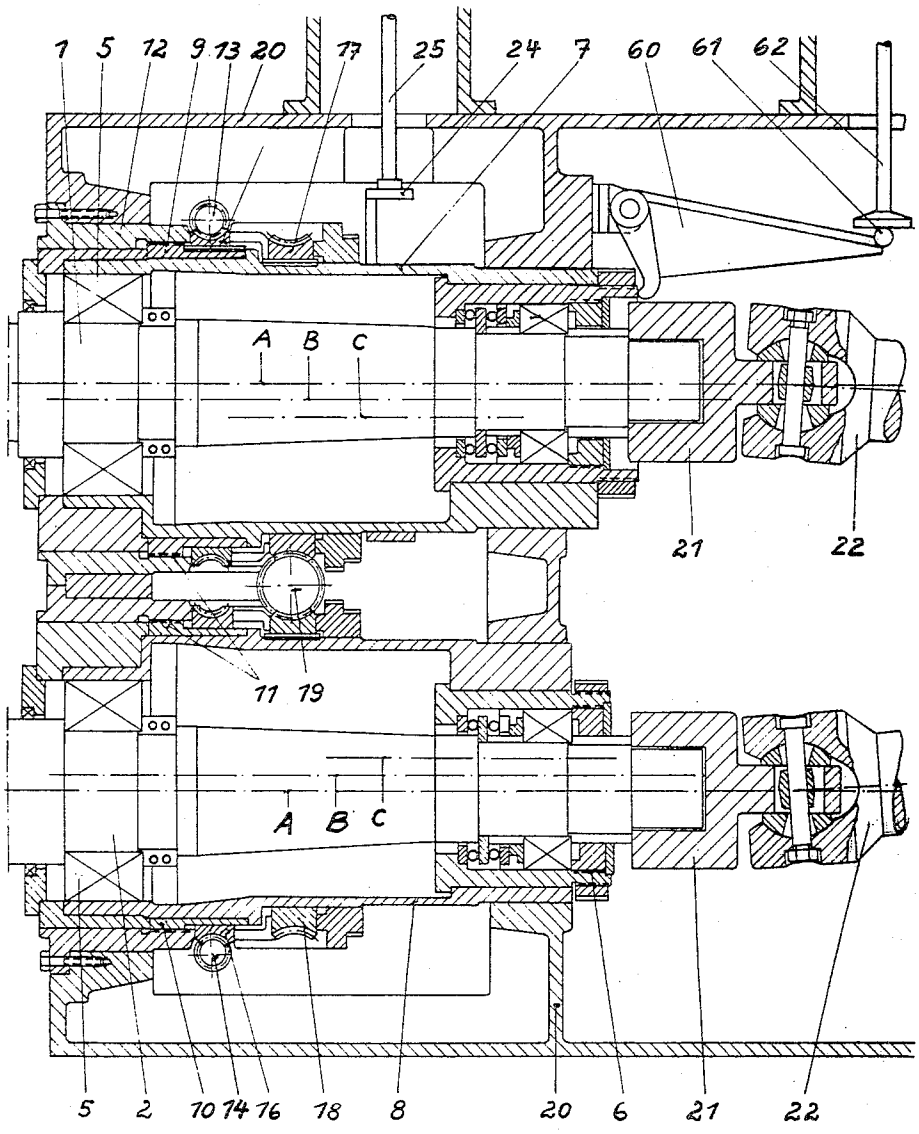
Jan. 23, 1968 H. SENFTLEBEN 3,364,803

MEANS FOR ADJUSTING THE CIRCULAR BLADES OF EDGE-TRIMMING SHEARS

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Fig. 1



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MEANS FOR ADJUSTING THE CIRCULAR BLADES OF EDGE-TRIMMING SHEARS

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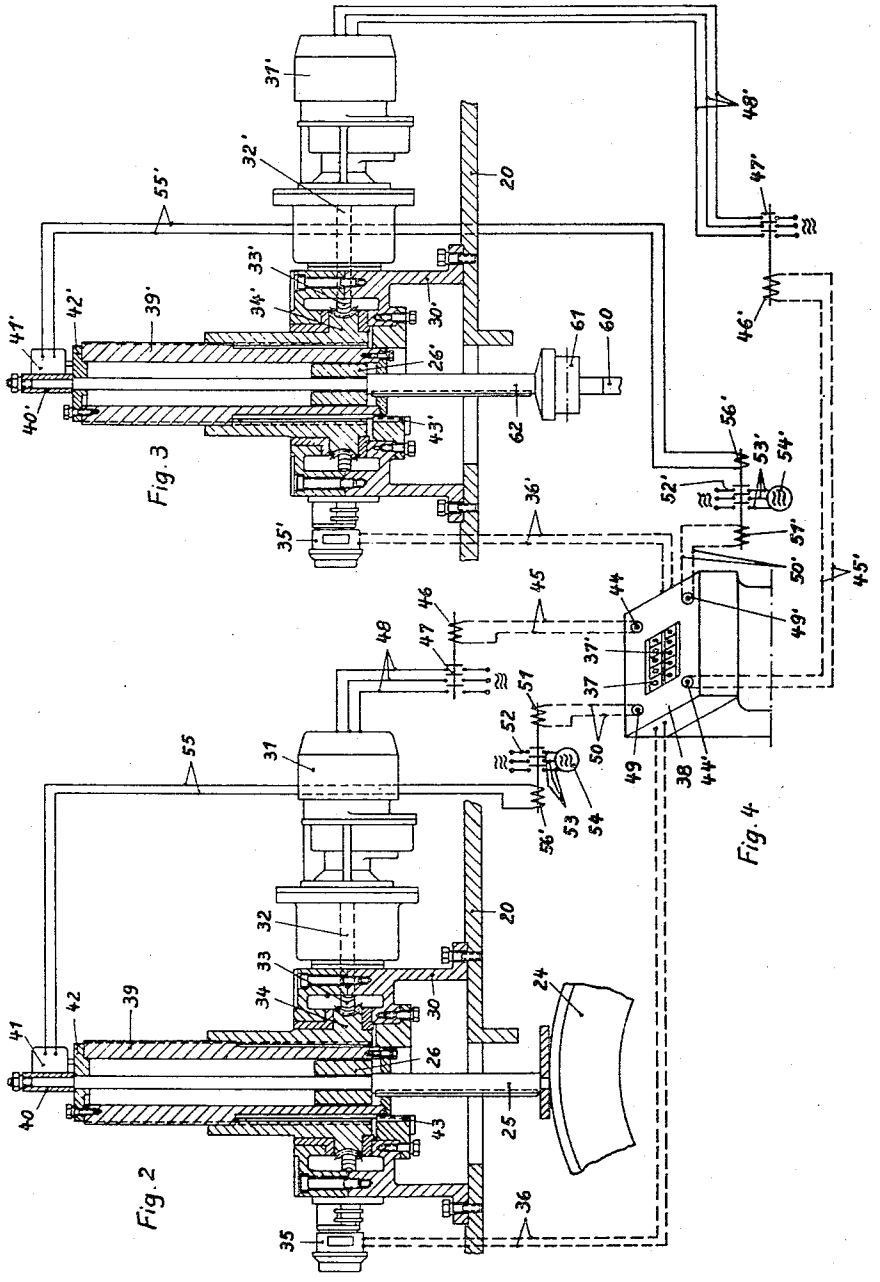


Fig. 3

Fig. 4

Fig. 2

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MEANS FOR ADJUSTING THE CIRCULAR BLADES OF EDGE-TRIMMING SHEARS

Henry Senftleben, Lintorf, Germany, assignor to Schloemann Aktiengesellschaft, Dusseldorf, Germany, a corporation of Germany

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This invention relates to means for adjusting the circular blades of trimming shears in axial and vertical directions. Such an adjusting means serves the purpose of changing the positions of the blades relative to one another, so as to adapt their positions to the particular thickness of sheet metal to be trimmed.

In a known circular-blade border-trimming machine the adjusting of the blades in a vertical direction is effected in such a way that the blade shafts are journalled in eccentric bushes, and the distance between the blade shafts is adjusted by rotating the eccentric bushes, by means of an adjusting motor for example, through a worm gear.

For the adjusting of the circular blades in an axial direction the eccentric bushes are rotatably but slidably accommodated in screw-threaded bushes, so that they are axially movable by rotating the threaded bushes in the bearing brasses by means of a motor, through a worm.

