(19) Canadian Intellectual Property Office / Office de la Propriété Intellectuelle du Canada

An Agency of Industry Canada / Un organisme d'industrie Canada

(11) **CA 451576** (13) **A**

(40) **05.10.1948**

(12)

(21) Application number: **451576D**

(22) Date of filing: **..**

(51) Int. Cl:

(71) Applicant: **ROSSMANITH WOLGANG.**

(72) Inventor: **ROSSMANITH WOLGANG ().**

(54) **MULTIPLE MACHINE TOOL**

(54) **MACHINE OUTIL MULTIPLE**

(57) **Abstract:**

The invention relates to a multiple machine tool and has as an object the provision of a new type of construction of multiple machine tool for chip removing work on which, by selection, a number of different operations can be carried out consecutively. The solution of this problem provides for two possibilities: the machine tool should be capable of working with a rotating work piece as well as with a rotating tool on the one hand, and with the working spindle in a horizontal position as well as in a vertical position on the other hand.

There are several means for rendering a machine tool capable of operating with a rotating work piece as well as with a rotating tool. The simplest method consists in arranging the head stock and bed slidably one against the other, whereby when using a rotating work piece (turning), the head stock is clamped on the bed in a certain position corresponding to the centre height of the tail stock, and when using a rotating tool (milling, drilling or grinding), the head stock is clamped on the bed in different positions according to the dimensions of the tool and work piece in hand.

In order to enable a machine tool to be employed with a horizontal as well as a vertical spindle shaft, there are also several methods. The simplest method - particularly for small work - which requires no alterations in the machine itself, consists in setting the whole machine in a fixed stand, pivotable around a horizontal axis in such a manner that the spindle shaft can be brought, as required, into a horizontal or a vertical position. Both methods are known as such and have been adopted in the past, each for itself, in the construction of universal machine tools.

The new form of construction of multiple machine tools, which is the basis of the present invention, is characterised in that in this case the two simplest methods have been selected from the possible methods for securing a great variety of work operations, and are employed simultaneously.

Accordingly the present invention provides a multiple machine tool for chip removing work with a bed which is pivotable in a horizontal or vertical position, wherein a head stock is slidable against the bed in a direction which is vertical to the spindle axis.

In this manner, therefore, a machine tool is provided of a degree of perfection which, in similar simplicity, has not been obtained in the forms of construction of multiple machine tools hitherto known. The new multiple machine tool enables turning, drilling, milling and grinding work with a horizontal or vertical spindle to be carried out, not only as a makeshift, but in the same perfection as on machine tools which are arranged only for a single work operation. It possesses only one headstock which is employed in all working operations, and only the three saddles which are required for carrying out the necessary movements of the tool or work piece in the three directions of space and which can be employed on all work operations.

The fundamental construction of a multiple machine tool according to the invention is shown diagrammatically in Fig. 1 of the accompanying drawings. It consists of five main parts: The fixed stand 10, the bed 1 which is pivotable about bolt 11, the head stock 2 carried on the bed, the bed saddle 3 which is slidable on the bed, and the transverse slide 4 which is arranged on the saddle. These five main parts are employed in all the different working operations. Saddle 3 produces the movement in <u>x</u>-direction, transverse slide 4 the movement in <u>y</u>-direction and head stock 2 the movement in <u>z</u>-direction.

The swinging of the bed 1 in the stand 10 can be secured either by gearing or by hand using weight compensation devices.

For small and light work it is also possible to dispense altogether with the stand 10 and to perform the swinging of the machine so that the whole machine is turned through 90^{o} and set on a lateral surface of the bed. The simplest solution for the guide between bed and head stock results if plane N of the guide is placed vertically to the head stock axis.

When using a separate electric drive, as is usual, the placing of the driving motor direct on the slidable head stock is the simplest solution because in this manner changes of position between motor and the working spindle which is to be driven, are avoided between bed and Head stock. When employing the machine for horizontal milling the head stock is suitably provided with an overhanging arm for the support of long milling mandrils, in the usual manner for horizontal milling machines.

If the machine is to be used also as a grinding machine, it is advisable to provide on the head stock, in addition to the slowly rotating main spindle for turning, drilling and milling, a second grinding spindle suitable for high rates of revolution, which may be driven by the same motor as the main spindle. It is also an advantage to place this grinding spindle on the overhanging arm of the head stock in such a manner that the grinding disc comes to lie on the free end of the overhanging arm, or to fix the grinding spindle instead of the overhanging arm, to the head stock. By this arrangement it is made possible to employ the multiple machine tool also as surface grinding machine with horizontal or vertical grinding spindle, as tool grinding machine, or as circular grinding machine.

