April 22, 1958 F. W. SALLWEY ET AL 2,831,405

COPYING MILLING MACHINE

Filed May 24, 1955 4 Sheets-Sheet 1

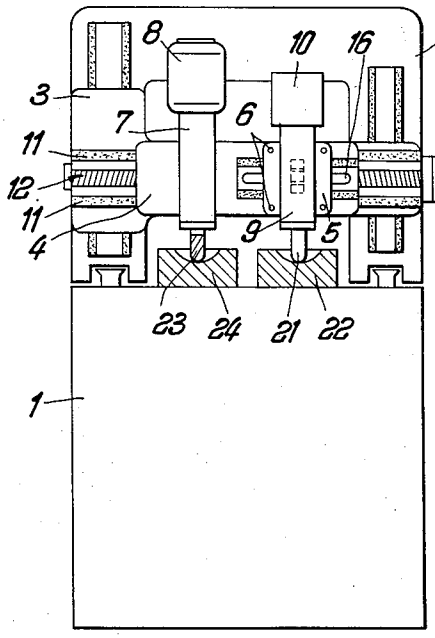


Fig. 1

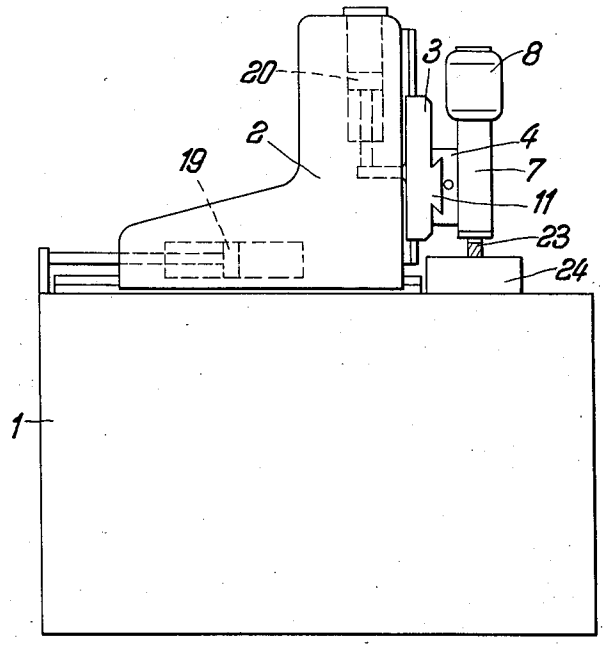


Fig. 2

Inventor:

April 22, 1958 F. W. SALLWEY ET AL 2,831,405

COPYING MILLING MACHINE

Filed May 24, 1955 4 Sheets-Sheet 2

Fig. 3

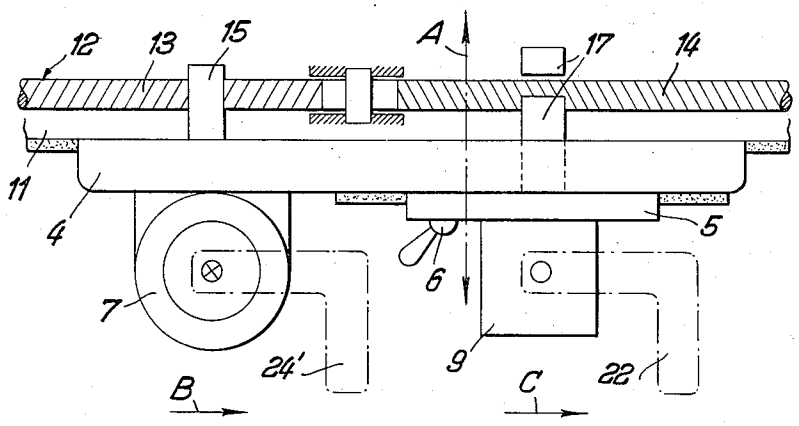
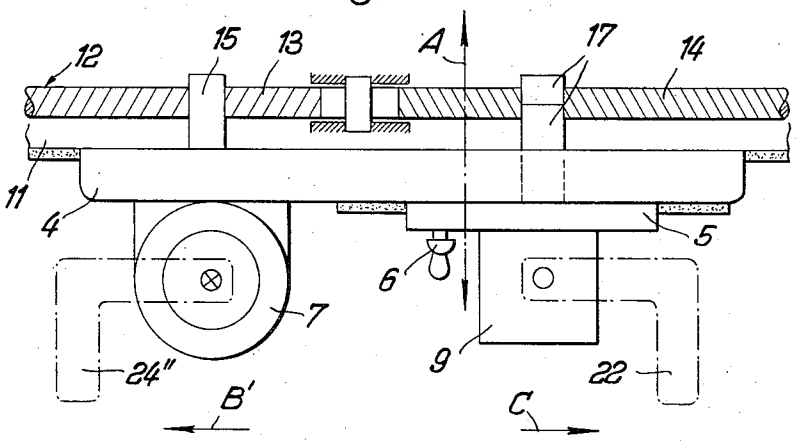


