April 9, 1968 E. SCHMIDT 3,376,672

ABRADING MACHINE WITH A PLURALITY OF ABRASIVE WHEELS

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FIG. 1

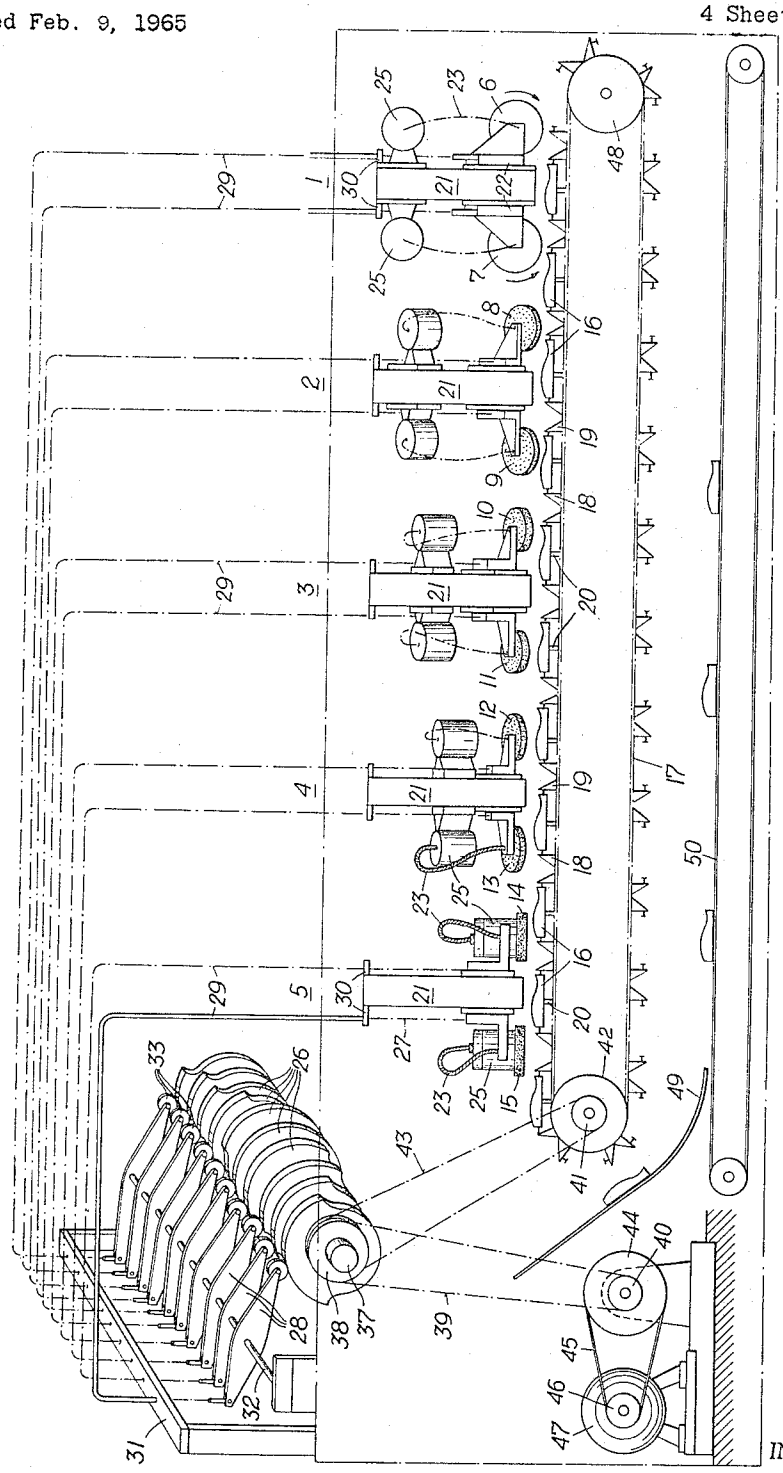

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FIG. 2