In Figs. 2 to 9 of the accompanying drawings, the employment of the new multiple machine tool is shown diagrammatically for different methods of rotating chip removal. The means (gears, weight compensation devices) for swinging the bed are not shown.

The driving motor 9 is placed direct on the head stock 2 which is slidable vertically. No automatic feeds are provided. The movement of the saddle 3 is effected by means of the hand wheel 5, the movement of the transverse slide 4 by means of the hand wheel 6 and the movement of the head stock 2 by means of the hand wheel 7.

Fig. 2 shows the machine tool as centre lathe. It is developed from the basic form shown in Fig. 1 by placing a tool holder 12 on transverse slide 4 and a tail stock 13 on the bed guide. The tool holder 12, as is usual for lathes, consists of a rotating disc and an upper slide with the fixing device for the tool. The slidable head stock is clamped on the bed in the position which corresponds to the centre height of the tail stock.

By sliding the head stock 2 upwards the centre height of the lathe can be increased to such an extent that the multiple machine tool can be employed also as a face lathe for turning large or bulky work pieces, as shown in Fig. 3. All that is necessary in this case is to fit below the tool holder 12 a setting up piece 14 corresponding to the increase in centre height.

In Fig. 4 the machine tool is shown as a horizontal milling or horizontal drilling machine. The work piece or the fixing device for the work piece is fixed on transverse slide 4. For the support of long milling mandrils, as is usual in horizontal milling machines, an overhanging arm 15 is provided, and is attached to the head stock 2. For use as horizontal drilling machine, an adjusting stock 16 which is adjustable in height, can be superimposed on the bed guide for bearing long boring spindles, a device known in horizontal drilling machines.

In Fig. 5 the machine is shown as vertical milling or vertical drilling machine. The bed is swung through 90° and is held in this position for example by a strut 17. On the transverse slide 4 an overhung table 18 is fixed upon which the work piece or the fixing device for the work piece is fixed.

Figs. 6 to 9 show the machine as grinding machine. A grinding spindle 19 suitable for a high rate of revolution is placed on the overhanging arm 15 of the head stock, as known by its use on horizontal milling machines, and is directly driven from the motor 9. The grinding disc is indicated by the reference numeral 20.

In Fig. 6 the employment as a surface grinding machine with horizontal spindle is shown. The work piece or the fixing device for the work piece is fixed on the transverse slide 4. If the bed is swung through 90° and an overhung table 18 - as shown in the vertical milling machine - is employed, the machine can be used as surface grinding machine with vertical spindle according to Fig. 7.

Fig. 8 explains the construction in form of a tool grinding machine. A fixing table 21 rotatable around a vertical axis, is attached to the transverse slide 4 and can be set obliquely at any desired angle, and upon which the fixing devices for the tool which is to be ground, are fixed.

Fig. 9 finally shows the machine as a circular grinding machine. The same rotatable fixing table 21 as in Fig. 8 is employed. On this table the head stock and tail stock for driving and fixing the work piece which is to be ground, are fixed. The drive of the work piece can be derived from the main spindle 8 of the machine head stock.

A further extension of the field of employment of the multiple machine tool according to the invention can be secured by employing the slidable head stock as a ram which moves to and fro, for straight line chip removal (planing or slotting), so that the machine can also be used as shaping or slotting machine. The arrangement is particularly simple, if the main spindle of the head stock is used as crankshaft of the crank drive for the reciprocating movement.

In Fig. 10 the machine is shown as vertical slotting machine. On the front end of the main spindle 8 a crank disc 22 which carries the crank pin, is placed. Connecting rod 23 engages at the crank pin, the lower end of the former being placed on a bolt which is fixed on the bed 1. The tool holder 24 can, for instance, be attached to the end of overhanging arm 15. The work piece or the fixing device is fixed on transverse slide 4.

Fig. 11 shows the machine as a shaping machine with the same drive arrangement as for the reciprocating movement in Fig. 10, but with the bed pivotable through 90°. 25 is the tool holder which is fixed on the head stock 2. The work piece or the fixing device is fixed on the overhung table 18 which is fixed on the transverse slide.

Having thus described my invention, I claim:

1. A multiple machine tool for chip removing work having a bed, a stand in which said bed is pivotable about a horizontal axis between horizontal and vertical positions, said bed having two legs arranged at an angle of 90 degrees, a slide rest guided by one of said legs, and a head stock having a regulating device and a working spindle supported by the other leg, whereby said working spindle and head stock may be carried between horizontal and vertical positions by displacement of said bed and will be operable to machine the work piece in both positions.