The invention is based upon the problem of obtaining, by an early and quick actuation of the adjusting means, a sharp displacement, and with it an economical utilization of the circular-bladed shearing machine. According to the invention, therefore, it is proposed that both the vertical and the axial adjustments of the blade shafts can be pre-selected by displacing, in each case an abutment moved by an auxiliary motor through the medium of a gear and a spindle, and the switching off of the particular adjusting motor is effected by means of a limit switch which is moved against the abutment, and is carried by a feeler which scans the change of position.

As a further feature, the vertically arranged spindle is constructed as a hollow spindle accommodating the freely movable feeler, and is guided in a screw-threaded bush provided with a worm wheel, the worm wheel being driven by way of a worm from an auxiliary motor. The feeler of the pre-selecting means for the vertical movement of the blade shafts bears upon the periphery of an eccentric sheave, the eccentricity of which is n times as great as the eccentricity of the eccentric bushes of the shafts of the circular blades.

In a further development of the invention, the feeler of the pre-selecting means for the axial movement of the blade shaft bears upon the longer arm of a lever, the shorter arm of which scans the horizontal position of the eccentric bush.

Furthermore it is advantageous to couple the auxiliary motor of each adjusting equipment with an impulse-emitter, which actuates a remote indicating device, for instance an electrical counting mechanism, the impulse-emitter generating a predetermined number of impulses per revolution of the auxiliary motor, and thus corresponding to the displacement of the abutment.

With the apparatus according to the invention, both the axial and the vertical adjustment of the blade shaft can be verified, and can be pre-selected and re-adjusted according to the thickness of the sheet to be cut. The employment of auxiliary motors for the pre-selection of the horizontal and vertical positioning of the blades permits a fluid working of the circular-bladed trimming shears, even with a changing program of work. The remote indication by means of the electrical counting mechanism facilitates the operation of the plant for the man in control, the accuracy of adjustment being improved by the transmission ratio of the adjusting stroke.

The invention will now be further explained with reference to the accompanying drawing, in which:

FIGURE 1 shows a side view of a circular-bladed border-trimming shearing machine in section;

FIGURES 2 and 3 each show a section through a pre-selecting means for the vertical and horizontal blade positions; and

FIGURE 4 shows in perspective a common control disk.

In FIGURE 1 the shafts of the upper and lower circular blades are denoted by 1 and 2 respectively. Upon these shafts are arranged the circular blades, not shown in the drawing. By way of front roller bearings 5 and rear roller bearings 6, the blade shafts 1 and 2 are supported in eccentric bushes 7 and 8 extending through them. The adjusting of the blade shafts 1 and 2 in an axial direction is effected by means of screw-threaded bushes 9 and 10, which are rotatably connected with the continuous bushes 7 and 8, but are so connected with them as to be undisplaceable in an axial direction, and are supported by screw threads 11 in relation to the bearing brasses 12 of the bushes 7 and 8. The threaded bushes 9 and 10 are moved by means of worm shafts 13 and 14.

The existing position of the upper blade shaft 1 is scanned by the shorter arm of a feeler lever 60, rockably mounted on the shaft casing and constructed as a bell-crank lever, upon the longer arm of which, provided with a ball-shaped end, stands the shoe of a vertically arranged feeler 62.

The feeler lever 60 may however alternatively be supported lower down on the stand, and may then scan the position of the lower blade shaft 2.

The changes in the vertical distance of the blade shafts 1 and 2 from one another are obtained by rotating the eccentric bushes 7 and 8, which can be moved by means of a worm shaft 19, acting on worm wheels 17 and 18.

The eccentric bushes 7 and 8 are supported in an upstanding frame 20. The blade shafts 1 and 2 are driven by coupling means 21 and jointed spindles 22. The center lines of the blade shafts 1 and 2 are marked A and C respectively whilst the center lines of the bores in the standards, in which the eccentric bushes 7 and 8 respectively are journalled, are marked B. In the position of the eccentric bushes 7 and 8 illustrated, the center lines of the blade shafts 1 and 2 are located upon the center lines A, but upon rotation of the blade shafts 1 and 2 through 180°, they are located upon the center lines C.

Upon the eccentric bush 7 is mounted an eccentric sheave or disc 24, the eccentricity of which is n times as great as the eccentricity of the eccentric bush 7. On the periphery of the eccentric sheave 24 bears the shoe of a feeler 25, which transmits the adjustment of the stroke of the blade shafts 1 and 2, which is accomplished upon a circular path with the radius of the eccentricity, into a vertical lifting motion.

