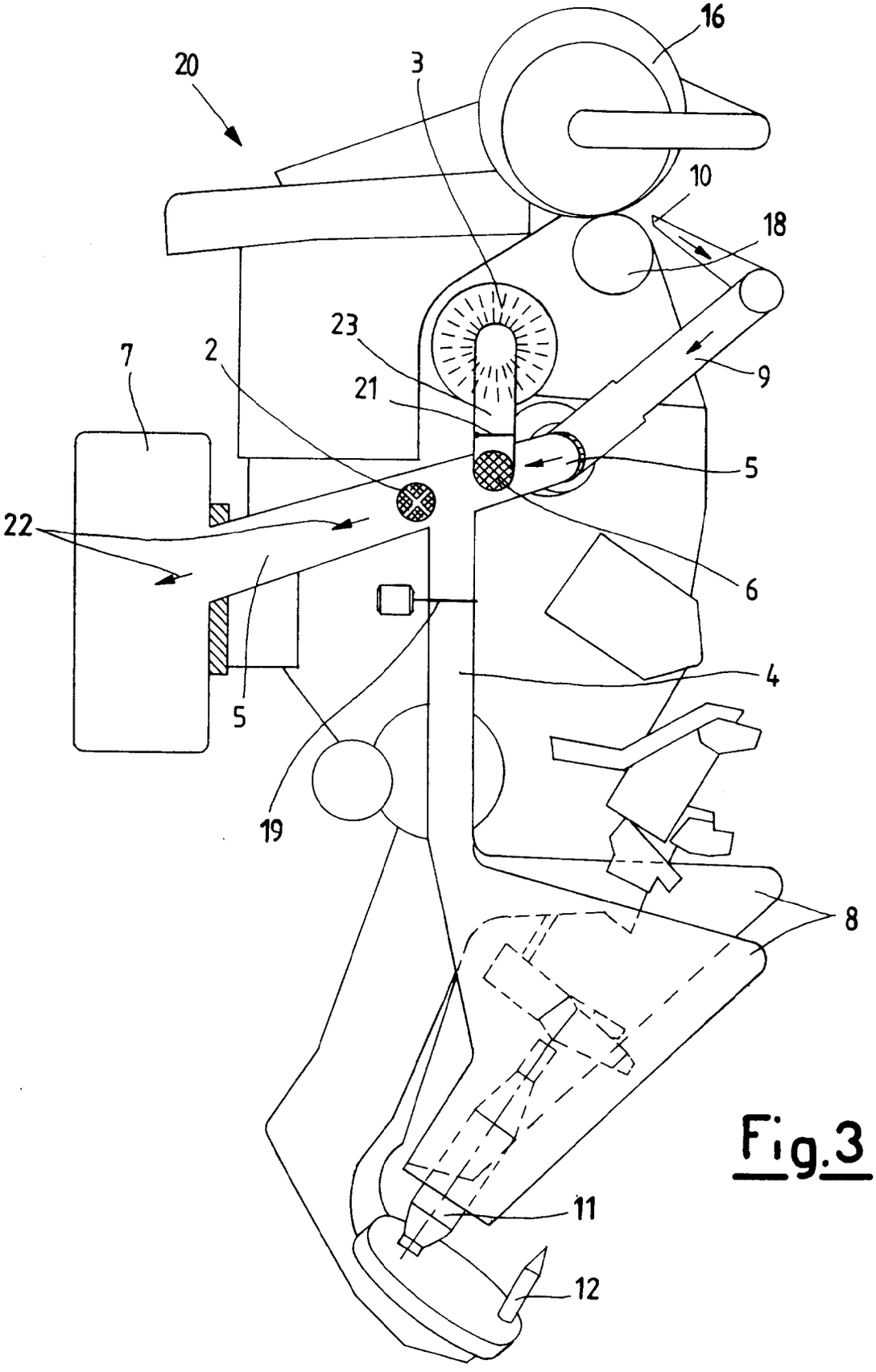


Fig.3