2. A machine tool as claimed in claim 1 wherein the head stock is directly slidable on said pivotable bed.

3. A machine tool as claimed in claim 2 wherein a plane member is disposed on a guide between the bed and the head stock vertically to the spindle axis.

B/

4. A machine tool as claimed in claim 3 wherein a driving motor is disposed on the slidable head stock.

5. A machine tool as claimed in claim 4 wherein a second spindle suitable for higher rates of revolution for grinding work is disposed on the head stock and is driven by the motor.

6. A machine tool as claimed in claim 5 wherein the grinding spindle is disposed on an overhanging arm of the head stock.

7. A machine tool as claimed in claim 6 wherein the head stock is constructed slidable on the bed as a reciprocating ram for straight-line chip removal.

8. A machine tool as claimed in claim 7 wherein the working spindle of the head stock is constructed as a crank shaft of the crank drive for the reciprocating movement of the head stock, a connecting rod being fixed at one end to the bed and at the other end to a crank pin.

Fig. 1

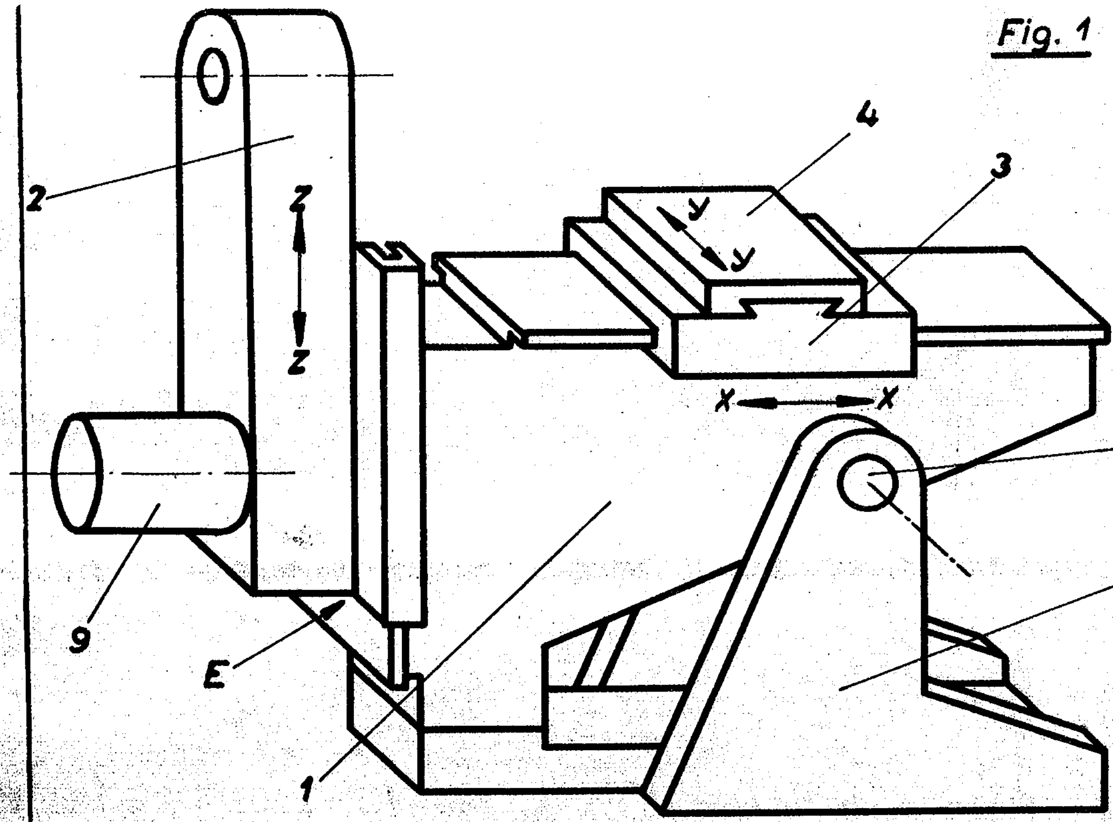
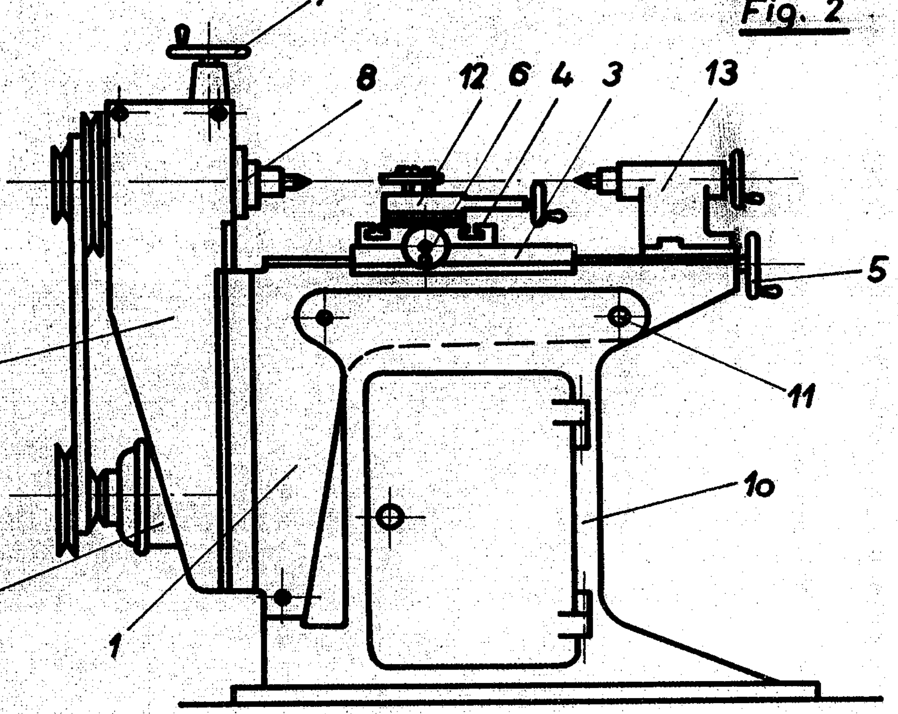