Upon the standard frame 20 are arranged side by side two similar and equal appliances, illustrated in section in FIGURES 2 and 3, for the pre-selection of the axial adjusting of the upper blade shaft 1 and for the pre-selecting of the radial adjusting of the blade shafts 1 and 2, the corresponding individual parts of which are provided with the same references, which, in the case of the pre-selecting appliance for the axial adjusting of the upper blade shaft have been supplemented by a prime mark.

These appliances each consist of a casing 30 or 30', which is secured upon the standard frame 20, and on which an auxiliary motor 31 or 31' is arranged, upon the shaft 32 or 32' of which, shown dotted, is mounted a worm 33 or 33', which meshes with a worm wheel 34 or 34'. At its free end there is located upon the shaft 32 or

32' an impulse-emitter 35 or 35', for instance a roll limit switch, which is connected, by way of a conductor 36 or 36', with an electrical remote indicator 37 or 37', for instance a counting mechanism, in the switch desk 38 illustrated in FIGURE 4. The worm wheel 34 or 34' is constructed axially in one direction as a screw-threaded bush, in which a hollow spindle 39 or 39' is movable in a vertical direction, and is secured against rotation by means of a jib-headed key 43 or 43'. In the hollow spindle 39 or 39', the feeler 25 or 62 is so guided as to be freely movable in a vertical direction, and is supported, with corresponding adjustment of the auxiliary motor 31 and of the eccentric sheave 24, or of the auxiliary motor 31' and of the feeler lever 60, by way of a sleeve 40 or 40' with a limit switch 41 or 41', upon an abutment 42 or 42' on the top of the hollow spindle 39 or 39'.

From the switch desk 38, by means of a switch 44 or 44' and conductors 45 or 45', a relay switch 46 or 46' is actuated, which, by means of a switch 47 or 47', connects the auxiliary motor 31 or 31', by way of conductors 48 or 48', with the means. A further switch 49 or 49', by way of conductors 50 or 50', actuates a relay switch 51 or 51', and the latter actuates a switch 52 or 52', which switches conductors 53 or 53' of a driving motor 54 or 54' for the worm shaft 19 or 13, and thus effects the radial or axial adjustment of the blade shaft 1 or 2. The limit switch 41 or 41' is connected by conductors 55 or 55' with a further relay switch 56 or 56', which likewise actuates the switch 52 or 52'.

The method of working of the appliances is as follows: If the circular blades, not shown, upon the blade shafts 1 and 2, are to be radially and axially adjusted to the sheet thickness of the next metal sheet to be trimmed, then, by way of the switch 44 or 44' for forward and reverse running of the auxiliary motor 31 or 31', the latter is switched on, in the desired direction of rotation, by way of the conductors 45 or 45', the relay switch 46, 47 or 46', 47', and the conductors 48 or 48'. By way of the shaft 32 or 32', the worm 33 or 33', and therefore, by way of the worm wheel 34 or 34', the hollow spindle 39 or 39' is shifted upwards or downwards, according to the direction of rotation of the auxiliary motor. Upon the rotation of the shaft 32 or 32', the impulse-emitter 35 or 35', in this case the roll limit switch, is at the same time also moved. The latter, during the rotation of the shaft 32 or 32', closes and opens contacts of a circuit, whereby, during one revolution, a definite number of impulses are supplied by way of the conductors 36 or 36' to the remote indicating device 37 or 37', which records them by means of a counting device, and indicates them at every moment. On the other hand, one revolution of the shaft 32 also corresponds to a definite adjustment of the hollow spindle 39 or 39'. By allotting a given number of impulses to a definite adjustment travel of the hollow spindle 39 or 39', in one revolution of the shaft 32 or 32', the particular adjustment travel can be read off from the remote indicator 37 or 37', and this indicates the stroke or lift of the blade shafts 1 and 2, or the horizontal position of the upper blade shaft 1 in relation to the blade shaft 2 adjusted to a mark, and therefore directly indicates the blade gap. When the desired value for the position of the blade shafts 1 and 2 for the next cut is reached, the auxiliary motor 31 or 31' is stopped by means of the switch 44 or 44', by way of the relay switch 46, 47 or 46', 47'. As soon as the sheet just to be trimmed has run out, the relay switch 51, 52 or 51', 52' is actuated by means of the switch 49 or 49', and the driving motor 54, rotating the worm shaft 19 or 13, and with it the eccentric bushes 7 and 8, or the driving motor 54' axially displacing the upper eccentric bush 7, is switched on. The position of the blade shafts 1 and 2, and of the circular blades arranged thereon, relative to one another, is therefore changed, in a vertical and a horizontal direction respectively. The movement of the blade shaft 1 is followed by the eccentric sheave 24 or by