Fig. 4



Inventor:

April 22, 1958 F. W. SALLWEY ET AL 2,831,405

COPYING MILLING MACHINE

Filed May 24, 1955 4 Sheets-Sheet 3

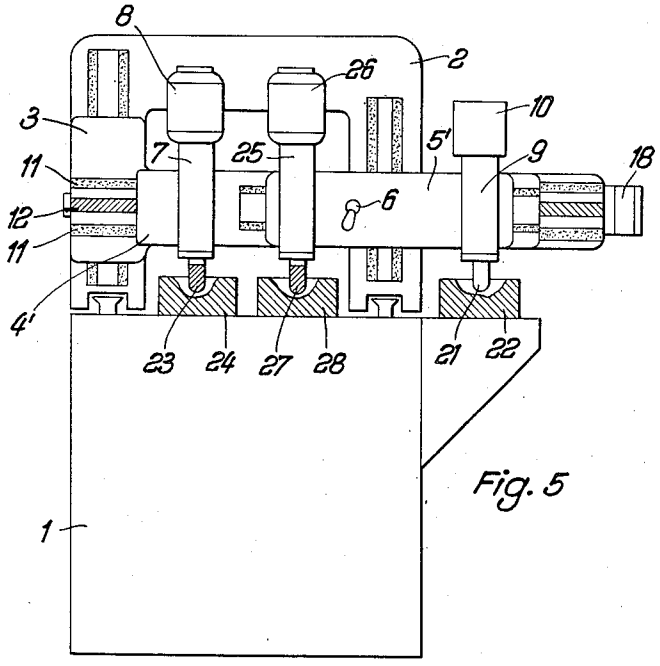


Fig. 5

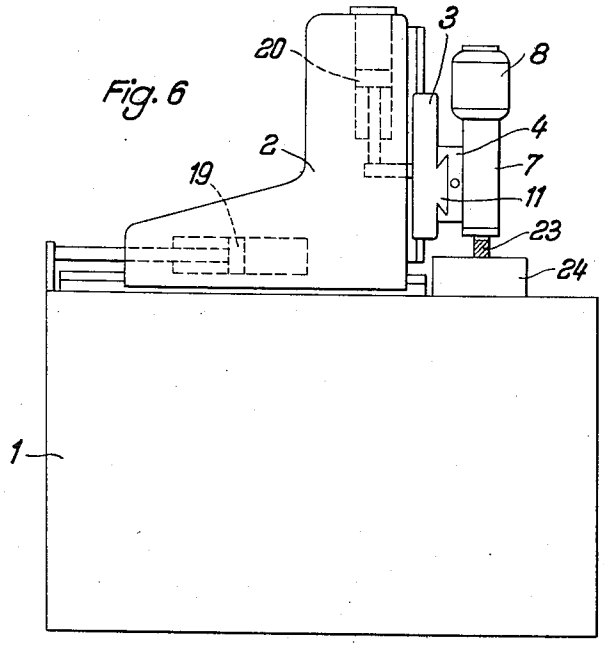


Fig. 6

Inventor:

April 22, 1958 F. W. SALLWEY ET AL 2,831,405

COPYING MILLING MACHINE

Filed May 24, 1955 4 Sheets-Sheet 4

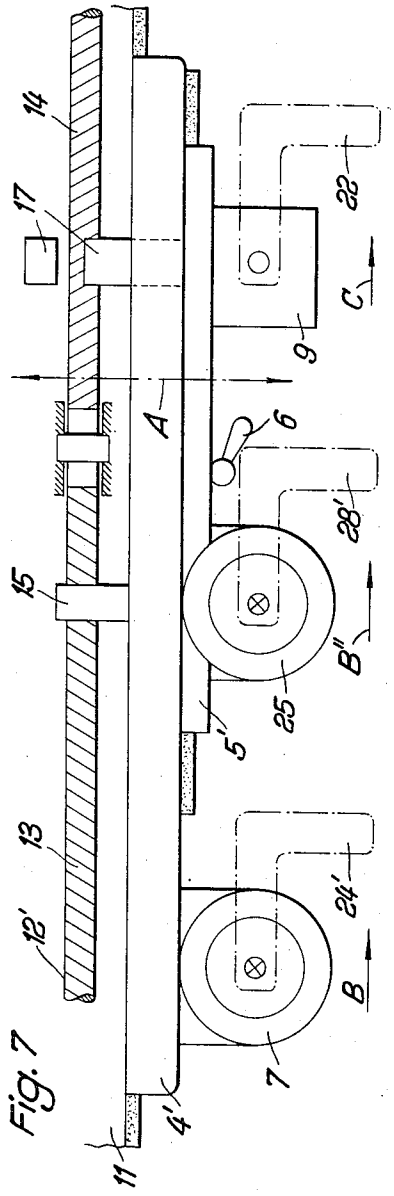


Fig. 7

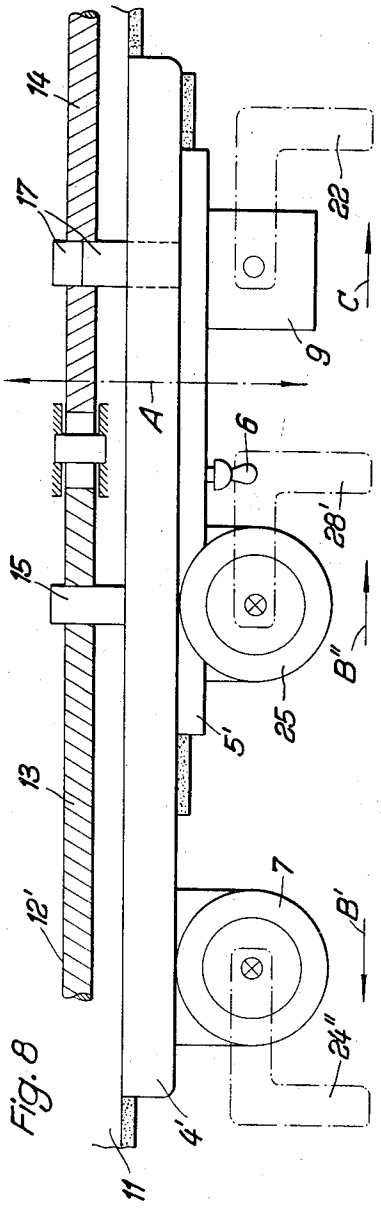


Fig. 8

Inventor:

United States Patent Office 2,831,405 Patented Apr. 22, 1958

2,831,405

COPYING MILLING MACHINE

Friedrich W. Sallwey and Georg Schlapp, Langen, near Frankfurt am Main, Germany, assignors to Nassovia Maschinenfabrik Hanns Fickert G. m. b. H., Langen, near Frankfurt am Main, Germany

Application May 24, 1955, Serial No. 510,786

Claims priority, application Germany May 25, 1954

4 Claims. (Cl. 90—13.1)

The invention relates to copying machines, particularly copying milling machines, and comprises an arrangement for controlling the carriage bearing the copying head and the milling head or heads.

The use of copying milling machines for making either a geometrically similar or a mirror-image copy from a pattern or template is known.

