Feb. 9, 1960 W. ECKOLD 2,924,131

MACHINES FOR FORMING AND PRESSING SHEET METAL AND PROFILES

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Fig. 1

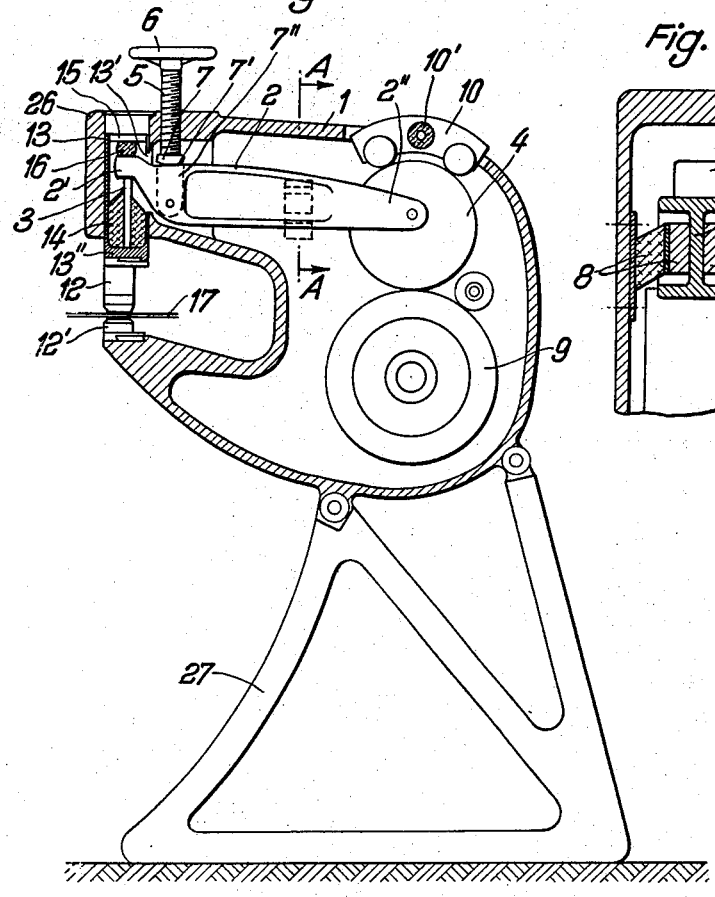
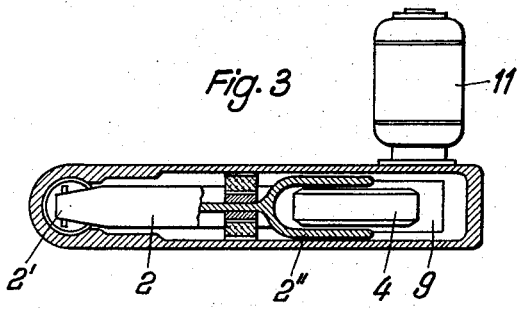


Fig. 2 (A-A)

Fig. 3



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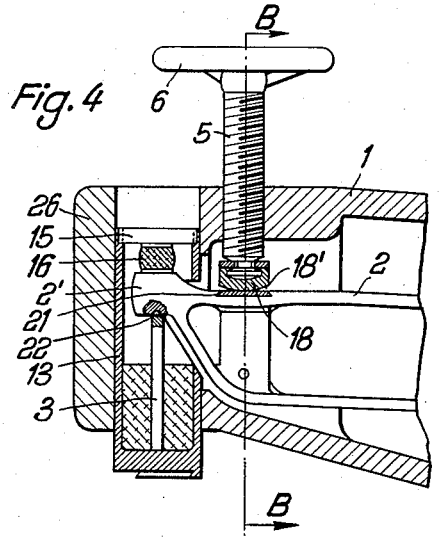

Fig. 4

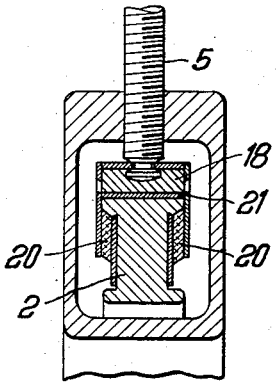

Fig. 5 (B-B)