Fig. 2



Dr. Wolfgang ROSSMANITH
INVENTOR

BY:

ATTORNEYS

Certified to be the drawings referred to in the specification hereunto annexed,
Montreal, Can., 7th day of Jan. 19 46

Fig. 3

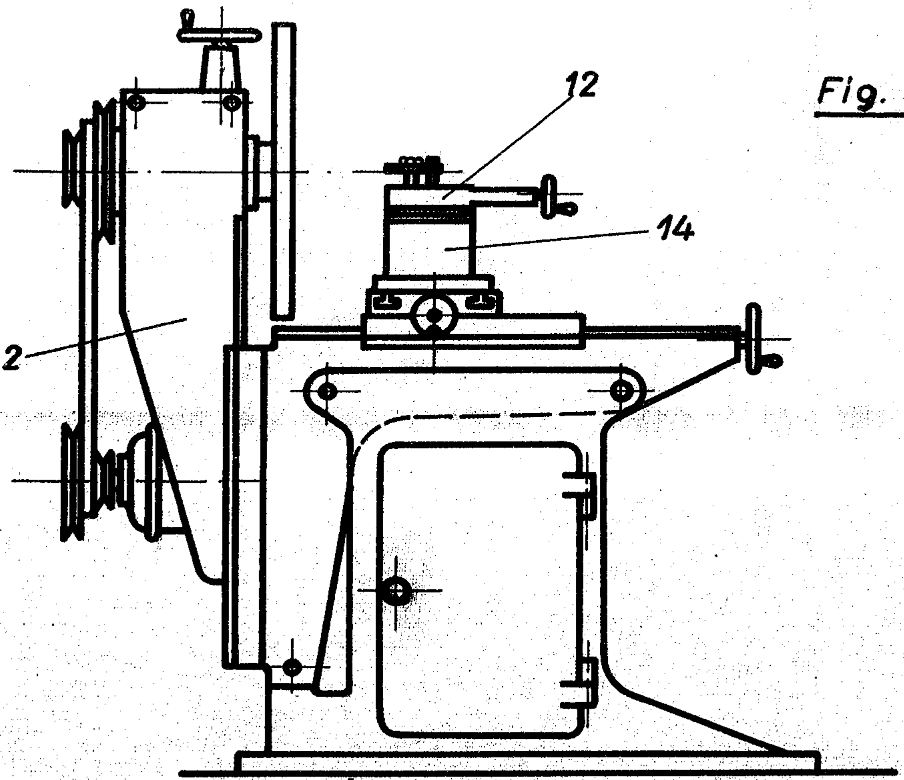
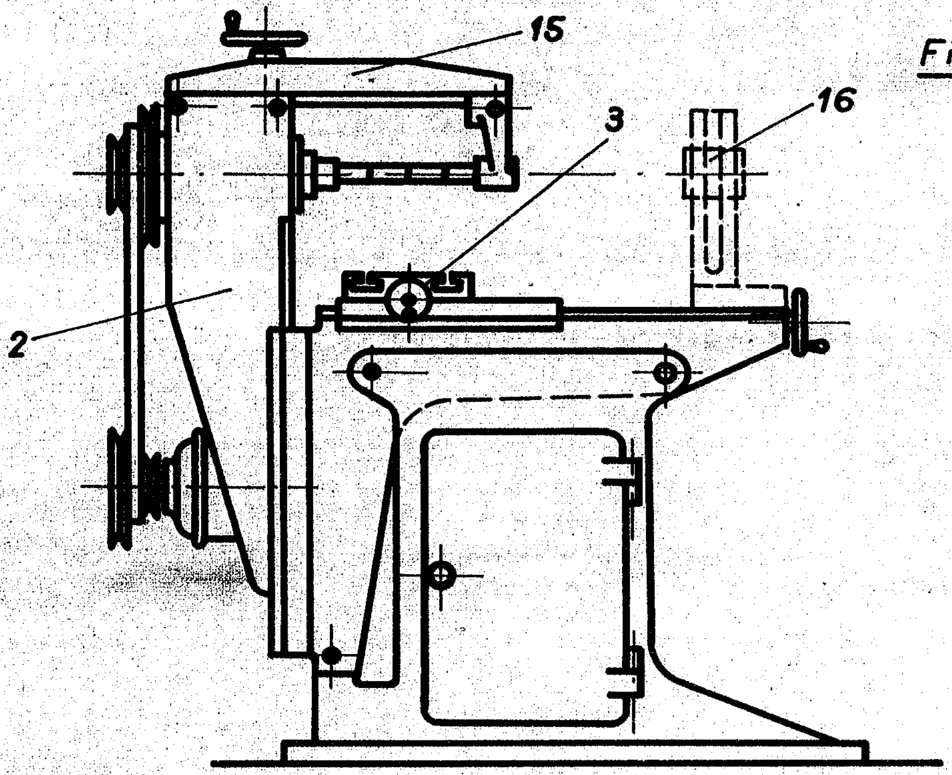


