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CA 2330141 C 2005/07/12

(11)(21) 2 330 141

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 1999/05/20
(87) Date publication PCT/PCT Publication Date: 1999/11/25
(45) Date de délivrance/Issue Date: 2005/07/12
(85) Entrée phase nationale/National Entry: 2000/10/23
(86) N° demande PCT/PCT Application No.: EP 1999/003473
(87) N° publication PCT/PCT Publication No.: 1999/059773
(30) Priorité/Priority: 1998/05/20 (298 09 768.0) DE

(51) Cl.Int.^{6}/Int.Cl.^{6} B23Q 5/10

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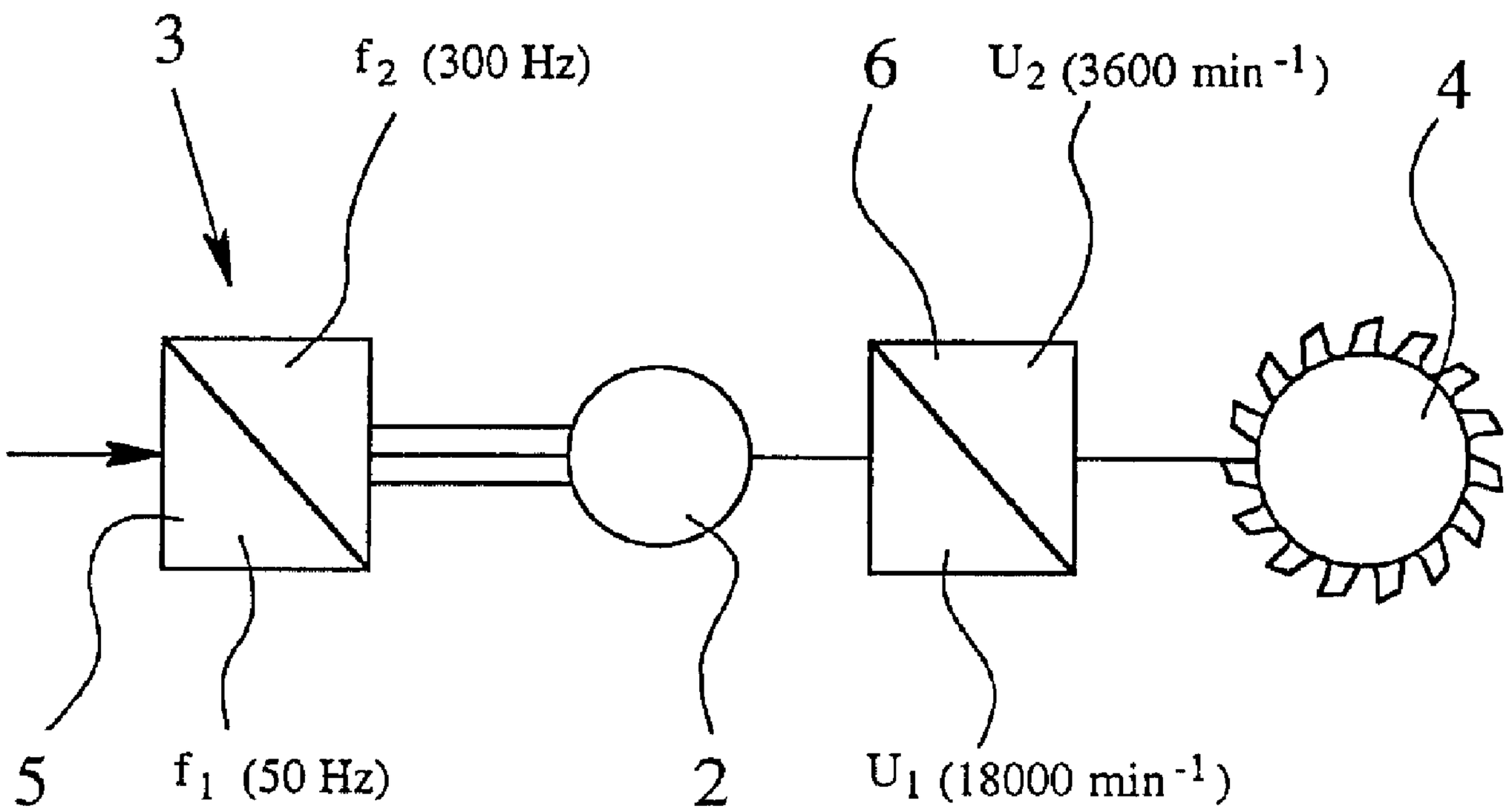
(54) Titre : MACHINE-OUTIL TRANSPORTABLE, EN PARTICULIER SCIE CIRCULAIRE A TABLE
(54) Title: MOBILE MACHINE TOOL, ESPECIALLY TABLE SAW



