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 [33] **Germany**
 [31] **P1,627,299**

[56]

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[54] **NIBBLING MACHINE CONTROL DEVICE**
4 Claims, 6 Drawing Figs.

[52] **U.S. Cl.**..... **83/237,**
83/241, 83/277, 83/916, 355/205
 [51] **Int. Cl.**..... **B23d 27/00,**
B26d 5/20
 [50] **Field of Search**..... **83/916,**
241, 246, 237, 225, 230; 335/205, 206; 200/38D,
38D-1

ABSTRACT: A control device for a nibbling machine is formed of an eccentric shaft, means mounted on and rotatable with the shaft for opening and closing a switch, and a switch member spaced radially outward from the shaft. Either the means for opening and closing the switch or the components of the switch may be variably spaced apart for achieving adjustable control of the device.

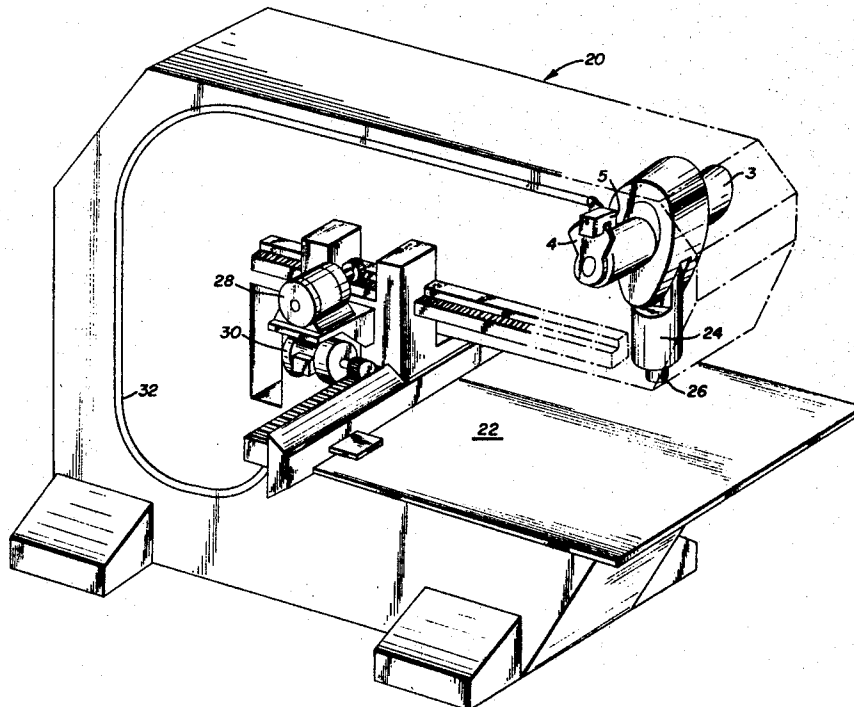


Fig. 1

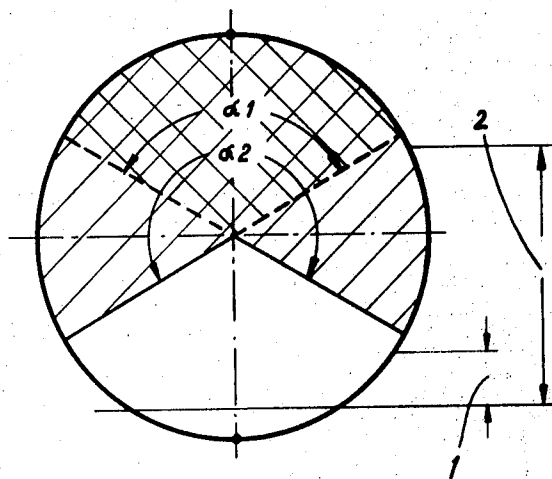
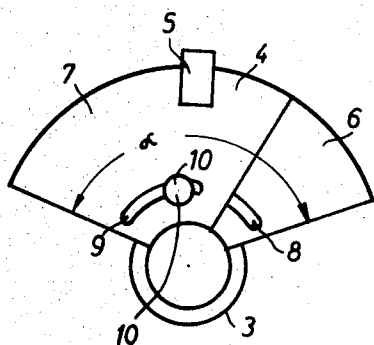
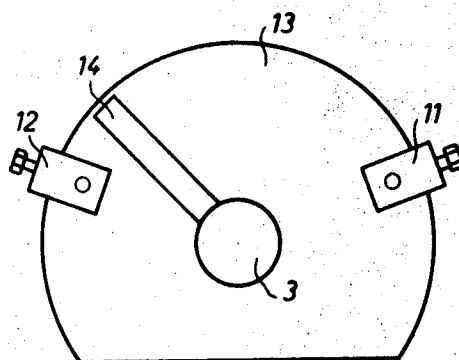


