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E. HÄNNI

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SHEET METAL WORKING MACHINES

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2 Sheets-Sheet 2

Fig. 2

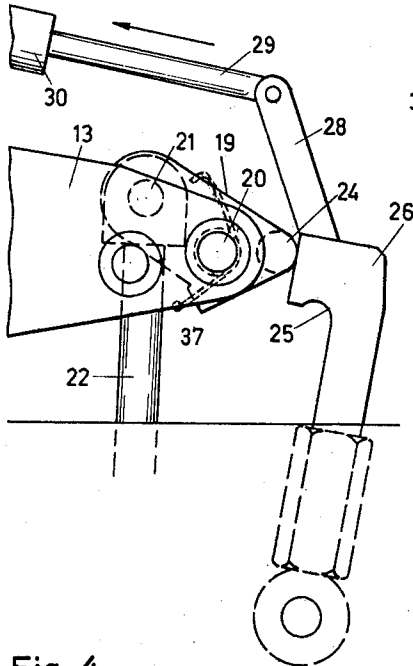


Fig. 3

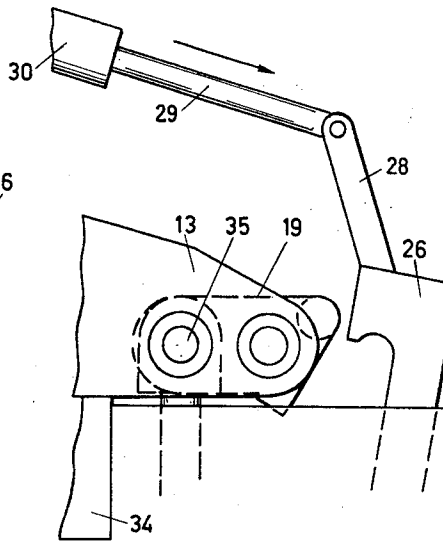


Fig. 4

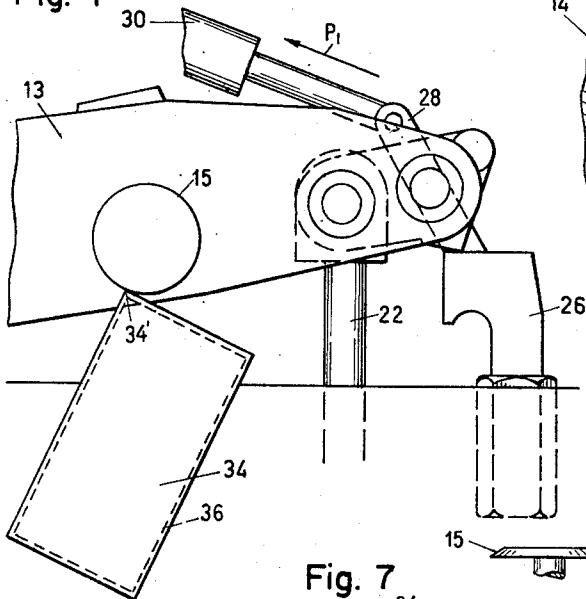


Fig. 5

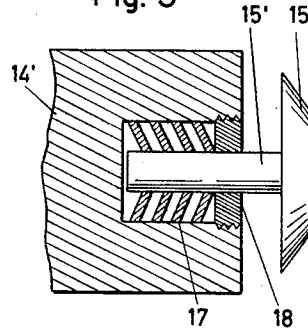


Fig. 6

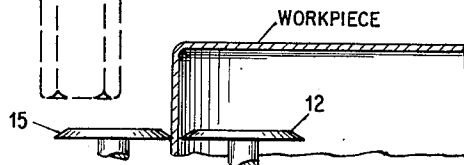
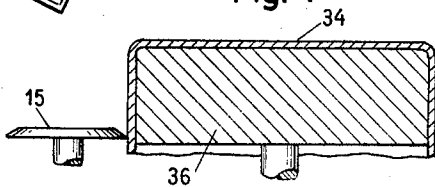


Fig. 7



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**SHEET METAL WORKING MACHINES**

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The present invention concerns sheet metal working machines for the trimming of cylindrical and non-circular sheet metal parts and having two tool shafts of which one is mounted in a movable bearing member and the other in the machine frame.

