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(54) **Brush tufting machine**
Bürstentuffingmaschine
Machine à tuffer des brosses

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(56) References cited:
EP-A- 0 722 677 **DE-A1- 4 005 276**
DE-U1- 8 129 284 **GB-A- 2 055 567**
GB-A- 2 110 079

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Description

[0001] The present invention relates to a brush tufting machine, in particular for making toothbrushes.

[0002] Conventional brush tufting machines have a machine tool table having a slide that is displaceably guided thereon in two mutually orthogonal directions. A drum is rotatably mounted at the slide. A plurality of brush body holders is arranged on the peripheral surface of the drum. A tufting tool is arranged at the machine tool table in opposition to the peripheral surface of the drum. A brush body feeder transports individual brush bodies to the drum to deliver the brush bodies to a brush body holder one at a time. This can be performed manually or mechanically, e.g. by means of a gripper or a robot. The slide, and the drum along with it, are reciprocated in the two directions by a pair of drives, while the tufting tool is reciprocated perpendicularly to the peripheral surface of the drum..

[0003] In the event of a malfunction of such a brush tufting machine, the machine needs to be stopped, resulting in a complete loss of production. In order to be able to continue with the production of brushes, at least one further brush tufting machine is required, which is operated independently of the other.

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[0006] EP 0722677A discloses a brush tufting machine having two filling tools operated by a common drive.

[0007] The invention allows, for one thing, to double the production capacity of a brush tufting machine at moderate additional expense and, for another, to ensure continued operation of the machine at half the production capacity in the event of a malfunction.

[0008] In the brush tufting machine according to the present invention, two drums are arranged at the slide at a distance from each other and mounted for rotation about two parallel axes. Associated with each drum is a tufting tool, each tufting tool being driven by a separate independent drive. Each of the drums also has an associated brush body feeder. Both drums are reciprocated by the slide simultaneously in at least two mutually orthogonal directions. The invention is based on the idea that, in the great majority of cases, failure of a brush tufting machine is caused by malfunctions appearing in the area of the tufting tool and the brush body supply, whereas malfunctions involving the slide drive occur quite rarely. Accordingly, when there is a malfunction in the area of a tufting tool or the brush body feed, the machine can continue to work at half the production capacity, putting to use the other tufting tool and the associated brush

body feeder. With both tufting tools in operation, production capacity may be doubled, as compared to a conventional brush tufting machine. Accommodation of a second drum and a second stuffing tool in the machine requires only slight modifications to be made on the machine tool table and on the slide. It is therefore possible to double the production capacity involving little additional expenditure.

[0009] In the brush tufting machine shown in Figure 1, a machine tool table 10 is provided, on which a lifting frame 12 is guided on slide bars 14 for vertical reciprocating movement. A drive 16 that is arranged beneath the machine tool table 10 and is coupled to the lifting frame 12 by a spindle 18 drives the lifting frame, as indicated by a vertical double arrow. The lifting frame 12 carries two horizontal slide bars 20 on which a slide 22 is guided for reciprocating movement. The slide 22 is rigidly connected to a vertical supporting plate 24 having two drums 26, 28 mounted thereon for rotation on one horizontal shaft each, the drums 26, 28 being arranged vertically one on top of the other and at a distance from each other. The drums 26, 28 are indexable in steps of 90°. They are driven synchronously by a shared indexing drive 30. As an alternative, each drum 26, 28 may have a drive of its own. The slide 22 is driven to perform a horizontal reciprocating movement by a drive 32 arranged at the lifting frame 12 via a spindle 34, as is indicated by a horizontal double arrow. The slide 22, along with the supporting plate 24 and the drums 26, 28, is thus driven by the drives 16, 32 in two mutually orthogonal directions, namely in the vertical direction and in the horizontal direction, with the horizontal movement of the slide 22 being performed parallel to the shafts on which the drums 26, 28 are mounted. As an alternative, the slide 22 may be moved in three directions.