The object of the invention is to provide a copying machine, in particular a copying milling machine, on which it is possible by a very simple arrangement, in one copying operation, simultaneously to produce one or more similar or similar and symmetrical copies. This is accomplished by so arranging the milling heads and the copying head and so connecting them to a control means, that either the milling heads move in the same or opposite direction, or one or more in the same and the other or others in the opposite direction, as or to the copying head.

The control means used may be any means of producing motions directed towards or away from each other and in the same direction, and capable of being suitably operated, for example, piston, sprocket and gear transmissions. In a preferred embodiment of the invention, the control means proposed is a screw with opposed, i. e. one right-hand and one left-hand threads. Such a screw permits a design of great simplicity in construction and operation.

The arrangement according to the invention will now be more fully described with reference to the accompanying drawings, but it should be understood that these are given by way of illustration and not of limitation and that many changes in the details may be made without departing from the spirit of the invention.

In the drawings,

Fig. 1 shows a schematic front view of a copying milling machine equipped with one copying and one milling head;

Fig. 2 shows a left-hand side view of the copying milling machine according to Fig. 1;

Figs. 3 and 4 each show a top view of the copying and milling heads and the screw of the machine shown in Figs. 1 and 2, in different set-ups;

Figs. 5 and 6 each show a modification of the copying milling machine of Figs. 1 and 2, with two milling heads; and

Figs. 7 and 8 each show a top view of the copying and milling heads and the screw of the machine shown in Figs. 5 and 6, in different set-ups.

The copying milling machine according to Figs. 1 to 4 comprises a frame **1**, with cross-carriage **2**, vertical carriage **3** and lengthwise carriage **4** displaceably mounted thereon in known manner. According to the invention, the lengthwise carriage **4** bears an additional, shorter lengthwise carriage **5**, likewise displaceably mounted. The two lengthwise carriages may be locked together by a clamping means, for example setscrews **6**.

Lengthwise carriage **4** bears a milling head **7** with drive motor **8**. The other lengthwise carriage **5** bears the copying head **9** with control means **10**. On the vertical carriage **3**, preferably between or near the slide ways **11**, a screw **12** of suitable length is rotatably mounted in known manner, with one right-hand thread **13** and one left-hand thread **14**. The lengthwise carriage **4** bears a projection **15** directed towards the screw **12**, provided with a female threaded transversed by the right-hand thread **13** of the screw. The lengthwise carriage **5** is likewise provided with a projection passing through a lengthwise slot **16** in the lengthwise carriage **4** and having a half-nut **17** engaging the left-hand thread **14** of screw **12**. The screw is driven by suitable means **18**, for example a variable electric or rotary-piston motor. The requisite motions of cross-carriage **2** and vertical carriage **3** are accomplished in known maner, for example by means of suitably controlled hydraulic cylinders **19** and **20**.

The copying milling machine as hitherto described affords the following possibilities of producing copies from a pattern or template:

A. *Production of identical copy* (*Fig. 3*).—On the bed of the machine, pattern **22** is set up within the field of the follower **21**, and the work **24** within the field of the cutter **23**. The lengthwise carriage **5** is united to lengthwise carriage **4** by means of clamp **6**, and the half-nut **17** opened. Now if the screw is driven for copying operation, the lengthwise carriages **4** and **5** will move jointly in the same lengthwise direction of the screw, and the cutter **23** will make an identical copy **24'** out of the work **24** as the pattern **22** is explored by the follower **21**.

The cross-carriage **2** is presumed to be moved back and forth in the direction of exploration (arrow A, Fig. 3). Then, at the moment of reversal of the cross-carriage **2**, the screw **12**, with the aid of the suitably arranged drive **18**, effects the advance (arrows B and C, Fig. 3). The direction of tracing thus lies in the direction of motion of the cross-carriage **2**, while the parallel advance takes place in the direction of the screw **12**.

Alternatively, however, the reciprocating tracing motion may be performed in the direction of the screw. The screw drive will then be effected for that purpose, for example by means of a reversing motor or reversing clutch, alternately in right-hand and left-hand direction, and the advance will be taken care of by the cross-carriage **2**.