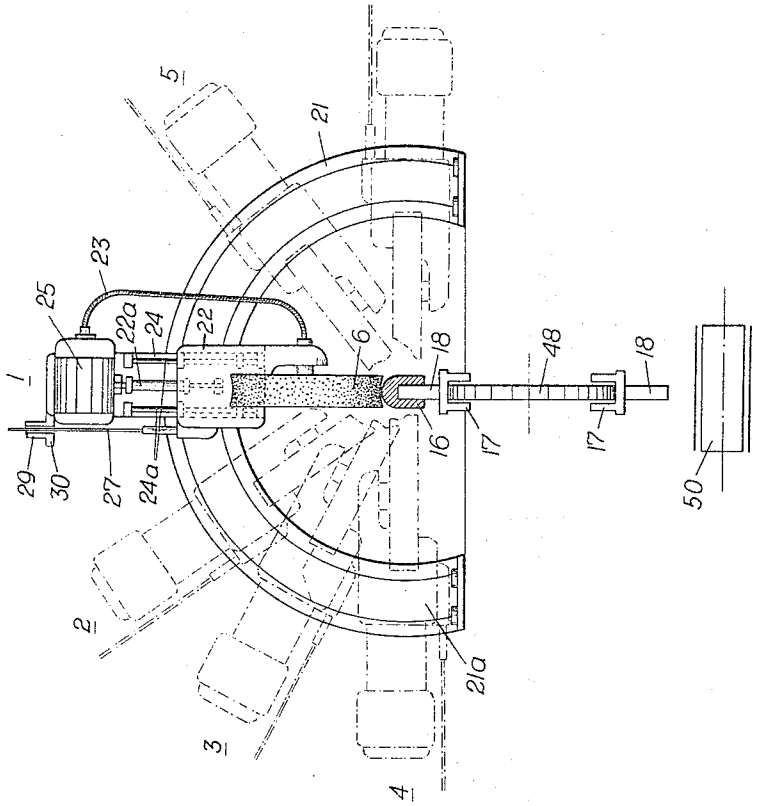

FIG. 3

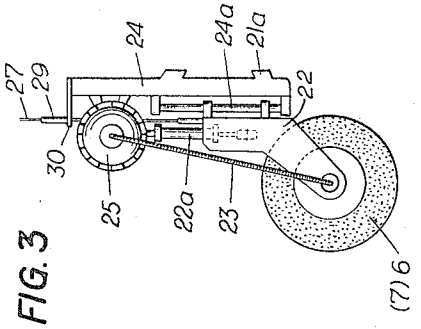

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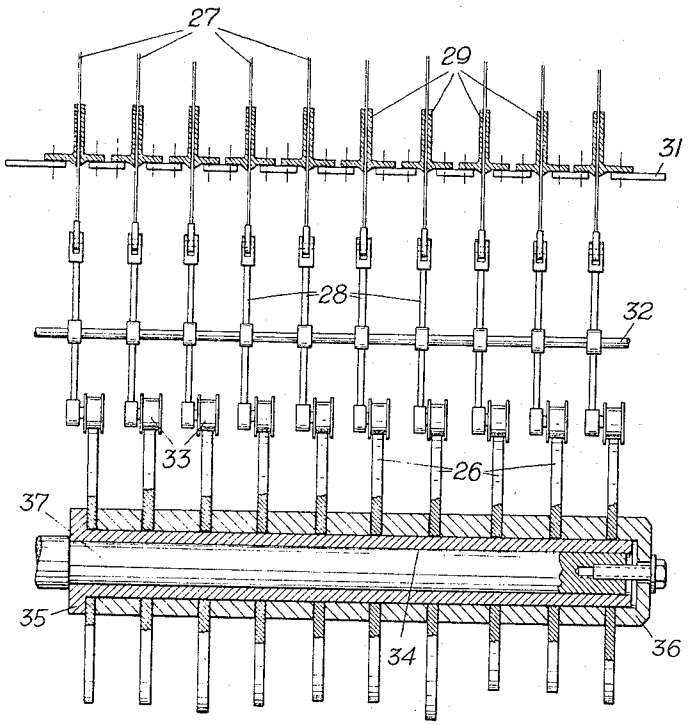
FIG. 4