Fig. 4



Dr. Wolfgang ROSSMANITH
INVENTOR

Certified to be the drawings referred to in the specification hereunto annexed.
Montreal, Can., 7th day of Jan. 1946

BY:
ATTORNEYS

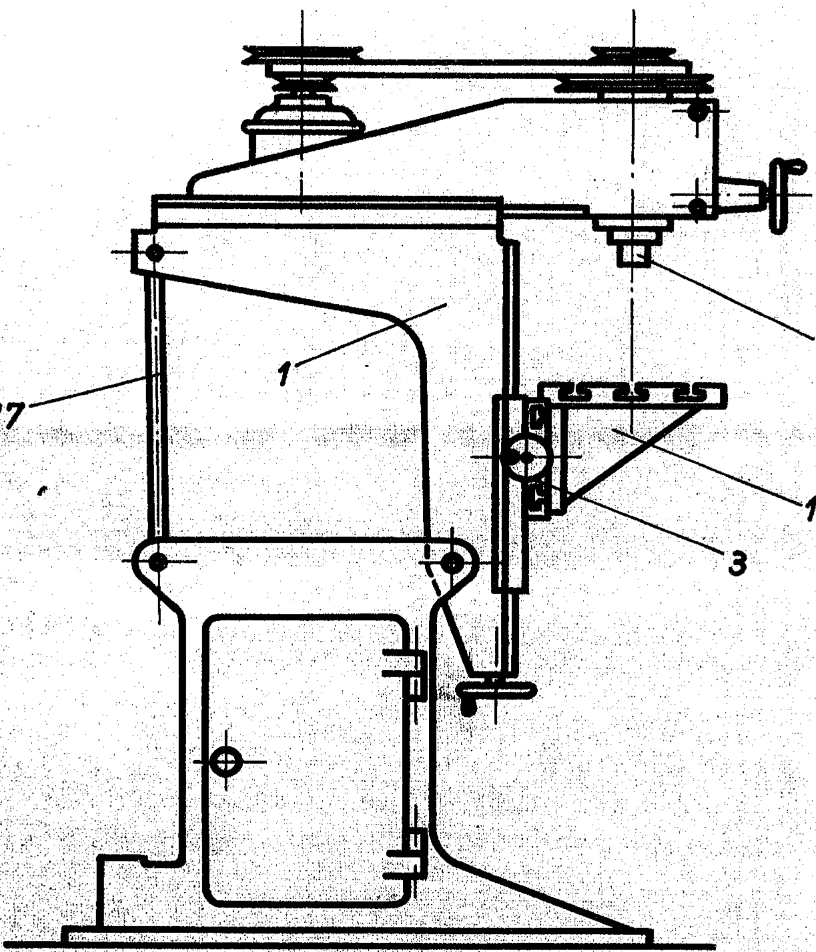


Fig. 5

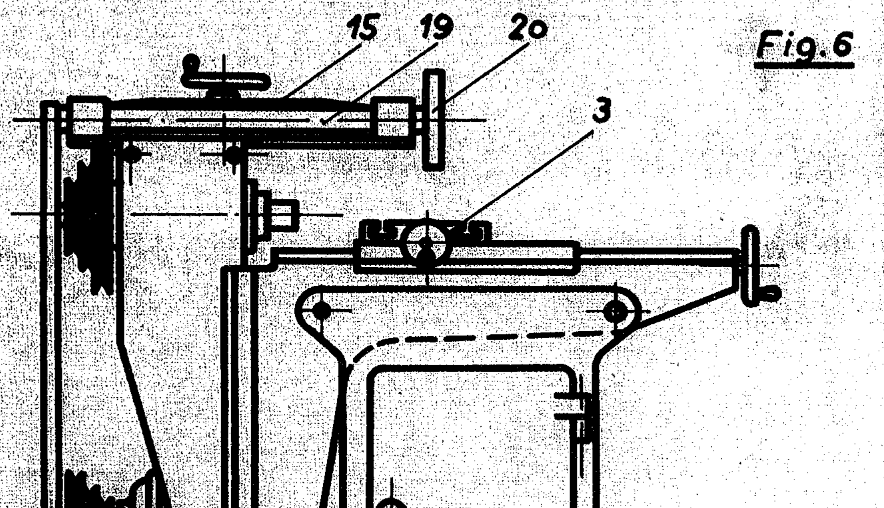


Fig. 6

Certified to be the drawings referred to in the specification hereunto annexed.
Montreal, Can., 7th day of Jan. 19 46