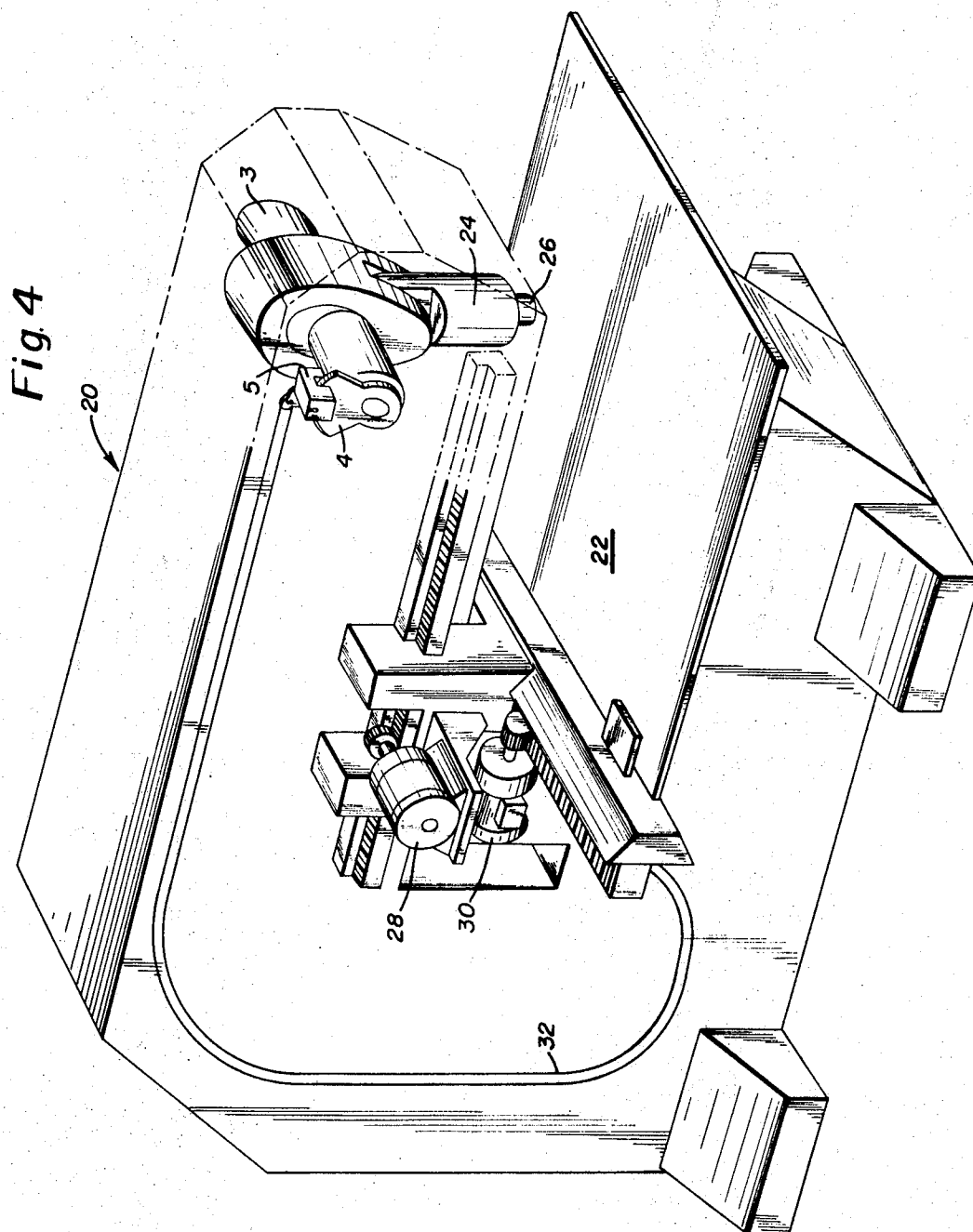
Fig. 2

Fig. 3



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Fig. 5

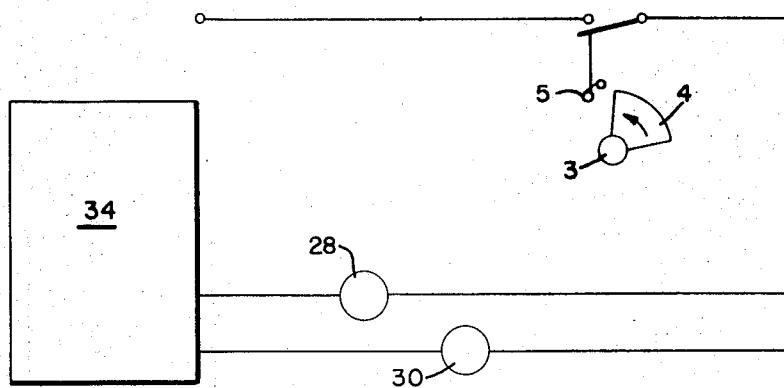
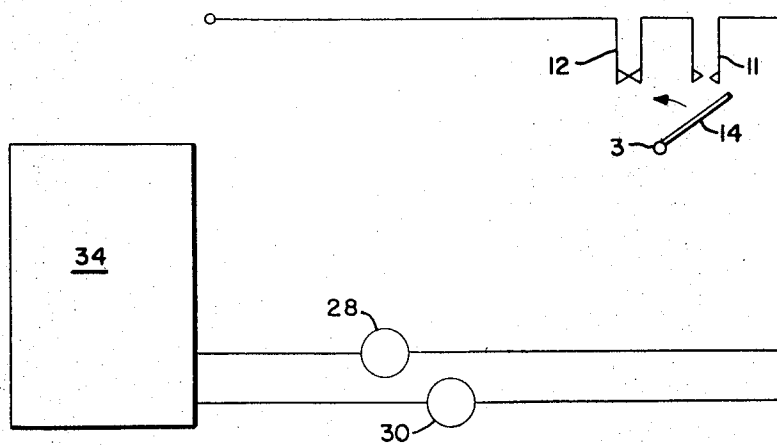


Fig. 6



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NIBBLING MACHINE CONTROL DEVICE

SUMMARY OF THE INVENTION

The present invention is directed to a nibbling machine having a tool moved by an eccentric shaft and, more particularly, it is directed to a control device for feeding a workpiece to the tool. Nibbling machines work with intermittent feed of the workpiece. The movement of the workpiece can only be accomplished when the tool has released the workpiece during its upward stroke. In one machine of this type presently in use, the feed of the manually guided workpiece is limited by the design of the tool itself. In nibbling machines which employ automatic feed, the tool is generally incapable of absorbing the expended feeding power and as a result there is the risk that the upper die of the tool will strike against the lower die.

In well-known types of presses, the carriage for performing the feed of the workpiece is driven hydraulically. In such an arrangement, control of the feed is carried out by a valve arranged in the hydraulic line which operates in dependence on the tool stroke, the valve being closed or opened by a switch actuated by the drive shaft of the press. In power presses or in stamping machines, however, the individual working strokes of the machine tool are performed in relatively long intervals, even during rapid operation, since each tool stroke represents a complete operation. In contradistinction, in nibbling machines the cutting out of the desired contour comprises a great number of individual tool strokes. As a result, the problem of controlling feed of the workpiece in nibbling machines is significantly different from other machine tools because a substantially higher frequency is required in controlling the feed of the workpiece.

Another important difference between nibbling machines and other machine tools is that nibbling machines are controlled simultaneously by two feed carriages while in presses only the driving gear is controlled. Accordingly, the features of known presses cannot be applied to the means employed for feeding the workpiece in nibbling machines. It is not possible to achieve the precision required for feeding workpieces in nibbling machines by initiating the control operation from the drive shaft. The use of the drive shaft is inadequate because there are too many intermediate members involved and the play between these members makes precision operation difficult to attain. Control by hydraulic means is unsuitable in nibbling machines because it is too slow and results in disadvantageous shock pressure, vibrations and the like.

Accordingly, it is the primary object of the present invention to accomplish control of the feeding of the workpiece in a nibbling machine by means of an electrical switch arrangement actuated by the eccentric shaft in the machine.

Another object of the machine is to provide a switch arrangement which is adjustable to accommodate the various plate thicknesses used and other conditions which are experienced in the nibbling operation.