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ABRADING MACHINE WITH A PLURALITY OF ABRASIVE WHEELS

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FIG. 5

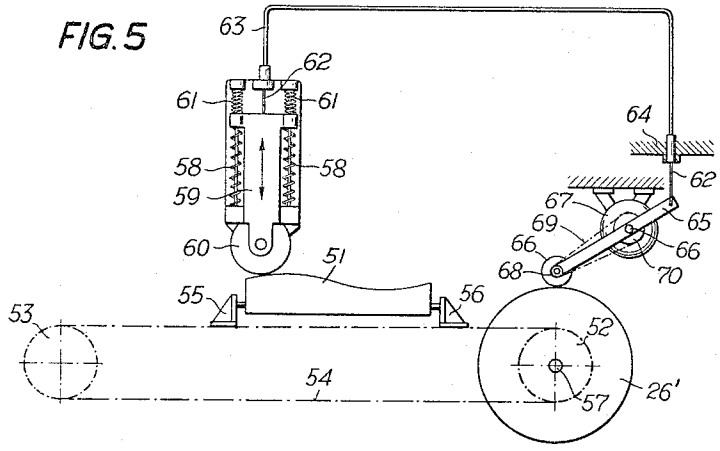


FIG. 6

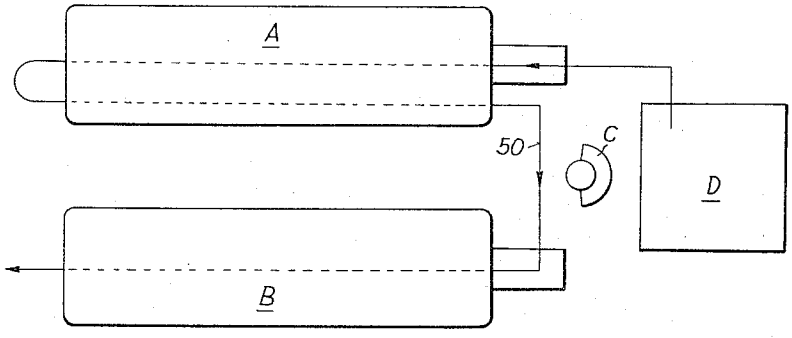
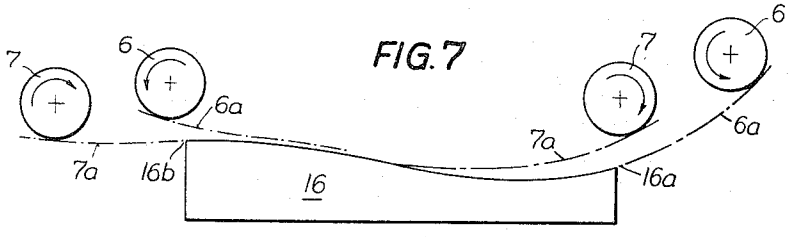


FIG. 7



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3,376,672

ABRADING MACHINE WITH A PLURALITY OF ABRASIVE WHEELS

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14 Claims. (Cl. 51—76)

ABSTRACT OF THE DISCLOSURE

Machine for the abrading of a succession of elongated workpieces displaced along a linear transport path by a conveyor belt in which pairs of abrasive wheels are spaced along this path at different angular orientations to surface predetermined linear stretches of each workpiece, the wheels of each pair being rotated in opposite senses by flexible shafts and respective motors while a cam arrangement includes cams individual to each wheel, respective cam-follower levels and Bowden lines displace the wheels in accordance with a predetermined pattern so that one wheel of each pair engages one end of the respective workpiece but is lifted before it sweeps the second end, and the second wheel engages the second end without contact with the first end to maintain the sharpness of the edges at the end faces of the workpieces.