The object of the invention is to provide a sheet metal working machine with which the cutting or trimming of cylindrical and non-cylindrical sheet metal parts is possible by the copy-method as well as by the follow-on method.

In the copy-method a tool is arranged in the frame mounted shaft, which tool has the inner shape of the workpiece to be machined whilst the movable bearing body, for example a rocker arm, carries a circular knife. According to the follow-on method two driven circular knives are used. The rocker arm, which carries one of the knives, must be pressed with as great a force as possible against the other cutting knife and thus the workpiece passes between the circular knives.

According to the invention a sheet metal working machine has a tool shaft with cutting knives arranged in the machine frame and a movable tool shaft with corresponding cutting knives pivotally mounted in a rocker arm opposite this tool shaft and is characterised in that there is pivotally mounted on the machine frame an operating catch under the influence of a control arrangement, which operating catch co-operates in one pivot position with the movable bearing member and locks this temporarily in the fully open position for removal of a finished cut workpiece from the machine and insertion of a new workpiece between the cutting knives and in another pivot position forms a part of a transmission for increasing the cutting pressure. The locking of the rocker arm is suitably effected after a complete rotation of the frame mounted tool shaft at the moment when the distance between the two shafts has reached a maximum.

The invention will now be described further, by way of example only, with reference to the accompanying drawings illustrating one embodiment thereof, in which:

FIG. 1 shows, in plan view, a diagrammatic representation of the sheet metal working machine for use in accordance with the follow-on method;

FIG. 2 shows a detail of FIG. 1 in another working position;

FIG. 3 shows the sheet metal working machine for use in accordance with the copy-method in a first working position;

FIG. 4 is the same detail as FIG. 3 in the locked position;

FIG. 5 shows the construction of the movable shaft with cutting knives;

FIG. 6 shows, in a partial sectional view the tools for cutting of a cylindrical sheet metal part; and

FIG. 7 shows in a similar view the tools for cutting a non-cylindrical part.

A sheet metal working machine has a frame 1 which carries a horizontal work table 2. In the frame there is provided a driving motor, for example, an electric motor 3 which via an infinitely variable device 4 drives the shaft 5 of an electro-magnetic clutch 6. The clutch 6 is in engagement with a chain drive 7 which drives the shaft 8 of a worm 9. The worm wheel 10 with which the worm 9 co-operates serves to drive the tool shaft 11, said shaft

11 being firmly mounted in the frame 1 and carrying a cutting tool 12.

In addition a movable bearing member in the form of a rocker arm 13 is provided which is pivotally mounted in the frame about a vertical shaft 14. On the rocker 13 is mounted a tool shaft 14', said shaft 14' carrying a cutting tool 15 and being movable with the arm. The tool shaft 14' is driven by the tool shaft 11 through a chain drive 16 provided between the tool shaft 11 and the tool shaft 14'. The shank 15' (see FIG. 5) of the tool 15 is mounted on the end of the tool shaft 14'. If the tool 15 is to be freely rotatable then a ball bearing assembly is used for the mounting of the shank. If a fixed connection is required then, as can be seen in FIG. 5, spring plates 17 are used, the latter being tensioned by a nut 18 to provide the fixed connection.

The extremity of the rocker arm 13 carries a spring loaded lever 19, said lever being rotatably mounted on a bolt 20 and held in the position shown in FIG. 2 under the influence of a spring 37. The part of the lever 19 directed towards the shaft 14' is connected, by a bolt 21, to the piston rod 22 of a piston (not shown), arranged in an air cylinder 23. In the working position as illustrated in FIG. 1 (follow-on method) the nose of the lever 19 extends beyond the arm 13, and co-operates with the hook 25 of an operating catch 26 in that the nose 24 engages the hook 25. The catch 26 is pivotally mounted in the frame 1 and has holes 27 whereby adjustment of the position thereof might be effected. The remote end of the catch 26 is provided with an arm 28 pivotally coupled to the piston rod 29 of a piston 32 located in an air cylinder 30. The air cylinder 30 is pivotally mounted in the frame by means of a lug 31. The piston 32 moves against the action of a compression spring 33, the latter tending to hold the piston in the position illustrated in FIG. 1.