Still another object of the invention is to provide a switching arrangement which is simple in arrangement, efficient in operation and capable of continuous operation without undue wear.

Therefore, in the invention the feed control of the workpiece in a nibbling machine is accomplished by means of an electrical switching device which consists of a switch member and an actuator or contact member mounted on the eccentric shaft or on a part directly connected to it for closing and opening the switch member. By connecting one of the switch components directly to the eccentric shaft, definite switching positions can be established and a high degree of accuracy achieved in the control of the feeding operation. By employing an electrical switch device, it is possible to obtain substantially higher frequencies which correspond to the frequencies of operation of the nibbling machine. When a switch contact is mounted on the eccentric shaft and rotates with it, considerable advantage is gained since the entire period during which the tool is disengaged from the workpiece can be utilized in the operation of feeding the workpiece. Preferably, the con-

tact or transmitter for closing and opening the switch is secured to the eccentric shaft so that the operation of the workpiece feeding mechanism can be conducted directly from the switch. Since there is always a certain delay involved in such operations, due to the inertia of the control and the driving system of the entire machine, the contacts may be suitably positioned on the eccentric shaft to compensate for such delays.

In nibbling machines, the basic arrangement of the switch device is dependent on certain of the machine data, that is, for example, the response times of the valves, and since this data will vary during a prolonged operating period, it is possible to effect a readjustment. In the arrangement of the switch device a single large sector-shaped contact may be used or a narrow switch member may be employed in combination with separate circuit closing and breaking members.

Since the time period available for feeding the workpiece differs when thick or thin plates are being shaped in a nibbling machine, the angular spacing of the switch components or the angular width of the switch contacts may be adjustable to accommodate the thickness of the plate.

A particularly simple and effective embodiment of the invention is obtained by employing a magnetic switch and using an iron vane as the switch contact which passes through the gap in the switch without contacting it for effecting the closing of the switch and subsequently breaking the contact.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention; its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a circular diagram of the tool stroke in a nibbling machine;

FIG. 2 is a front view of a somewhat schematic illustration of an eccentric shaft in a nibbling machine with an electrical switch arrangement embodying the present invention;

FIG. 3 is a view of a schematic arrangement displaying another embodiment similar to that shown in FIG. 2;

FIG. 4 is a perspective view of a nibbling machine embodying the present invention;

FIG. 5 is a schematic showing of a circuit including the switch arrangement of FIG. 2 for operating the feed means of the nibbling machine displayed in FIG. 4; and

FIG. 6 is another schematic showing for a circuit including the switch arrangement of FIG. 3 for operating the feed means of a nibbling machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, the thickness of a thin plate 1 and a thick plate 2 is shown. In the circular diagram the angle α_1 indicates that portion in one complete cycle of operation of the nibbling machine during which the tool is displaced or released from the thickness of the thick plate 2 and α_2 represents a similar angle for the thin plate 1.

The crank angles α_1 are therefore proportional to the time that is available to feed the workpiece. To attain optimum use of the machine, it will be appreciated that a greater number of strokes must be performed for the thin plates in order to attain the maximum operating speeds.

In FIG. 2 an eccentric shaft 3 is shown in combination with an electrical switch mechanism. The switch mechanism is comprised of a circular sector-shaped switch component 4 mounted on the eccentric shaft 3 and extending radially outward from it and a magnetic switch 5 located at a fixed point on the machine shown in FIG. 4. The switch component 4

passes through a gap in the magnetic switch effecting closing of the circuit, see FIG. 5, without making contact with the switch. As the eccentric shaft is rotated, the switch 5 remains closed during the period in which the sector-shaped switch component 4 passes through the switch 5, and the switch is opened as soon as the switch component 4 completes its passage through the switch 5. During the period in which the switch is closed, the feeding of the workpiece takes place, FIG. 4, a nibbling machine 20 is shown incorporating the eccentric shaft 3, the sector-shaped switch component 4 and the magnetic switch 5. A workpiece of sheet material is located in the machine below a ramming tool 24 having a cutting head 26 at its end. The workpiece is positioned below the cutting head by a longitudinal feed means including a motor 28 and a transverse feed means including a motor 30. A cable 32 interconnects the magnetic switch 5 and the feed motors.