(57) Abrégé/Abstract:
The invention relates to a mobile machine tool, especially a mobile table saw, comprising an outer casing, an electric drive motor (2) arranged therein which has a connecting device (3) for connecting it to a power supply network with a low system frequency, and a tool (4), especially a circular saw blade, driven by the drive motor (2). The invention is characterized notably in that the electric drive motor (2) is configured as an asynchronous (or synchronous) motor, the connecting device (3) has a frequency converter (5) by means of which the low system frequency is converted to a high operating frequency of the electric drive motor (2), the electric drive motor (2) is operated at a higher speed corresponding to the higher operating frequency and the electric drive motor (2) is coupled to the tool (4) via a speed-reducing gear train (6) which is run at a corresponding lower speed suitable for machining workpieces.

Abstract:

The invention relates to a mobile machine tool, especially a mobile table saw, comprising an outer casing, an electric drive motor (2) arranged therein which has a connecting device (3) for connecting it to a power supply network with a low system frequency, and a tool (4), especially a circular saw blade, driven by the drive motor (2). The invention is characterized notably in that the electric drive motor (2) is configured as an asynchronous (or synchronous) motor, the connecting device (3) has a frequency converter (5) by means of which the low system frequency is converted to a high operating frequency of the electric drive motor (2), the electric drive motor (2) is operated at a higher speed corresponding to the higher operating frequency and the electric drive motor (2) is coupled to the tool (4) via a speed-reducing gear train (6) which is run at a corresponding lower speed suitable for machining workpieces.

Mobile Machine Tool, especially Mobile Table Saw

The invention relates to a mobile machine tool, particularly a mobile table saw.

The invention relates to a mobile machine tool which is to be understood as neither a firmly installed, nor a hand-held machine tool, rather a machine tool which sits on a table or a stand in order to perform the machining of the workpiece; however, as far as size and weight go, it is constructed so that it can be transported from place to place, advisably able to be carried by one or two people.

A mobile machine tool of the sort in question is known (German Utility Patent DE – U – 297 21 232). Only an example of a mobile machine tool is being dealt with, wherein, in principle, such machine tools have been prior art for decades.

Weight is especially important for mobile machine tools. This is substantially defined by the weight of the electric drive motor, at least when considerable shaft power is required, as, for example, in circular table saws. In order to keep the weight of this type of mobile machine tool as low as possible, universal motors are used. These run with a high rotational speed, build small and have a comparably low weight. A shaft power of 1 kW at 18,000 rpm means a motor weight of 1.5 to 2.0 kg and over-all dimensions of 0.75 l for a universal motor.

For machine tools, particularly circular table saws, universal motors are therefore problematic in practice because they are sensitive to wear due to their required collector ring and required brushes. Wear is increased even more, especially for circular table saws, through the dust-filled surroundings.

An aspect of the invention is to develop a more wear-resistant mobile machine tool, particularly a circular table saw, of the sort in question at a low as possible weight.

Another aspect of the present invention provides a portable machine tool comprising: an outer casing; an electric drive motor which is arranged in the casing; a connecting device

for connecting the drive motor to a power supply network with a low system frequency; and a tool driven by the drive motor; wherein the connecting device comprises a frequency converter means for changing the low system frequency of the power supply network to a higher operating frequency for operation of the drive motor; the electric drive motor operating at higher rotational speed corresponding to the higher operating frequency; and wherein the electric drive motor is coupled to the tool by a speed reduction gear train for rotating the tool at a workpiece machining speed that is lower than the rotational speed of the electric drive motor.

According to the invention, a substantially maintenance-free asynchronous motor is used as an electric drive motor. The use of an asynchronous motor for machine tools is, naturally, fundamentally known. Until now, however, the weight and space conditions for asynchronous motors were seen as hindering so that asynchronous motors have only been used reluctantly for mobile machine tools. At the least, the weight of the mobile machine tools was, then, comparably high. This is because an asynchronous motor is tied to the system frequency with its rotational speed. The rotational speed is slightly less than the synchronous rotational speed which is determined by the quotient of the system frequency divided by the number of pole pairs. At a normal system frequency of 50 Hz, a shaft power of 1 kW at 3000 rpm requires a motor weight of 8.0 to 10.0 kg and a dimension requirement of the asynchronous motor of 1.5 to 2.0 liters. The portion of iron and coils of the asynchronous motor are decisive for the weight and volume of the asynchronous motor.