In the position shown in FIGS. 1 and 2 the sheet metal working machine is arranged for the cutting or trimming of large cylindrical and non-cylindrical cup shaped or similar sheet metal parts with variable speed ratios of the main shafts in accordance with the follow-on method. The workpiece to be machined is cut by means of the two cutting tools 12 and 15, both cutting tools being driven. After the workpiece has been brought into the machining position while the arm 13 is pivoted to an open position, the arm 13 is pivoted in clockwise direction so that the cutting tool 15 contacts the workpiece. For the pivoting of the arm relatively little force is needed and such force as is necessary is applied by the air cylinder 23. After the working position has been reached the operating catch 26 is pivoted, under the action of the compression spring 33, in anti-clockwise direction as there is no air in the cylinder 30. The nose 24 is held by the hook 25 as can be seen in FIG. 1. In this way there results a lever transmission with the arms *a* and *b* which transmission effects the increase of the force exercised by the air cylinder 23 in the direction of the arrow I in the ratio *a/b*. The arm 13 is therefore brought, with relatively small expenditure of force, into the working position. However, as soon as the cutting tool 15 contacts the sheet metal of the workpiece the force is multiplied and is then sufficient for the cutting of the material. After the working procedure is terminated air is applied to the cylinder 30 so that the spring 33 is compressed and the operating catch 26 again pivoted into the initial position.

If the sheet metal working machine described is used in accordance with the copy-method the tool on the shaft 11 is replaced by a tool 36 having the shape of the workpiece 34 as shown in FIGS. 3 and 4 and the pivoting movement of the lever 19 is prevented. For this purpose a locking pin 35 is used, said pin 35 firmly connecting the

lever 19 to the arm 13. In the initial position the arm 13 is in just less than the fully open position, and is supported on the pawl 26 (FIG. 4). In this manner the catch is firmly held although, against the action of the compression spring 33, the pressure in the cylinder 30 tends to effect a pivoting of the catch 26 in clockwise direction. As soon as the cutting tool 12, and thus the workpiece 34, begins to rotate in a clockwise direction the arm 13 is raised a little by the edge 34' of the workpiece 34, whereupon the catch 26, under the action of the air cylinder 30, is pivoted in a clockwise direction and the locking of the arm is released (FIG. 3). The arm 13 can accurately follow the contours of the rotating workpiece 34 as the arm 13 is pressed resiliently against the workpiece 34 by the air cylinder 23. Shortly before completion of the first rotation of the workpiece the air in cylinder 30 is released by a control device C schematically indicated in FIG. 1 so that the compression spring 33 acting in the direction of the arrow P1 pivots the catch 26 into the locking position seen in FIG. 4 shortly before the rocker arm 13 has been brought by the edge 34' into its fully open position. On further rotation of the workpiece the arm remains in the locked open position so that the finished cut workpiece can be taken off from the tool. After the next workpiece is put in place, the air pressure is again applied to cylinder 30, to compress spring 33 in preparation for the next cycle.

The sheet metal working machine can be used in a simple manner both for the cutting of workpieces in accordance with the follow-on method and the copy-method whereby the conversion is effected in an extremely simple manner.

What I claim is:

1. Sheet metal working machine for trimming cylindrical and non-cylindrical sheet metal parts, said machine comprising a machine frame, a movable bearing member mounted on said frame, two tool shafts of which one is mounted in said movable bearing member and the other on said machine frame, an operating catch pivotally mounted on said machine frame movable under the influence of a control device, said operating catch cooperating in one pivot position with the movable bearing member for temporarily locking the same in a fully open position and in another pivot position forms a part of a transmission for increasing the cutting pressure, said movable bearing member being formed as a swing arm pivotally mounted about an axis, a lever carried by said swing arm at the end remote from its pivoted axis, said lever being pivoted intermediate the ends thereof, said lever having a nose-like end extending beyond the swing-arm and being adapted to co-operate with the operating catch in that position of the swing arm in which the latter is pivoted toward the frame mounted tool shaft, and operating means connected to the other end of said lever for moving the same in a direction so as to move said tool shaft in said movable bearing member toward the other tool shaft and in opposite direction for separating said shafts to a maximum.