In FIG. 5, the schematic arrangement of the circuit including the switch mechanism in FIG. 2 is shown which comprises the eccentric shaft 3, the switch component 4, the magnetic switch 5, the feed motors 28 and 30, and a control cabinet 34. As the switch component 4 rotates with the eccentric shaft 3 and passes through the magnetic switch 5, the feed motors 28 and 30 are actuated for feeding the workpiece and when the switch component completes its passage through the magnetic switch, the feed motors are stopped.

To accommodate different thicknesses of plates in the nibbling machine, the angular width at the outer periphery of the switch component 4 is adjustable for effectively varying the period during which the switch 5 is closed. For this purpose, the switch component 4 is formed of two separate sector plates 6 and 7 each having a curved slot capable of being adjustably aligned one with the other and a locking screw 10 is inserted through the slots. After the individual sector plates 6 and 7 are positioned relative to one another, the locking screw can be tightened and the plates fastened together.

In FIG. 3 another embodiment of the switch mechanism is disclosed wherein the adjustability is provided by varying the angular spacing of the components of the switch and using a single narrow switch contact member. In this arrangement, a circuit closer 11 and a circuit breaker 12 are secured on a machine support member 13 located radially outwardly from the eccentric shaft 3. The contact component for the switch is formed by a narrow iron vane 14 which extends radially outwardly from and rotates with the eccentric shaft. As can be noted, set screws or similar devices are provided on the circuit closer 11 and the circuit breaker 12 so that they may be adjustably attached at different positions on the periphery of the support member 13. By varying the angular spacing of these two circuit components, different thicknesses of plates can be accommodated in the control device.

In FIG. 6 a schematic arrangement of the circuit including the switching mechanism of FIG. 3 is set forth, which comprises the eccentric shaft 3, the circuit closer 11, the circuit breaker 12, the vane 14, the feed motors 28 and 30, and a control cabinet 34. As the vane 14 rotates with the eccentric shaft, it first contacts the circuit closer 11 actuating the feed

motors 28 and 30 which position the workpiece and then, as it continues in its path of travel, it contacts the circuit breaker 12 and the feed motors are stopped.

I claim:

1. A nibbling machine including an eccentric shaft rotatably mounted in the machine, a cutting tool operatively secured to said shaft, and feed means for positioning a workpiece in relation to said cutting tool, wherein the movement comprises an electrical circuit operatively connected to said feed means, a switch located in said circuit for starting and stopping said feed means, switch closing and opening means is secured to said shaft and extends outwardly therefrom and is rotatable therewith, said switch closing and opening means arranged in operative communication with a said switch, said switch is located in the path of travel of said switch closing and opening means as it rotates with said shaft so that in each rotational cycle of said shaft said switch is first closed by said switch closing and opening means as it moves along its path of travel for actuating said feed means and then said switch closing and opening means opens said switch for stopping said feed means.

2. A nibbling machine as set forth in claim 1, wherein said switch closing and opening means are adjustable for varying the period during the rotational cycle of said shaft during which said switch means are closed.

3. A nibbling machine, as set forth in claim 1, wherein said switch closing and opening means comprises a sector-shaped member mounted on said shaft and extending radially outwardly therefrom for effecting the closing and opening of said switch, said sector-shaped member comprises at least a pair of sector-shaped plates each mounted on said shaft and at least one of said plates movably positionable about said shaft relative to the other for varying the angular extent of said sector member in closing and opening relationship with said switch, means for locking said plates together comprising a similarly shaped curved slot formed in each of said plates, said slots arranged to extend in the direction of rotation of said shaft and disposed in curved alignment, and a locking member arranged to extend through said slots for fastening said sector-shaped plates together in the desired angular relationship, and said switch means comprises a magnetic switch with said sector-shaped member arranged to pass in noncontacting relationship with said magnetic switch whereby said magnetic switch is maintained in the closed position during the passage of said sector-shaped member in operative and noncontacting relationship with said switch means.

4. A nibbling machine, as set forth in claim 1, wherein said switch comprises a support member positioned in the nibbling machine spaced radially outwardly and extending about at least a portion of the circumferential periphery of said shaft, an adjustably positionable circuit closing element and an adjustably positionable breaking element mounted on said support member in angularly spaced relationship relative to said shaft and spaced radially outwardly from said shaft, and said switch closing and opening means comprising a vane secured to said shaft and extending radially outwardly therefrom for actuating said circuit closing element and said circuit opening element as it is rotated past these elements by said shaft.