The asynchronous motor is operated with a considerably higher operating frequency by the inventively suggested combination of the asynchronous motor with a frequency converter. Through this, a substantially higher rotational speed is reached. At the given shaft power, a substantially smaller asynchronous motor is needed which has a substantially lower weight and less volume. The weight of the mobile machine tool which is equipped with the asynchronous motor having a frequency converter is thus considerably lowered since the weight of the frequency converter is barely of consequence. The total reduction of weight and volume is estimated at about 50% in comparison to the asynchronous motors used until now not having a frequency converter.

At similar electrotechnical starting positions, a synchronous motor which is tied precisely to the rotational speed of the rotary field, i.e. shows no slippage, can also be used in place of an asynchronous motor.

Preferred embodiments are also subject matter of the sub-claims.

Next, the invention is explained more precisely with a drawing representing merely one embodiment. The drawing shows:

Fig. 1 a schematic representation of a mobile machine tool, in the case of this example, a circular table saw,

Fig. 2 a circuit diagram of the machine tool according to the invention.

The mobile machine tool represented in Fig. 1 is, in the embodiment, a circular table saw comprising a casing 1, an electric drive motor 2 which is arranged in the casing and merely suggested, and a connecting device 3 for this electric drive motor 2 with which this electric drive motor 2 is connected to a generally lower system frequency. The system frequency in Germany is 50 Hz for the normal domestic system, in the USA, for example, it is 60 Hz.

A tool 4 of the machine tool, which is a saw blade of the circular table saw in the represented and preferred embodiment, is driven by the drive motor 2.

Fig. 2 now makes it clear that the electric drive motor 2, which is configured as an asynchronous motor, is connected to the electric supply via a frequency converter 5 within the connecting device 3. Nowadays, frequency converters 5 are available on the market in a plurality of embodiments, the relevant publications of the suppliers of such frequency converters 5 can be referred to. The low system frequency is changed to a high operating frequency for the drive motor 2 through the frequency converter 5, in the case of the example represented, to a frequency of 300 to 400 Hz. An electric drive motor 2 which is configured as an asynchronous motor, then runs with a correspondingly higher rotational

speed, which is determined by the quotient of the operating frequency divided by the number of pole pairs. If the asynchronous motor has a rotational speed of 3000 RPM in operation at 50 Hz, it will have a rotational speed of 18,000 rpm at 300 Hz and a rotational speed of 24,000 rpm at 400 Hz.

It is essential that at a high rotational speed, a determined shaft power, e.g. 1 kW, is reached with a substantially lower-weight asynchronous motor because the portion of iron and coils is lower than in an asynchronous motor of the same shaft power operating at a lower rotational speed. This has all already been described in detail in the general part of the description.

Fig. 2 further shows that the electric drive motor 2, here in the form of an asynchronous motor, is connected via a speed-reducing gear train 6 to the tool 4, here the saw blade of the circular bench saw, which is operated at a correspondingly lower rotational speed, in this case a rotational speed of 3600 or 4800 rpm.

In place of an asynchronous motor, a precisely system-driven synchronous motor can be used.

The considerably lower weight due to the higher operating frequency and the considerably lower volume are essential for the asynchronous motor which is usable in this respect in a mobile machine tool and can show all its known advantages of maintenance-freedom in unfavorable surrounding conditions.

CLAIMS:

1. A portable machine tool comprising:

an outer casing;

an electric drive motor which is arranged in the casing;

a connecting device for connecting the drive motor to a power supply network with a low system frequency; and

a tool driven by the drive motor;

wherein the connecting device comprises a frequency converter means for changing the low system frequency of the power supply network to a higher operating frequency for operation of the drive motor; the electric drive motor operating at higher rotational speed corresponding to the higher operating frequency; and wherein the electric drive motor is coupled to the tool by a speed reduction gear train for rotating the tool at a workpiece machining speed that is lower than the rotational speed of the electric drive motor.