[0010] Each drum has a peripheral surface that is formed of four rectangular partial surfaces. Each of the partial surfaces has a brush body holder 40 fitted thereto. One tufting tool 42, 44 each is arranged in opposition to the peripheral surface of each of the drums 26, 28. The tufting tools 42, 44 cooperate in a known manner with a respective fiber box 46 and a bundle remover 48. The tufting tools 42, 44 are held stationarily on the machine column 10 and execute a horizontal stuffing movement. The relative movement between the drums 26, 28 and the tufting tools 42, 44 causes the hole pattern of a brush body to be scanned, which is clamped at one of the brush body holders 40 in opposition to the respective tool. Individual brush bodies are supplied from the side or from above by a brush body feeder (not shown in Figure 1). A robot (not shown in Figure 1) may be used for the feeding process, for example. The brush bodies, now complete with bristles, are rotated downwards through 90° by the drums 26, 28 away from the respective stuffing tool 42, 44, where they are then released from the brush body holder 40 and taken away.

[0011] The stuffing tools 42, 44 are preferably provided with mutually independent drives, as will be explained

infra with reference to Figure 4, and they may therefore be operated independently of each other. The two drums 26, 28, on the other hand, are driven simultaneously by the slide 22, and the indexing of the drums 26, 28 may also be effected synchronously by one single indexing drive 30. While in comparison with conventional brush tufting machines the production capacity is doubled by the doubling of the stuffing tool and the drum on one machine, the expenditure required for this doubling is kept within narrow limits since only one slide drive and one indexing drive are needed.

[0012] In the embodiment of the brush tufting machine as shown in Figure 2, brush body feeders are provided which are each realized in the form of a horizontal conveyor belt 50, 52. The brush bodies are transported in a horizontal orientation on the conveyor belt 50, 52. As is indicated at G in Figure 2, the brush bodies are brought close to the side of the peripheral surface of the appropriate drum 26, 28 by a gripper, robot or the like and are delivered to the oppositely arranged brush body holder 40. In the embodiment shown, the conveyor belts 50, 52 are each mounted on a cantilever arm 54, 56 of the supporting plate 24 and are moved together with the latter and with the slide. As an alternative, the conveyor belts 50, 52 may be uncoupled from the slide and mounted on the machine tool table.

[0013] In the embodiment shown in Figure 3, provision is made to feed the brush bodies vertically from above by means of a respective stacking hopper 60, 62. With this design it is useful to arrange the drums 26, 28 laterally offset in relation to each other, as shown in Figure 3, rather than vertically on top of each other. The stacking hoppers 60, 62 are arranged with a corresponding lateral offset in relation to each other. They are loaded by a feeder (not shown) from above. The stacking hopper 62, which is arranged farther down, may be extended towards the top, as shown in dashed lines in Figure 3, to allow it to be loaded at the same level as the stacking hopper 60. As is apparent from Figure 3, the tufting tools 42, 44 are also laterally offset in relation to each other to match with the drums 26, 28.

[0014] The horizontal reciprocation required for each tufting tool 42, 44 is produced by means of mutually independent drives, which may however be derived from a shared main drive. In Figure 4, the drive of the tufting tool 42 consists of a rocking lever 70 mounted on the machine column 10 and a cam disk 72 actuating the rocking lever 70. The cam disk 72 is caused to rotate by a main drive 76 via a driving belt 74 and via a releasable mechanical or electromagnetic coupling. The tufting tool 44 is provided with a separate drive which is constructed in the same way as the drive of the tufting tool 42 and is likewise coupled to the shared main drive 76 via a driving belt. As an alternative, each of the two drives is provided with a separate drive motor.

Claims

1. A brush tufting machine comprising a machine tool table (10) having a slide (14, 20) that is displaceably guided thereon in at least two mutually orthogonal directions, a first drive (16) for reciprocating said slide (14) in a first one of said two directions, a second drive (32) for reciprocating said slide (20) in a second one of said two directions, two drums (26, 28) that are mounted at said slide (14, 20) for rotation about parallel, spaced axes, and two tufting tools (42, 44), each tufting tool (42, 44) being driven by a separate independent drive and arranged at said machine tool table (10) at a distance from each other, each in opposition to a peripheral surface of one of said drums (26, 28), said peripheral surface of each of said drums (26, 28) having brush body holders (40) arranged thereon, and each of said drums (26, 28) having an associated brush body feeder (50, 52, 60, 62).
2. The brush tufting machine as claimed in claim 1, wherein each brush body feeder (50, 52, 60, 62) is arranged on a side of said drum (26, 28) opposite said tufting tool (42, 44).
3. The brush tufting machine as claimed in claim 2, wherein each brush body feeder includes a horizontal conveyor belt (50, 52) for transporting brush bodies in a horizontal orientation.
4. The brush tufting machine as claimed in claim 2, wherein said drums (26, 28) are arranged at said slide vertically on top of each other.
5. The brush tufting machine as claimed in claim 1, wherein said drums (26, 28) are arranged at said slide laterally offset in relation to each other and said brush body feeders (50, 52, 60, 62) are each arranged vertically above a respective one of said drums (26, 28).
6. The brush tufting machine as claimed in claim 5, wherein said brush body feeders are each configured as a stacking hopper (60, 62).