2. Sheet metal working machine as claimed in claim 1, in which said operating means includes an air cylinder, piston and piston rod, which latter is connected to said other end of said lever.

3. Sheet metal working machine as claimed in claim 1, in which said lever is lockable in one pivot position by a locking pin.

4. A machine for trimming cylindrical and non-cylindrical sheet metal parts comprising, in combination, a machine frame; a first tool shaft turnably carried by said frame; a first rotary tool carried by said first shaft; a swing arm pivotally mounted at one end thereof in said frame; a second tool shaft turnably mounted on said swing arm extending substantially parallel to said first tool shaft; a second rotary tool mounted on said second tool shaft, said swing arm being pivotable between an open position in which said tools are spaced from each

other permitting placing of a sheet metal part to be trimmed between said tools and a working position in which said tools are closely adjacent each other so that a sheet metal part placed between the tools will be engaged on opposite surface portions by said tools; drive means operatively connected to said shafts for turning the same about their axes; a lever mounted intermediate its ends on the other end of said arm for tilting movement about a pivot axis parallel to the axes of said shafts, said lever having at one end a noselike extension projecting beyond said other end of said arm; an operating catch tiltably mounted on said machine frame movable between a first position tilted away from said one end of said lever permitting movement of said arm to said open position and a second position engaging said noselike extension of said lever; means connected to said operating catch for moving the same between the positions thereof; and operating means connected to the other end of said lever for moving said lever and thereby said arm carrying said lever between said open position and said working position.

5. A machine as set forth in claim 4 wherein said operating catch is formed with a hook and wherein said noselike extension of said lever engages under said hook of said catch during trimming of the cylindrical sheet metal parts.

6. A machine as set forth in claim 5 in which the distance of the pivot axis of said lever from said one end of said lever is smaller than the distance from the other end thereof so that when said noselike extension of said lever is engaged under said hook and said operating means moves said lever so as to move said arm from its open towards its working position, said lever and said arm provide for a lever arrangement increasing the pressure at which said tools are pressed against opposite surface portions of a sheet metal part placed between the tools.

7. A machine as set forth in claim 4 and including locking means mounted on said arm and cooperating with said lever for locking the same in fixed position to said swing arm when said machine is used for trimming of non-cylindrical sheet metal parts.

8. A machine as set forth in claim 7 in which said one end of said lever, while said lever is locked by said locking means, engages said operating catch in said second position for momentarily locking said arm in said open position.

9. A machine as set forth in claim 7 wherein said means for moving said catch includes spring means for moving said catch to said first position when said one end of said lever is lifted from said catch during rotation of said non-cylindrical tool.

10. A machine for trimming cylindrical and non-cylindrical sheet metal parts comprising, in combination, a machine frame; a movable bearing member mounted on said frame; two tool shafts, one of said shafts being mounted in said movable bearing member and the other on said machine frame; an operating catch pivotally mounted on said frame movable under the influence of a control device, said operating catch cooperating in one pivot position with the movable bearing member for temporarily locking the same in a fully open position and in another pivot position forms part of a transmission for increasing the cutting pressure, said movable bearing member being formed as a swing arm mounted on said frame pivotally about an axis; a lever carried by said swing arm at the end remote from its pivot axis, said lever being pivoted intermediate the ends thereof and having a noselike end extending beyond the swing arm and being adapted to cooperate with the operating catch in that position of the swing arm in which the latter is pivoted toward the frame-mounted tool shaft; and a locking means carried by said swing arm and cooperating

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with said lever for locking the same in fixed position to said arm.

11. A machine set forth in claim 10 and including operating means connected to said lever for pivoting said swing arm carrying said lever to separate said tool shafts by a maximum, said operating means including an air cylinder, piston and piston rod, the latter being connected to said lever.

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