B. *Production of mirror-image copy* (*Fig. 4*).—In order to produce a mirror-image copy with the device described under point A, it suffices to close the half-nut **17** and release the connection between lengthwise carriage **4** and lengthwise carriage **5** by loosening the clamp **6**. Then as the screw **12** executes its rotary motions for copying purposes, the copying head **9** will move in the same direction (arrow C) as under point A, while the milling head **7** moves in the opposite direction (arrow B'). Lengthwise carriages **4** and **5** thus execute opposite motions in the direction of screw **12** (arrows B' and C), so that the cutter **23** makes a mirror-image copy **24''** from the work **24**.

Figs. 5 to 8 show an embodiment of the copying milling machine of Figs. 1 to 4 in which one milling head has been added. With this machine, equipped according to the invention, it is possible simultaneously to produce two identical or one identical and one mirror-image copy. By suitable lengthening of the lengthwise carriages and bed of the machine, further milling heads may be added, thus increasing the number of identical and/or mirror-image copies that may be simultaneously produced.

The essential structure and arrangement of parts in Figs. 5 to 8 being the same as in Figs. 1 to 4, a repetition

of the description may be dispensed with. Like parts bear like reference numerals.

Lengthwise carriage 4' bears milling head 7, and lengthwise carriage 5' bears copying head 9 and the other milling head 25 with drive 26. When the half-nut 17 is opened and clamp 6 tightened (Fig. 7), lengthwise carriages 4' and 5', and hence copying head 9 and milling heads 7 and 25, execute movements in the same direction (arrows B, B'' and C) with respect to the copying stroke (arrow A), so that cutters 23 and 27 simultaneously produce two identical copies 24' and 28' from work 24 and 28. If the half-nut 17 is closed and the clamp 6 connecting lengthwise carriages 4' and 5' loosened (Fig. 8) instead, then the motion of milling head 25 is in the same direction as that of the copying head 9 (arrows B'' and C), while milling head 7 executes an oppositely directed motion (arrow B'). Hence an identical copy 28' and a mirror-image copy 24'' are produced simultaneously.

What we claim is:

1. A copying machine tool, in particular a copying milling machine, comprising, in combination, a support member including a work table; a horizontally disposed cross carriage slidably mounted on said support; a vertical carriage slidably mounted on said cross-carriage; a first transverse carriage slidably mounted on said vertical carriage and having a first end portion provided with a milling head, and a second end portion provided with horizontal slideways and having a longitudinal slot extending therebetween; a second transverse carriage, having a tracing head secured thereto, slidably mounted on the said horizontal slideways of the said first transverse carriage and provided with a lateral projection extending through said longitudinal slot in said second end portion of said first transverse carriage; clamp means capable of securing and disengaging said second transverse carriage and the first transverse carriage; a feed screw rotatably mounted in said vertical carriage parallel to said transverse carriages, said feed screw being formed at each of its ends with oppositely directed threads; at least one pair of nuts, engaging with the said feed screw one of said nuts being secured to the said first end portion of said first transverse carriage, the other of said nuts being secured to the said lateral projection of the second transverse carriage, said other nut being formed in two separable parts adapted to engage with said screw when they are joined, or be disengaged from the latter when these are separated; means for joining or separating said parts of the said other nut; drive means for driving said feed screw and means for moving each of said carriages, whereby when said first and second transverse carriages are secured together by tightening said clamp means, and said parts of the other nut are separated, a copy identical with the original is produced, and when said first and second transverse carriages are disengaged by loosening said clamp means, and said parts of the other nut are joined, a mirror-image copy of the original may be produced.