2. A portable machine tool according to claim 1, wherein the electric drive motor is an asynchronous motor.

3. A portable machine tool according to claim 2, wherein the system frequency is 50 Hz.

4. A portable machine tool according to claim 2 or 3, wherein the operating frequency is in the range of 300 to 400 Hz.

5. A portable machine tool according to claim 4, wherein the rotational speed of the electric drive motor corresponding to the higher operating frequency is a rotational speed in the range of 18,000 to 24,000 rpm.

6. A portable machine tool according to claim 5, wherein the rotational speed of the tool is in the range of 3600 to 4800 rpm.

7. A portable machine tool according to any one of claims 2 to 6, wherein the portable machine tool is a table top circular saw and the tool driven by the drive motor is a circular saw blade.

8. A portable machine tool according to claim 1, wherein the electric drive motor is a synchronous motor.

9. A portable machine tool according to claim 8, wherein the system frequency is 50 Hz.

10. A portable machine tool according to claim 8 or 9, wherein the operating frequency is in the range of 300 to 400 Hz.

11. A portable machine tool according to claim 10, wherein the rotational speed of the electric drive motor corresponding to the higher operating frequency is a rotational speed in the range of 18,000 to 24,000 rpm.

12. A portable machine tool according to claim 11, wherein the rotational speed of the tool is in the range of 3600 to 4800 rpm.

13. A portable machine tool according to claim 12, wherein the portable machine tool is a table top circular saw and the tool driven by the drive motor is a circular saw blade.