Patentansprüche

1. Bürstenstopfmaschine mit einem Maschinenständer (10), an dem ein Schlitten (14, 20) in wenigstens zwei zueinander senkrechten Richtungen verschiebbar geführt ist, einem ersten Antrieb (16) zur Hin- und Herbewegung des Schlittens (14) in einer ersten der zwei Richtungen, einem zweiten Antrieb (32) zur Hin- und Herbewegung des Schlittens (20) in einer zweiten der zwei Richtungen, zwei Trommeln (26, 28), die an dem Schlitten (14, 20) um zu-

- einander parallele, voneinander beabstandete Achsen drehbar gelagert sind, und zwei Stopfwerkzeuge (42, 44), wobei die Stopfwerkzeuge (42, 44) jeweils von einem eigenen, unabhängigen Antrieb angetrieben und an dem Maschinenständer (10) im Abstand voneinander jeweils in Gegenüberstellung zu einer Umfangsfläche einer der Trommeln (26, 28) angeordnet sind, wobei jede Trommel (26, 28) auf ihrer Umfangsfläche Bürstenkörperhalter (40) aufweist, und wobei jeder der Trommeln (26, 28) eine Bürstenkörper-Zufuhreinrichtung (50, 52, 60, 62) zugeordnet ist.
2. Bürstenstopfmaschine nach Anspruch 1, bei der die Bürstenkörper-Zufuhreinrichtung (50, 52, 60, 62) jeweils auf einer dem Stopfwerkzeug (42, 44) gegenüberliegenden Seite der Trommel (26, 28) angeordnet ist.
 3. Bürstenstopfmaschine nach Anspruch 2, bei der die Bürstenkörper-Zufuhreinrichtung jeweils ein horizontales Förderband (50, 52) aufweist, auf dem Bürstenkörper liegend transportiert werden.
 4. Bürstenstopfmaschine nach Anspruch 2, bei der die Trommeln (26, 28) senkrecht übereinander am Schlitten angeordnet sind.
 5. Bürstenstopfmaschine nach Anspruch 1, bei der die Trommeln (26, 28) seitlich gegeneinander versetzt am Schlitten und die Bürstenkörper-Zufuhreinrichtungen (50, 52, 60, 62) jeweils senkrecht über einer entsprechenden Trommel (26, 28) angeordnet sind.
 6. Bürstenstopfmaschine nach Anspruch 5, bei der die Bürstenkörper-Zufuhreinrichtungen jeweils als Stapelmagazin (60, 62) ausgebildet sind.