2. A copying machine tool, in particular a copying milling machine, comprising, in combination, a support member including a work table; a horizontally disposed cross carriage slidably mounted on said support; a vertical carriage slidably mounted on said cross-carriage; a first transverse carriage slidably mounted on said vertical carriage and having a first end portion provided with a milling head, and a second end portion provided with horizontal slideways and having a longitudinal slot extending therebetween; a second transverse carriage, having a tracing head secured thereto, slidably mounted on the said horizontal slideways of the said first transverse carriage and provided with a lateral projection extending through said longitudinal slot in said second end portion of said first transverse carriage; clamp means capable of securing together or disengaging said second transverse carriage and the first transverse carriage; a feed screw rotatably mounted in said vertical carriage parallel to said transverse carriages, said feed screw being formed at each of its ends with oppositely directed threads; at least one pair of nuts, engaging with the said feed screw one of said nuts being secured to the said first end portion of said first transverse carriage, the other of said nuts being secured to the said lateral projection of the second transverse carriage, said other nut being formed in two separable parts adapted to engage with said screw when they are joined, or be disengaged from the latter when these are separated; means for joining or separating said parts of the said other nut; drive means for driving said feed screw and means for moving each of said carriages, whereby when said first and second transverse carriages are secured together by tightening said clamp means, and said parts of the other nut are separated, a copy identical with the original is produced, and when said first and second transverse carriages are disengaged by loosening said clamp means, and said parts of the other nut are joined, a mirror-image copy of the original may be produced.

3. A copying machine tool, in particular a copying milling machine, comprising, in combination, a support member including a work table; a horizontally disposed cross carriage slidably mounted on said support; a vertical carriage slidably mounted on said cross-carriage; a first transverse carriage slidably mounted on said vertical carriage and having a first end portion provided with a milling head, and a second end portion provided with horizontal slideways and having a longitudinal slot extending therebetween; a second transverse carriage, having a tracing head secured thereto, slidably mounted on the said horizontal slideways of the said first transverse carriage and provided with a lateral projection extending through said longitudinal slot in said second end portion of said first transverse carriage; clamp means capable of securing together or disengaging said second transverse carriage and the first transverse carriage; a feed screw rotatably mounted in said vertical carriage parallel to said transverse carriages, said feed screw being formed at each of its ends with oppositely directed threads; at least one pair of nuts, engaging with the said feed screw, one of said nuts being secured to the said first end portion of said first transverse carriage, the other of said nuts being secured to the said lateral projection of the second transverse carriage, said other nut being formed in two separable parts adapted to engage with said screw when they are joined, or be disengaged from the latter when these are separated; means for joining or separating the said parts of the said other nut; drive means for driving said feed screw and means for moving each of said carriages, whereby when said first and second transverse carriages are secured together by tightening said clamp means, and said parts of the other nut are separated, a copy identical with the original is produced, and when said first and second transverse carriages are disengaged by loosening said clamp means, and said parts of the other nut are joined, a mirror-image copy of the original may be produced.

4. A copying machine tool, in particular a copying milling machine, comprising, in combination, a support member including a work table; a horizontally disposed cross carriage slidably mounted on said support; a vertical carriage slidably mounted on said cross-carriage; a first transverse carriage slidably mounted on said vertical carriage and having a first end portion provided with a multiplicity of milling heads, and a second end portion provided with horizontal slideways and having a longitudinal slot extending therebetween; a second transverse carriage, having a tracing head secured thereto, slidably mounted on the said horizontal slideways of the said first transverse carriage and provided with a lateral projection extending through said longitudnal slot in said second end portion of said first transverse carriage; clamp means

capable of securing together or disengaging said second transverse carriage and the first transverse carriage; a feed screw rotatably mounted in said vertical carriage parallel to said transverse carriages, said feed screw being formed at each of its ends with oppositely directed threads; at least one pair of nuts, engaging with the said feed screw, one of said nuts being secured to the said first end portion of said first transverse carriage, the other of said nuts being secured to the said lateral projection of the second transverse carriage, said other nut being formed in two separable parts adapted to engage with said screw when they are joined, or be disengaged from the latter when these are separated; means for joining or separating said parts of the said other nut; drive means for driving said feed screw and means for moving each of said carriages, whereby when said first and second transverse carriages are secured together by tightening said clamp

means, and said parts of the other nut are separated, a copy identical with the original is produced, and when said first and second transverse carriages are disengaged by loosening said clamp means, and said parts of the other nut are joined, a mirror-image copy of the original may be produced.

References Cited in the file of this patent

UNITED STATES PATENTS

2,185,011	Anderson	Dec. 26, 1939
2,303,956	Rossbacher	Dec. 1, 1942
2,590,378	Clausing	Mar. 25, 1952
2,718,702	Glass	Sept. 27, 1955

FOREIGN PATENTS

207,604	Germany	Mar. 4, 1909