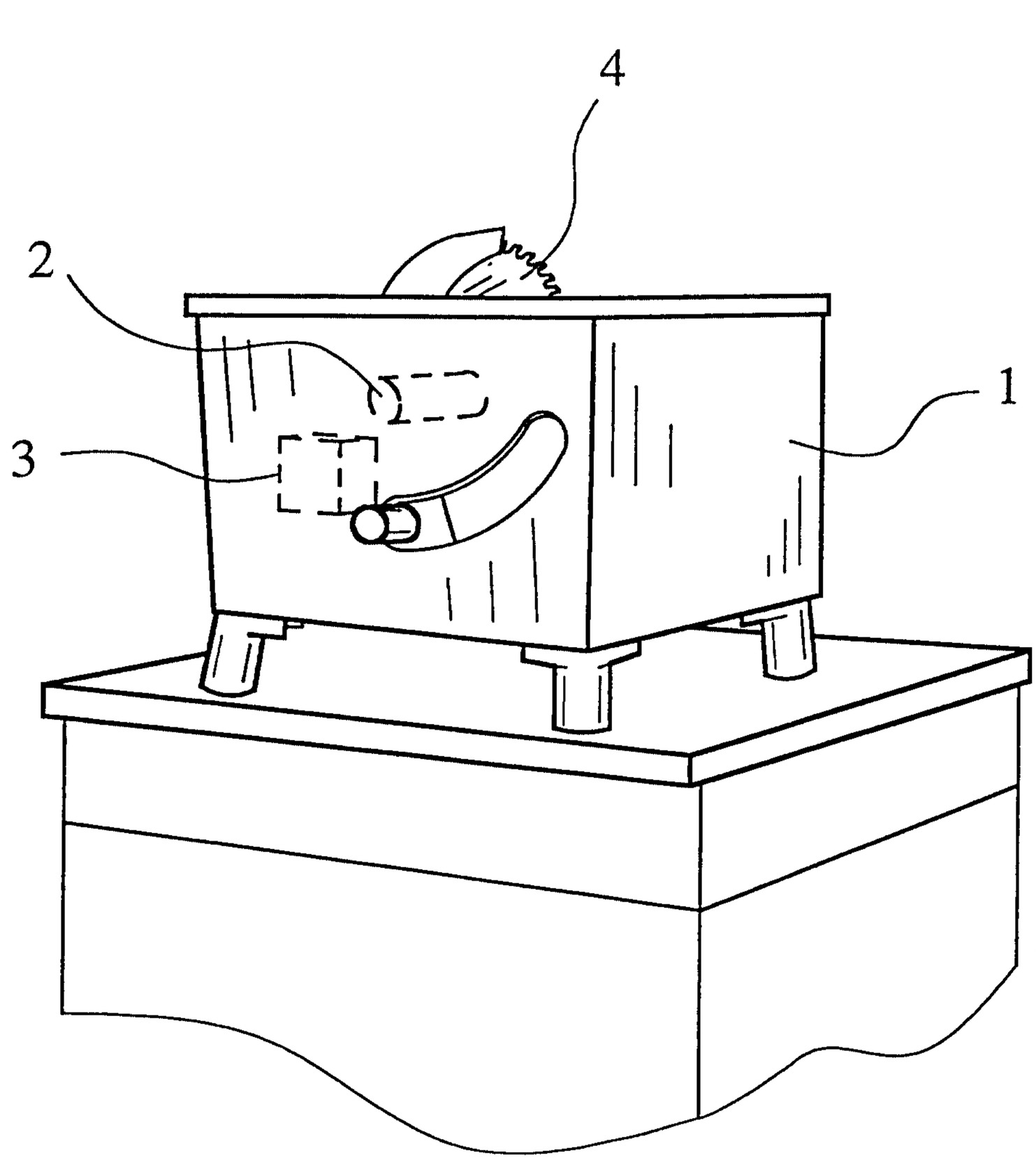


Fig. 1

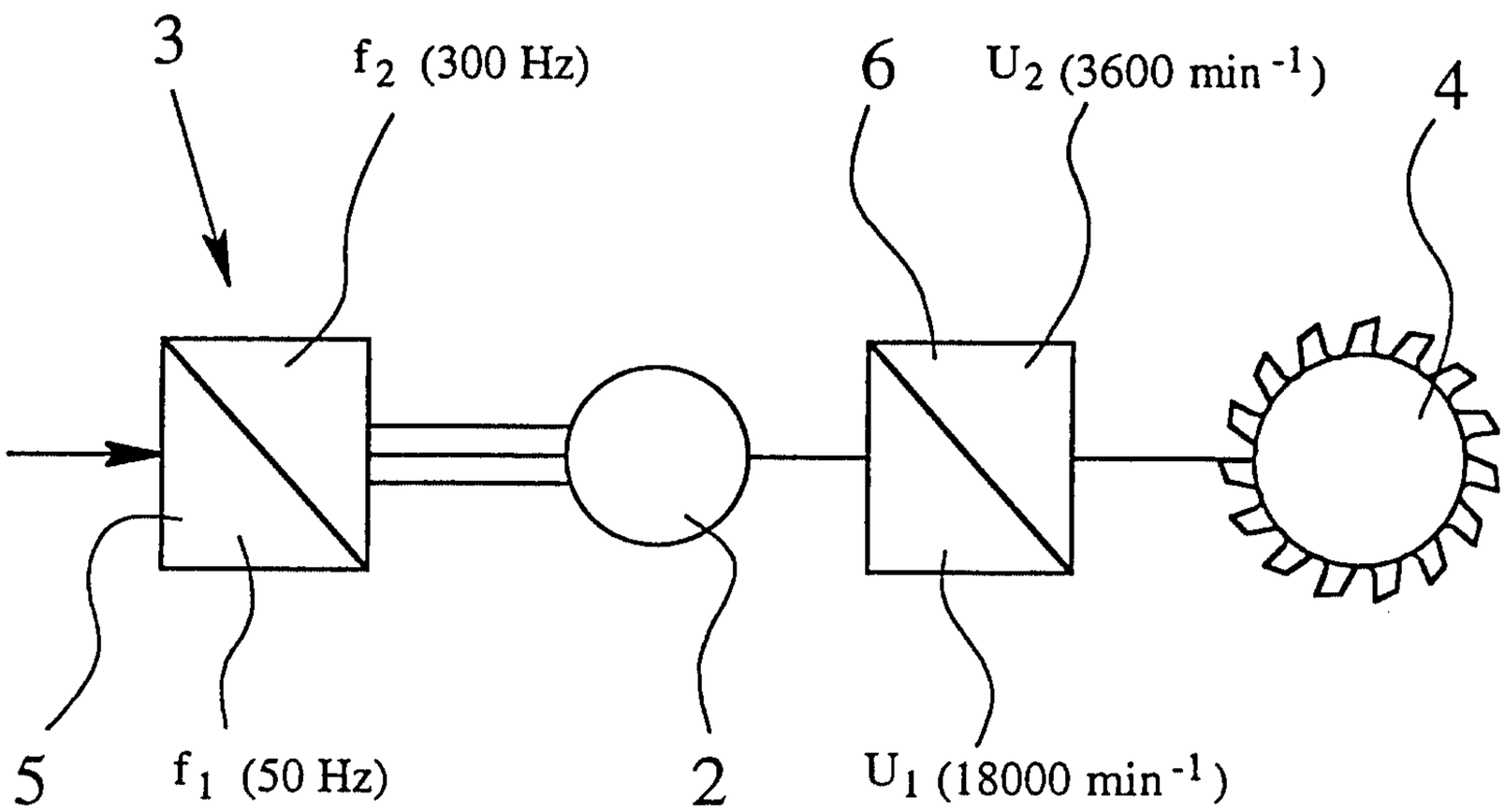