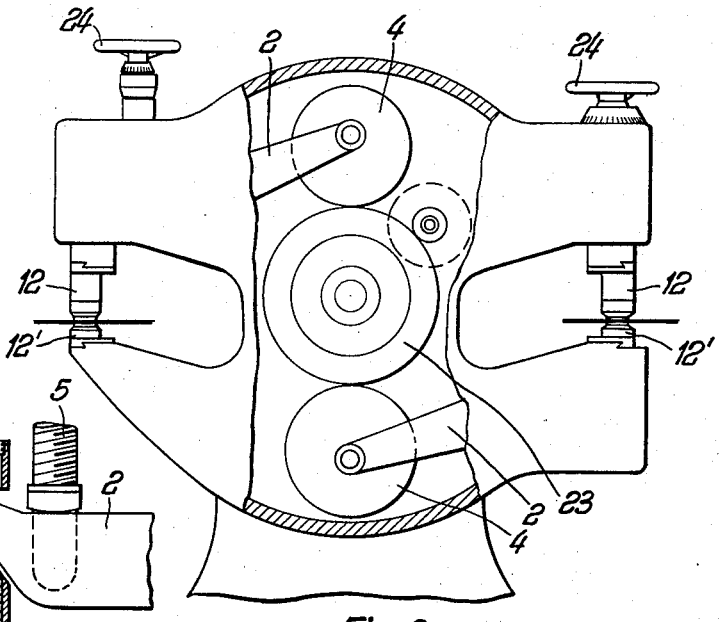

Fig. 6

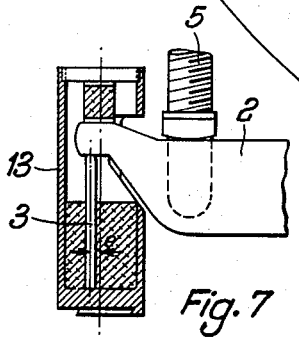

Fig. 7

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MACHINES FOR FORMING AND PRESSING SHEET METAL AND PROFILES

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Fig. 8

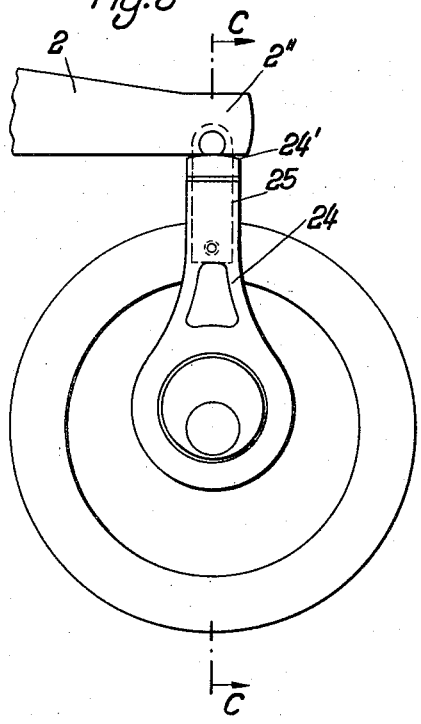


Fig. 9 (C-C)