Dr. Wolfgang ROSSMANITH
INVENTOR

BY: Marion & Marion
ATTORNEYS

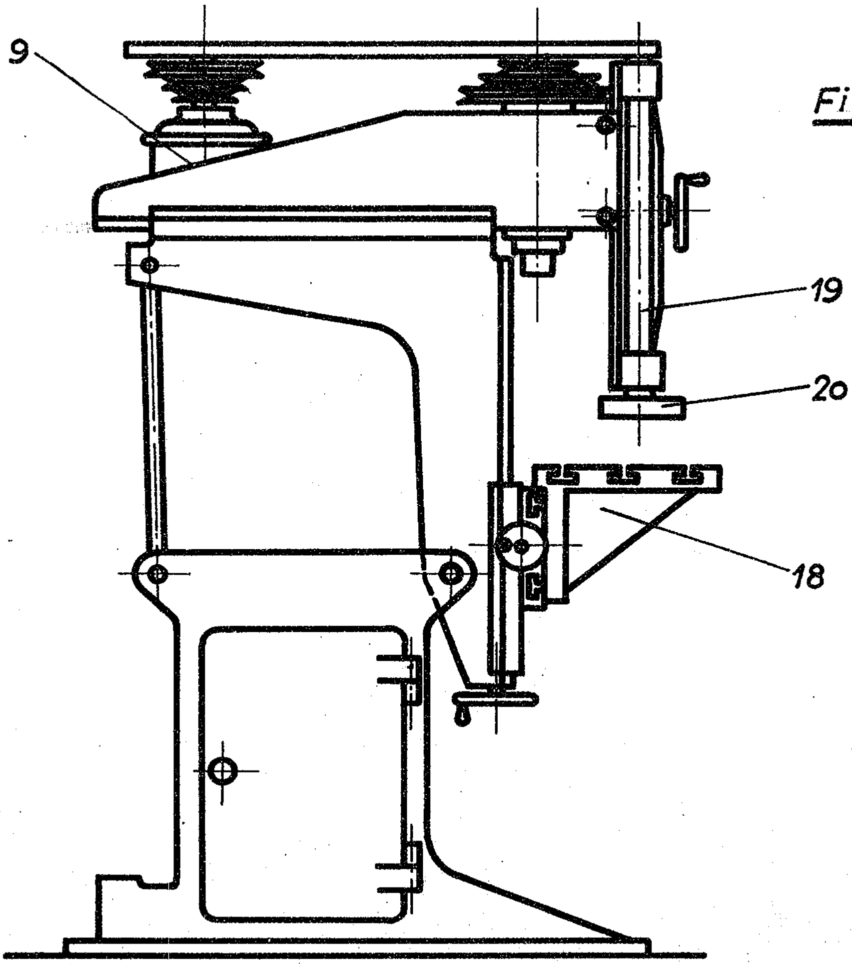


Fig. 7

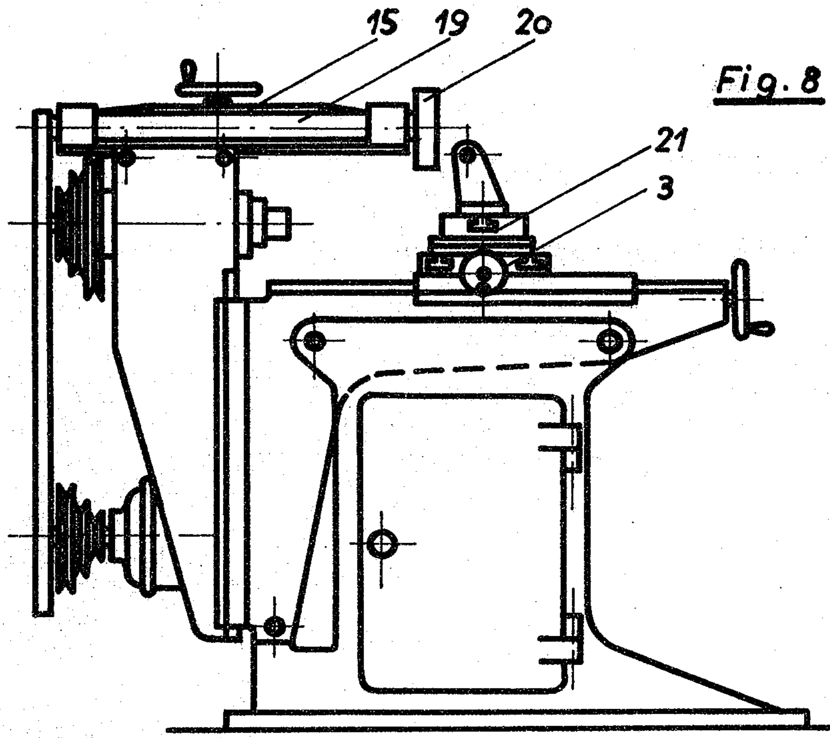


Fig. 8

Dr.
Wolfgang
ROSSMA-
NITH INVENTOR