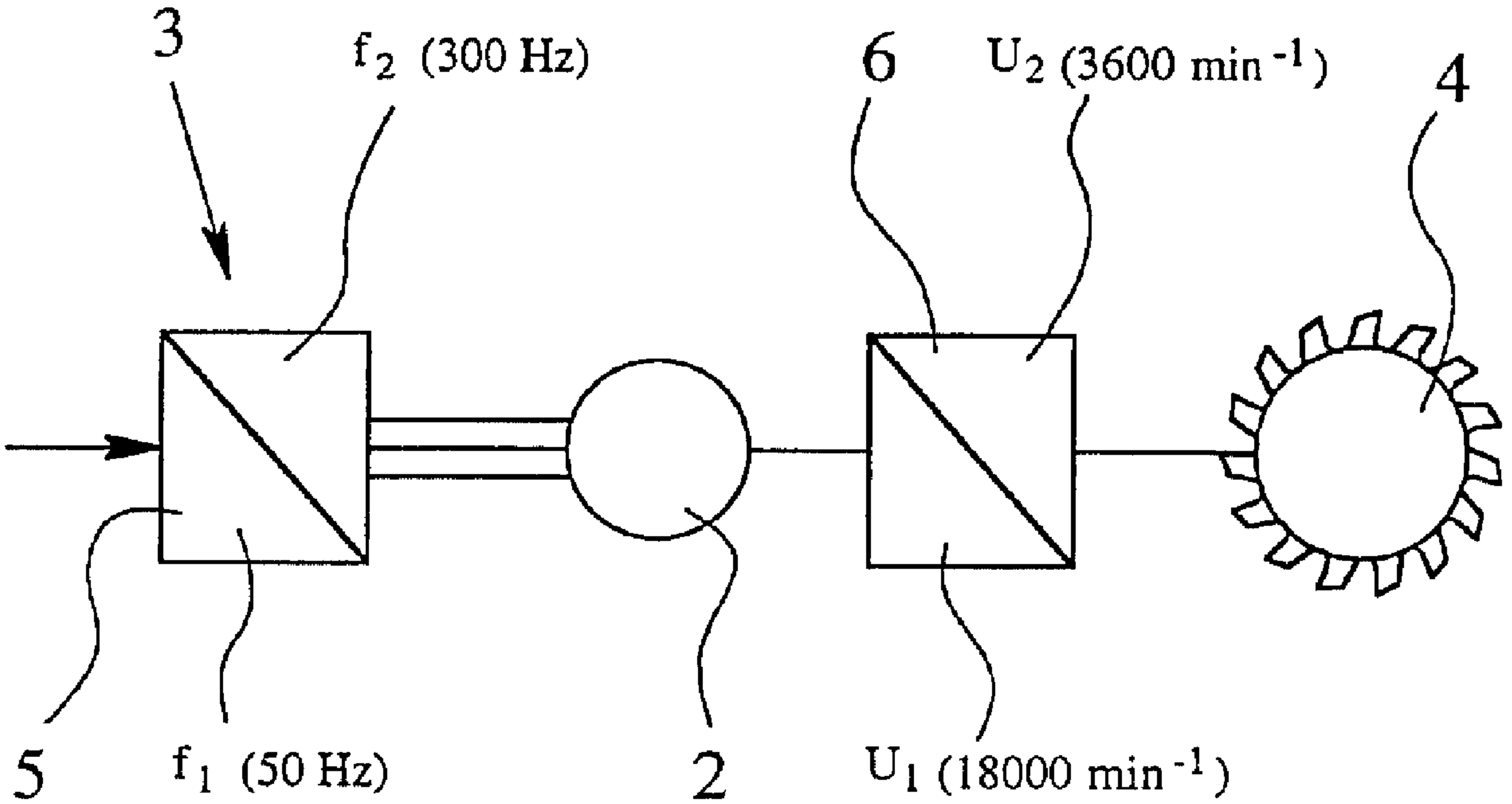


Fig. 2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