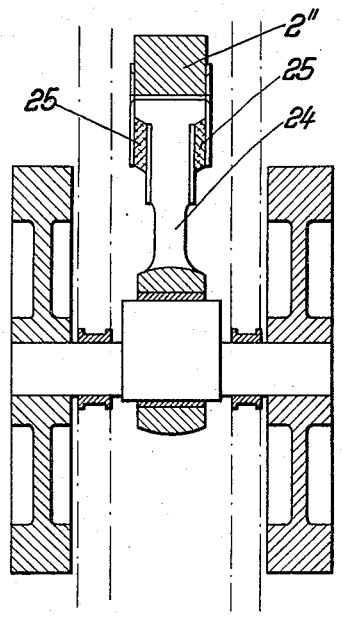


Fig. 10

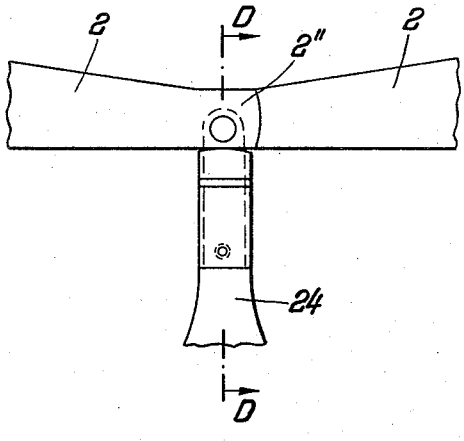
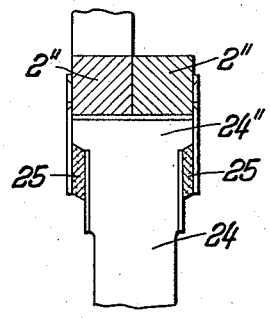


Fig. 11 (D-D)



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MACHINES FOR FORMING AND PRESSING SHEET METAL AND PROFILES

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Application August 20, 1957, Serial No. 679,289

Claims priority, application Germany August 30, 1956

7 Claims. (Cl. 78—36)

The present invention relates to machines for forming and pressing sheet metal and profiles which operate by means of press tools acting at a high speed upon the material. The high speed at which they operate calls for special care in the maintenance of such machines as far as adequate lubrication of their moving parts is concerned, particularly if high working pressures are used; otherwise these parts will be subjected to excessive wear, or they may even seize and thus render the whole machine unserviceable.

An object of the invention is to make the operation of the machines practically independent of the need for lubrication, and at the same time so to simplify the design of such machines that their manufacture and assembly becomes simple and economical.

According to the present invention, in a machine for forming and pressing sheet metal and profiles which operates by means of a press tool acting at high speed, movement and power are transmitted to the press tool by means of a floating, double-ended lever inside the housing of the machine, the said lever oscillating by executing a rolling movement over the surface of a pressure pad mounted in the housing.

One end of the double-ended lever may be operatively joined to a reciprocable ram carrying the press tool while the other end is operatively connected to an eccentric drive.

The movement and power may be transmitted to the reciprocable ram by means of a flat plate arranged upright on edge. The top edge of the plate is freely hinged to said end of the lever while the other edge of the plate is in contact with the ram. The centre line of the plate is preferably in line with the point of application of pressure by the press tool. The plate may be supported by a resilient mass such as a rubber mass to which the plate is bonded, the mass also being bonded to the ram.

Several embodiments of the invention will now be described in greater detail by way of example with reference to the accompanying drawings of which:

Fig. 1 shows a longitudinal section through a machine according to the invention,

Fig. 2 is a part section on the line A—A of Fig. 1 drawn on a larger scale,

Fig. 3 is a horizontal section of the embodiment of Fig. 1,

Fig. 4 is a longitudinal part section through the top of another embodiment of the invention,

Fig. 5 is a section on the line B—B of Fig. 4,

Fig. 6 shows the drive of a twin machine,

Fig. 7 is a detail showing a modification,

Fig. 8 shows a further type of drive,

Fig. 9 is a section on the line C—C of Fig. 8,

Fig. 10 shows the drive of Fig. 8 used in a twin machine, and

Fig. 11 is a section on the line D—D of Fig. 10.

In the embodiment of the invention shown in Figs. 1 to 3, a double-ended lever 2 floats inside a housing 1 of the machine, that is, the lever does not turn about a