Revendications

1. Machine de bourrage de brosse comprenant un montant de machine (10) sur lequel un chariot (14, 20) est guidé en translation dans au moins deux directions orthogonales l'une par rapport à l'autre, un premier entraînement (16) pour le déplacement en va-et-vient du chariot (14) dans une première des deux directions, un deuxième entraînement (32) pour un déplacement en va-et-vient du chariot (20) dans une deuxième des deux directions, deux tambours (26, 28) montés sur le chariot (14, 20) de manière à être mobiles en rotation autour d'axes parallèles et espacés l'un de l'autre, et deux outils de bourrage (42, 44), les outils de bourrage (42, 44) étant chacun entraînés par un entraînement distinct indépendant et étant agencés sur le montant de machine (10) à une distance l'un par rapport à l'autre et chacun à l'opposé d'une surface périphérique de l'un des tambours (26, 28), chacun des tambours (26, 28) comprenant sur sa surface périphérique des supports de corps de brosse (40), et chacun des tambours (26, 28) comprenant un dispositif d'alimentation (50, 52, 60, 62) pour corps de brosse associé.
2. Machine de bourrage de brosse selon la revendication 1, dans laquelle chaque dispositif d'alimentation (50, 52, 60, 62) pour corps de brosse est agencé sur un côté du tambour (26, 28) opposé à l'outil de bourrage (42, 44).
3. Machine de bourrage de brosse selon la revendication 2, dans laquelle chaque dispositif d'alimentation pour corps de brosse comprend une bande transporteuse (50, 52) horizontale pour le transport de corps de brosse à l'horizontale.
4. Machine de bourrage selon la revendication 2, dans laquelle les tambours (26, 28) sont agencés sur le chariot verticalement l'un au-dessus de l'autre.
5. Machine de bourrage selon la revendication 1, dans laquelle les tambours (26, 28) sont agencés sur le chariot de manière à être décalés latéralement l'un par rapport à l'autre et les dispositifs d'alimentation (50, 52, 60, 62) pour corps de brosse sont chacun agencés verticalement au-dessus d'un tambours (26, 28) correspondant.
6. Machine de bourrage selon la revendication 5, dans laquelle les dispositifs d'alimentation pour corps de brosse sont chacun configurés en tant que magasin à empilage (60, 62).