the feeler lever 60, until the eccentric sheave engages beneath the shoe of the feeler 25, or the feeler lever 60, bearing with one arm against the eccentric bush 7, engages with its ball-like end 61 beneath the feeler 62. The driving motor 54 or 54' is then stopped, by way of the limit switch 41 or 41', the conductors 55 or 55' and the relay 56 or 56'. The blade shafts 1 and 2 thus stand in the desired positions relative to one another.

If, when the desired new value is being adjusted for the blade shafts 1 and 2, the hollow spindle 39 or 39' has been moved downwards, the feeler 25 or 25', owing to the position of the eccentric sheave 24 or of the feeler lever 60, will still have remained in its position. As soon as the eccentric sleeve 7, and with it the eccentric sheave 24 or the feeler lever 60, is now moved, the feeler 25 or 62 descends, under its own weight and that of the weight 26 or 26', the shoe of the feeler 25 continuously bearing on the periphery of the eccentric sheave, or the shoe of the feeler 62 continuously bearing on the arm of the feeler lever 60. When the adjustment, given by the desired value, of the hollow spindle 39 with its abutment 42, or of the hollow spindle 39' with its abutment 42', is reached, the relay 56 or 56' is again actuated by the limit switch 41 or 41' by way of the conductors 55 or 55', and the driving motor 54 or 54' is stopped. The blade shafts 1 and 2 likewise stand in the desired relative positions.

I claim:

1. Means for adjusting the blades of a border-trimming shearing machine having a standard, two blade shaft journaled in the standard, and two circular blades, one on each shaft, comprising: first and second eccentric bushes, each of the blade shafts being journaled in one of these bushes; screw-threaded bushes accommodating the said eccentric bushes, a first adjusting motor for relatively rotating the eccentric bushes, and thereby adjusting the distance between the blade shafts, a second adjusting motor for turning the screw-threaded bushes and thereby adjusting the blades horizontally, a first abutment, a first auxiliary motor for moving the said first abutment, a second abutment, a second auxiliary motor for moving the said second abutment, two longitudinally movable spindles, each interposed between one of the said abutments and its associated adjusting motor, a first feeler scanning the changes in the distance between the blade shafts; a second feeler scanning the horizontal adjustment of the blades, and two limit switches, each carried by one of the said feelers, each of the limit switches being adapted to switch off its associated auxiliary motor when its associated spindle comes into contact with its associated abutment.

2. Means for adjusting the blades of a shearing machine as claimed in claim 1, the said longitudinally movable spindles being vertically arranged hollow screw-threaded spindles, the feelers extending through and being freely movable in the said spindles, and the blade-adjusting means further comprising: third and fourth screw-threaded bushes meshing with the said spindles, external worm teeth on these screw-threaded bushes, and worm shafts driven by the auxiliary motors and meshing with the said worm teeth.

3. Means for adjusting the blades of a shearing machine as claimed in claim 1, further comprising: an eccentric disc, the eccentricity of which is n times as great as that of the first eccentric bush, the first feeler bearing upon the periphery of this eccentric disc, for pre-selecting the distance between the blade shafts.

4. Means for adjusting the blades of a shearing machine as claimed in claim 1, further comprising: a lever with unequal arms fulcrumed on the standard, the shorter arm of this lever engaging the second eccentric bush and thereby scanning its horizontal position, and the longer arm of the lever engaging the second feeler.

5. Means for adjusting the blades of a shearing machine as claimed in claim 1, further comprising: two im-

pulse-emitters, each coupled to one of the two auxiliary motors, each impulse-emitter generating a predetermined number of impulses per revolution of its associated auxiliary motor, so that the number of impulses generated corresponds to the displacement of the associated abutment, and a remote indicator such as a electrical counting mechanism, actuated by both the impulse-emitters.

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