fixed fulcrum. One of the ends, 2' of the lever is freely hinged to a flexible flat plate 3 which stands upright on edge, whilst the other forked end 2'' of the lever carries an eccentrically-mounted pulley 4. The pulley or wheel 4 is eccentrically mounted on the lever 2 at the end 2''. The lever 2 rotates about a pressure pad 5 which is in the form of a threaded spindle and is adjustable for height by means of a hand wheel 6. In this arrangement, the actual support for the lever 2 is provided by the end 7 of the spindle having a cylindrical contact surface 7', over which the lever 2 rolls when it oscillates. Fixed to each side of the support 7 are lugs 7'' forming a fork in which the lever 2 moves. Adhering to the insides of these lugs are rubber blocks, which are preferably pre-compressed and which fill the space between the lugs 7'' and the sides of the lever 2. If these rubber blocks are pre-compressed in an upward direction, all looseness between the support 7 and the rolling surface of the lever 2 in contact with it is eliminated. Further flexible support for the lever 2 is provided by another pair of rubber-metal elements 8. Those elements are attached, on the one hand to the central web 2''' of the lever 2 which is formed by recesses at each side of the lever, and on the other hand to the sides of the housing 1. These rubber connections are pre-compressed such that they always press the pulley 4 against a pulley or wheel 9 of a motor 11. This effect can be reinforced, or alternatively can be provided, by a roller arch 10, which is supported resiliently by a rubber torsion bush 10'. With regard to the motor drive, another possibility is to mount the pulley 9, which is driven by the motor 11, eccentrically, in which case the pressure roller 4 would run centrically. If one or both of these transmission elements were to be made of some hard plastic or laminated material noise during the operation of the machine would be largely eliminated.

The machine has a ram in the form of a hollow cylinder 13 having a slot 13' through which the end 2' of the lever passes into the inside of the cylinder. The eccentric drive formed by 4 and 9 causes the lever arm 2' to reciprocate and the motion of this arm is transmitted through the ram and the flat plate 3 to a press tool 12. The flat plate 3 is freely supported on the bottom 13'' of the hollow cylinder 13 and is held resiliently inside a rubber cushion 14 to which the plate is bonded. The cushion 14 is also bonded to the internal surface of the cylinder. At its top the hollow cylinder 13 is closed by a screwed plug 15. This plug exerts such a pressure on an intermediate rubber spacer 16 that all play at the contact edges of the flat plate 3 will be prevented.

The ram of the machine is thus made in the form of a hollow cylinder, and the inertia of the parts which have to be accelerated at every stroke is considerably reduced in comparison with the solid shape formerly used for such parts, so that the vibrations set up by the machine are greatly reduced.

A blank 17 is inserted between the upper press tool 12 and a fixed bottom press tool 12'. If the operation is to produce compressive or tensile deformation of the sheet, it is preferable to use for this purpose tools with clamping jaws moving in opposite directions. The motor 11 is switched on, actuating the eccentric drive 4, 9, and the upper press tool 12 will move up and down with short strokes and will, in conjunction with the lower tool 12', cause the compressive or tensile deformation of the blank. Although thrusts of the order of several tons are being transmitted, the whole system remains flexible and does not require any lubrication. It will be seen that the centre line of the plate 3 is in line with the point of application of pressure by the press tool 12.

Figures 4 and 5 show an embodiment of the invention in which the support of the pressure pad 5 is provided

by a movable and easily exchangeable cap 18 having a cylindrical contact surface 18'. Any eccentric power transmission which might possibly occur will, in this way, be automatically eliminated. Apart from that, rubber-metal elements are again provided in this embodiment to support lever 2 resiliently and which exert a force such as to prevent any play between the rolling contact faces. In order to reduce wear of the contact face of the lever 2 it is provided with a hardened inset 21 which can easily be exchanged when necessary. In order to provide a satisfactory hinge between the upper edge of the flat plate 3 and the under side of the end 2' of the lever, a ball 22 is provided which is located in spherical seatings in both these parts.

Fig. 6 shows the principle of a twin machine, in which a central driving pulley 23 supplies the power for the two press units 12 and 12'. The two levers 2 going to the left and to the right are here each driven by an eccentric 4. The purpose of the hand wheels 4 is as before to enable the travel of the press tools to be adjusted.

Fig. 7 shows part of an embodiment of the invention in which the flat plate 3 is placed eccentrically with respect to the hollow cylinder 13. This arrangement would be useful if the press tools, as shown in Figs. 1 and 6, are also mounted eccentrically in the machine but if nevertheless it is desired to transmit pressure to them on as accurately central a line as possible.

In the embodiment of the invention part of which is shown in Figs. 8 and 9, the reciprocating motion of the eccentrics is transmitted by a connecting link 24 having a cylindrical contact surface 24', which executes a rolling movement along the under side of the end 2'' of the lever. Here again, both parts are so constrained with respect to each other by rubber-metal blocks in lugs 25 that all play between the contact faces is prevented.