FIG. 1

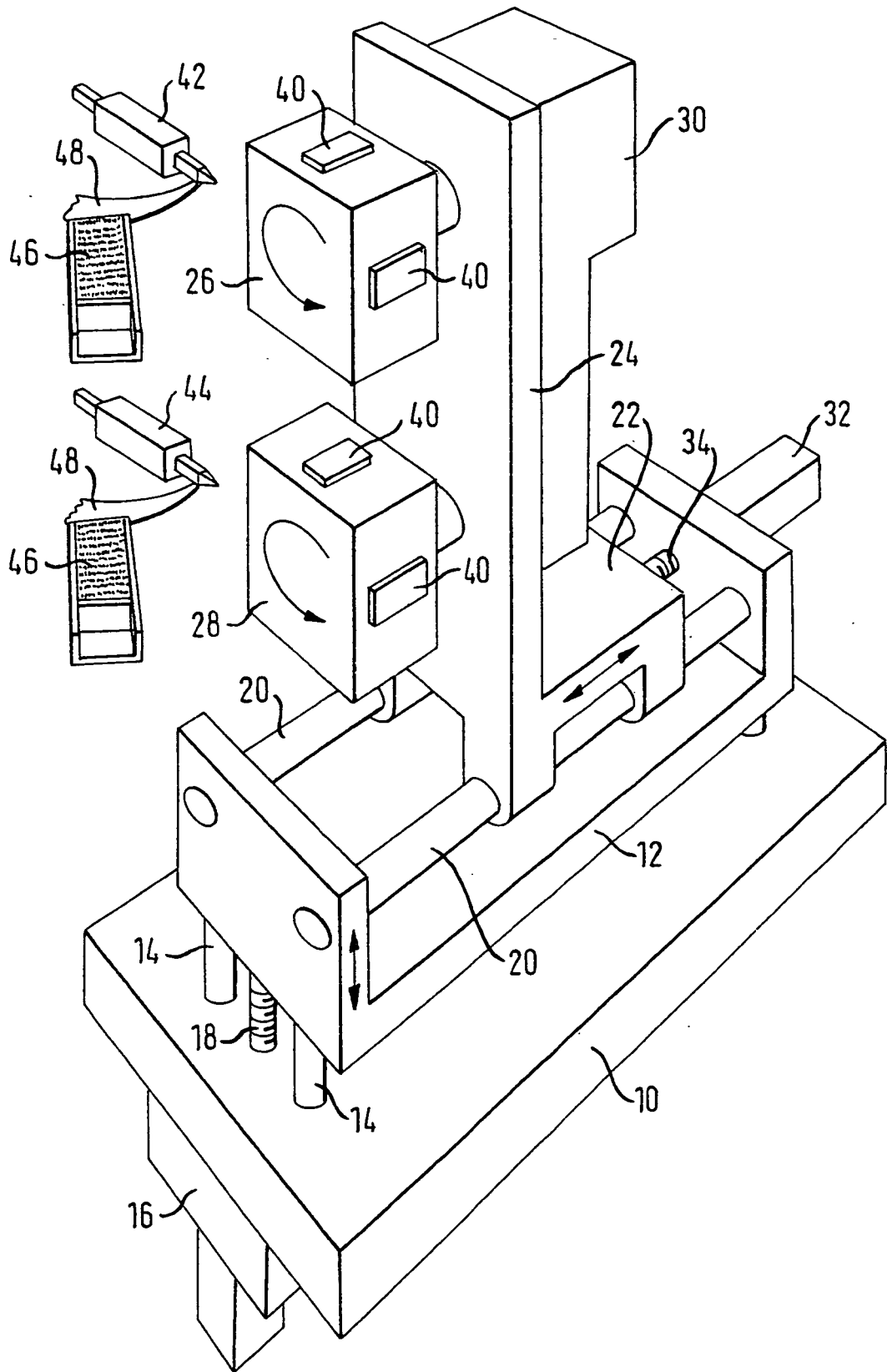


FIG. 2

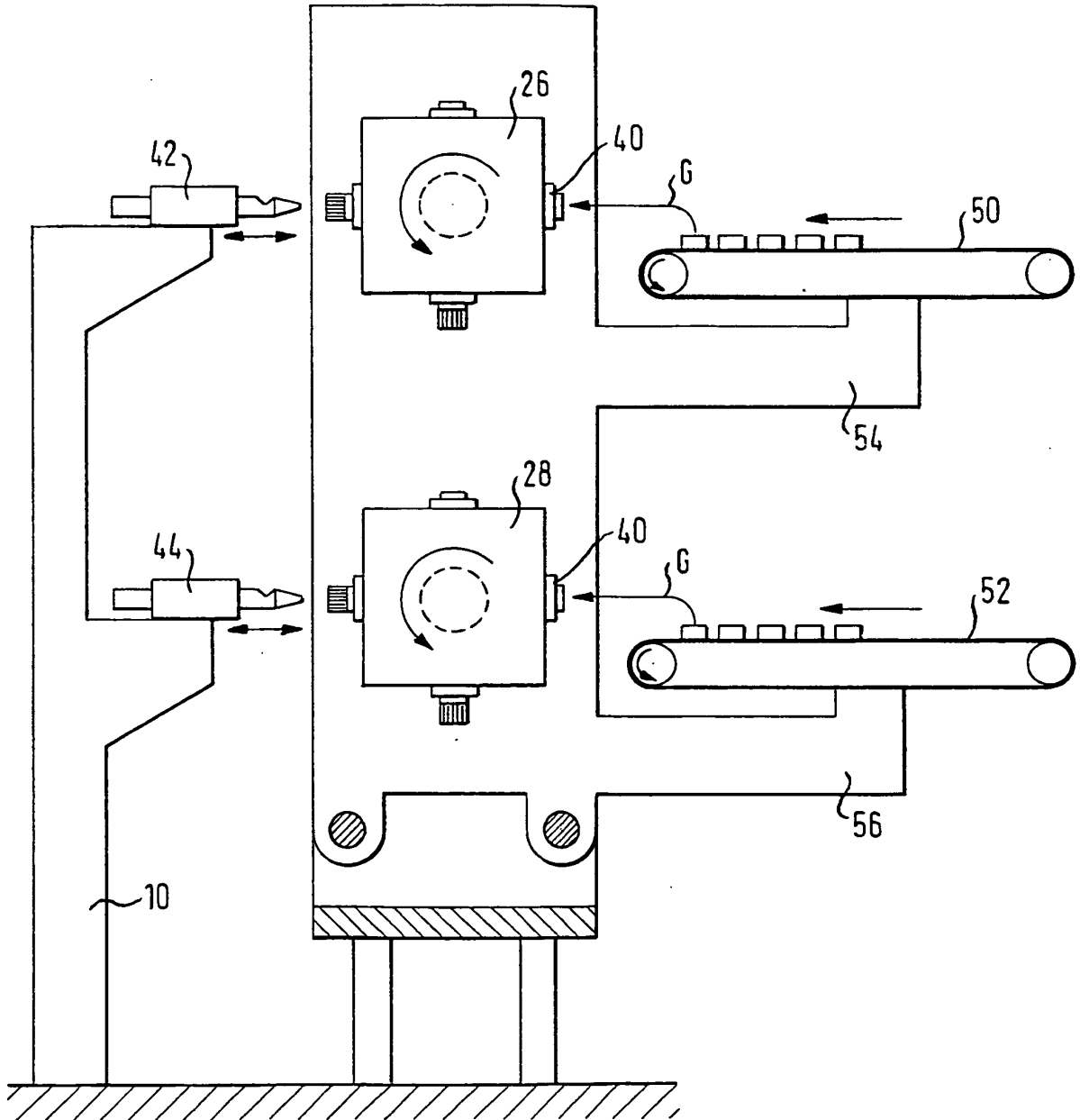