Certified to be the drawings referred to in the specification hereunto annexed.
Montreal, Can., 7th day of Jan. 1946

BY: Marion & Marion
ATTORNEYS

Fig. 9

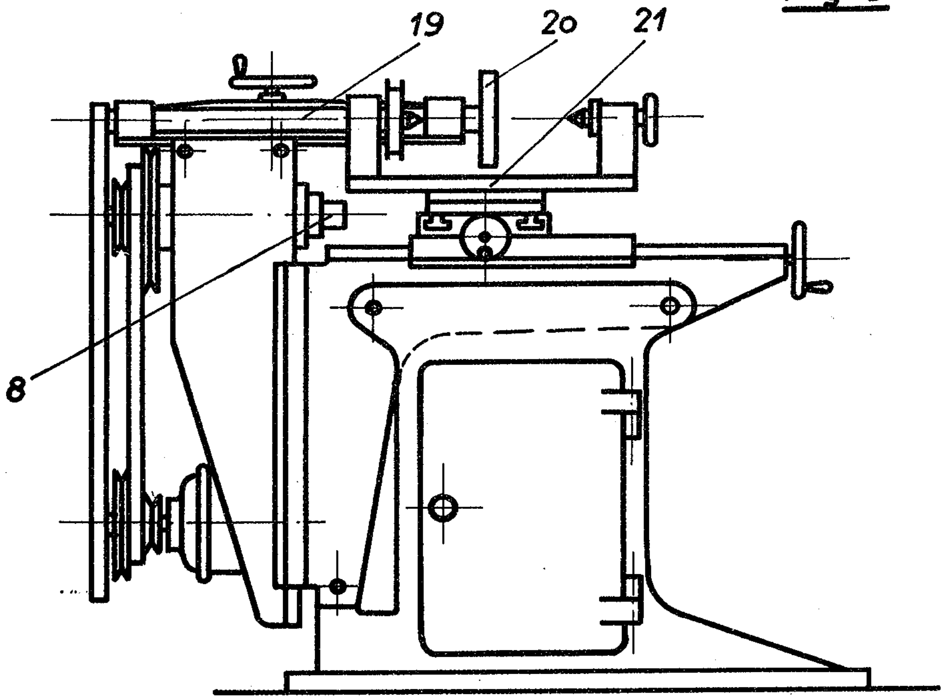
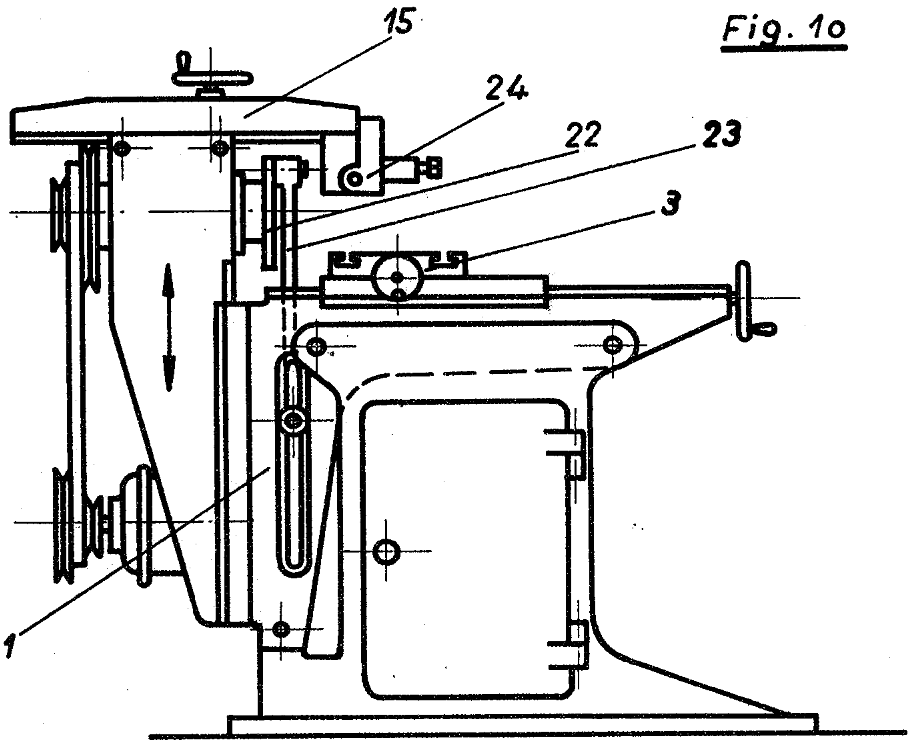