Figs. 10 and 11 show the actuating mechanism of the embodiment of Figs. 8 and 9 applied to a twin machine. The contact surface 24'' of the connecting link 24 is here made wide enough so that the ends 2'' of the levers of both halves of the machine can be accommodated on top of it. Apart from this, the same type of rubber-metal elements 25 as in Figs. 8 and 9 are provided with the two ends 2'' of the levers arranged between them.

In order to prevent vibrations as far as possible during the operation of the machine, all rotating parts, such as the pressure rollers, eccentrics and pulleys are as accurately balanced by recesses, drilled holes, lead insets etc. as possible, which contributes further towards noiseless running of the machine. Resiliently mounted balancing weights may also be provided in the side walls of the housing for the same purpose.

The housing of the machine can be split longitudinally in two halves which are screwed together. The housing is best closed at the front by a separate cover 26 which forms, together with the housing or with the halves of the housing, a bearing for the support of the reciprocating machine ram. This would simplify considerably the assembly of the various parts of the machine; in some cases their assembly would not be possible without such an arrangement at all.

In contrast to the imbodiments of the invention shown in the drawings, the motor drive of the machine could also actuate the lower tools; in that case, a twin machine might be so arranged that on one side the upper tool and on the other side the lower tool is driven by the motor.

The housing 1 is supported by a rigid pedestal 27. On the other hand, the housing might also be supported in a movable frame suitable for different working positions.

These machine elements used for the transmission of power in the machines described above may have to transmit forces amounting to several tons and by abandoning the former practice of supporting them in fixed pivots it becomes possible to make the transmission of power so flexible that the sudden impact loads to which they had formerly been subjected are eliminated, so that much steadier and quieter running will be achieved as a consequence.

What I claim is:

1. A machine for forming and pressing sheet metal and profiles comprising a casing, a stationary press tool secured in the casing, a press tool in the form of a ram mounted in the casing to be movable therein to cooperate with and movable toward the stationary press tool with short strokes, a motor driven wheel mounted in the casing, a double ended lever mounted to float in the casing having one end in contact with the movable press tool, a wheel mounted on the other end of the lever with the lever mounted eccentrically relative to the center axis of the last-mentioned wheel, a fulcrum support in the casing in contact with the lever and which is in the form of a pressure pad, and means in the casing in contact with the last-mentioned wheel so that when the motor driven wheel rotates the last-mentioned wheel, the latter will oscillate the lever due to the eccentric connection and thereby transmit intermittent power forces to the movable press tool with the means maintaining the two wheels in contact with each other.

2. A machine according to claim 1, in which the means is in the form of a roller arch in contact with the first-mentioned wheel to maintain the wheels in contact with each other.

3. A machine according to claim 1, in which rubber elements are provided on each side of the lever approximately intermediate the ends and supported by the casing.

4. A machine according to claim 1, in which rubber elements are provided on each side of the lever approximately intermediate the ends and supported by the casing with each rubber element composed of pre-compressed rubber and with a metal plate on the casing and lever with the rubber element in between.

5. A machine for forming and pressing sheet metal and profiles comprising a casing, a stationary press tool secured in the casing, a press tool in the form of a ram mounted in the casing to be movable therein to cooperate with and movable toward the stationary press tool with short strokes, a motor driven wheel mounted in the casing, a double ended lever mounted to float in the casing having one end in contact with the movable press tool, a wheel mounted on the other end of the lever with the lever mounted eccentrically relative to the center axis of the last-mentioned wheel, a fulcrum support in the casing in contact with the lever and which is in the form of a pressure pad, and means in the casing to maintain the wheels in contact with each other, said means being in the form of an arched member with at least two rollers bearing on the last-mentioned wheel.

6. A machine according to claim 1, in which a flat plate is provided secured in the movable press tool to contact the end of the lever in contact with the movable tool.

7. A machine according to claim 1, in which a flat plate is provided secured in the movable press tool to contact the end of the lever in contact with the movable tool, the flat plate being supported by and bonded to a rubber cushion, the said rubber cushion being bonded to the ram of the movable tool.

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