FIG. 3

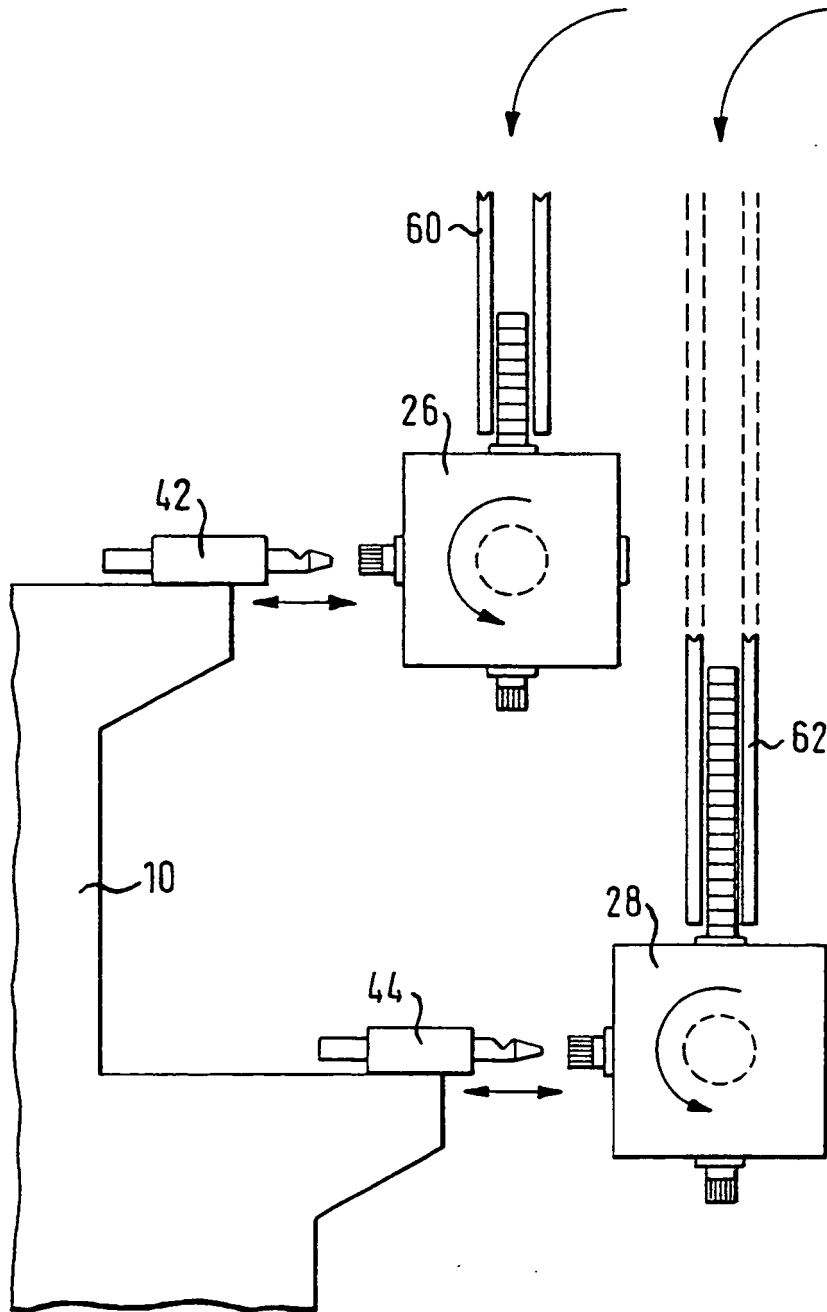


FIG. 4