Fig. 1o



Dr. Wolfgang [illegible]

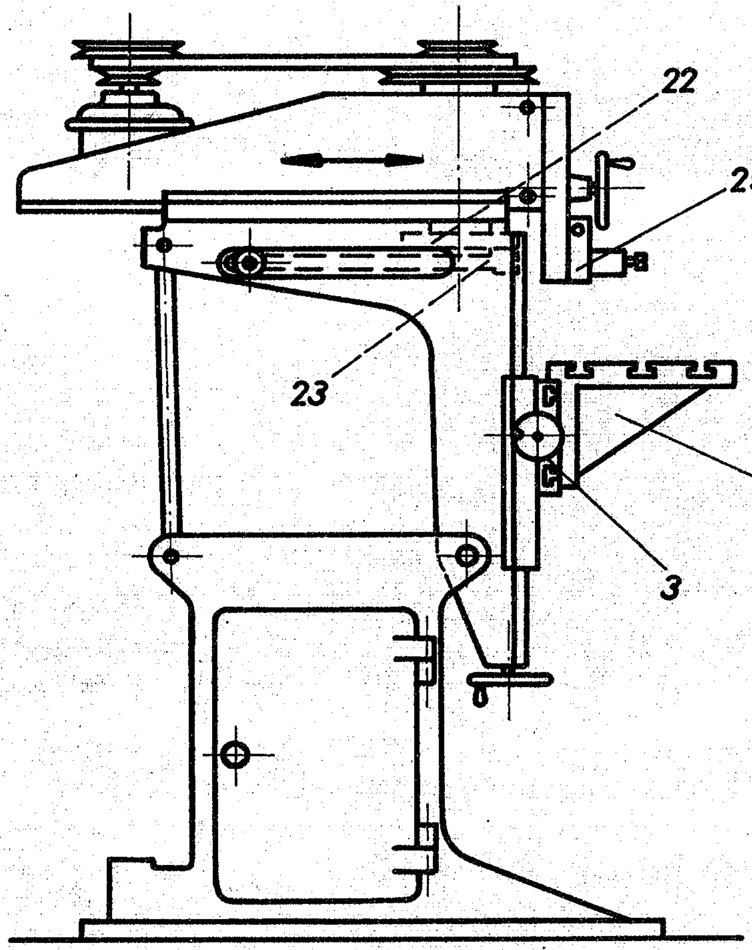
INVENTOR

BY: [signature]

ATTORNEYS

Certified to be the drawings referred
to in the specification hereunto annexed.
Montreal, Can., 7th day of [illegible]

Fig. 11



Dr. Wolfgang ROSSMA-
NITH
INVENTOR

BY: Marion & Marion
ATTORNEYS

Certified to be the drawings referred to in the specification hereunto annexed.
Montreal, Can., 7th day of Jan. 19 46