The invention relates to a grinding machine having a plurality of abrasive wheels successively abrading a workpiece.

According to the present invention, there is provided a machine for grinding the surface of an elongate workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, means for rotating the wheels in a common plane containing the line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second grinding wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact or engage the leading edge but does contact the trailing edge during grinding of said workpiece whereby the transverse edges are maintained sharp.

Preferably the actuating means includes a cam drive arrangement for controlling movement of said wheels into and out of contact with said workpiece.

In a preferred embodiment there are a plurality of pairs of abrasive wheels, each pair being driven in identical manner and each pair being adapted to abrade a predetermined proportion only of the surface of the workpiece. Thus the pairs of wheels may be axially spaced along the line of said relative linear movement, the pairs of abrasive wheels being displaced angularly with respect to one another.

The machine may be provided with an endless belt on which the workpieces may be supported for linear movement past the pair(s) of wheels.

Preferably the arrangement is such that the pairs of grinding wheels can be adjusted to different positions around the circumference of the workpiece, and then fixed in the desired position, to the effect that in a single operation, each pair of wheels abrades a separate longitudinal

strip on the workpiece, which can have any desired transverse or longitudinal cross-section.

In order to reduce as far as possible the masses which have to be moved by the operation of the cams, each abrasive wheel is, according to the invention, slidably mounted on a supporting arm independently of the support carrying the driving motor, in such fashion that the wheel can move relatively to the surface of the workpiece. The abrasive wheel is connected to the motor in such fashion that it can move relatively to the motor and to the structure supporting the motor. Thus, for example, the abrasive wheel can be driven by a flexible shaft. This arrangement has the further advantage that the wear of the wheel is considerably reduced.

The invention is illustrated, merely by way of example, in the accompanying drawing, in which:

FIGURE 1 is a side-elevational view which shows diagrammatically the main characteristics of a machine according to the present invention,

FIGURE 2 is an end elevation of part of the machine of FIGURE 1,

FIGURE 3 is a side elevation of part of the device shown in FIGURE 2,

FIGURE 4 is a part sectional end elevation through part of the machine of FIGURE 1,

FIGURE 5 shows a machining arrangement suitable for preparing the cams used in the machine according to the present invention,

FIGURE 6 represents a system using two machines according to the present invention, and

FIGURE 7 represents the process of grinding employed in the machine according to the present invention.

Referring to the drawing, there is shown a machine comprising a number of abrading devices **1** to **5**. Each device comprises two independently controllable grinding wheels **6** and **7**, **8** and **9**, **10** and **11**, **12** and **13**, **14** and **15**, each consisting of a hub and a number of leaves of abrasive paper projecting radially and supported by bundles of bristles. The wheels may, alternatively consist of a foam-rubber wheel on which is mounted a strip of abrasive paper.

The abrading devices **1** to **5** are identical. Device **1** is shown in more detail in FIGURES 2 and 3. Device **1** comprises wheels **6** and **7** rotatably mounted on arms **22** (only wheel **6** and its corresponding arm **22** is shown in FIGURES 2 and 3). Arms **22** are slidably mounted on frame members **24** (only one shown) by guides **24***a* of which there are two for each arm **22**.

Devices **22***a* are provided for biasing the arms **22** downwardly. These operate under pneumatic pressure or are constituted by compression springs and serve to push the arms **22** with their abrasive wheels constantly against the workpieces. On each frame **24** there is fixedly mounted a drive motor **25**, which drives the respective grinding wheel through a flexible shaft **23**, which is under tension. The drive for the wheels are so arranged that the abrasive wheel **6** is driven counter clockwise (as seen in FIGS. 1 and 7), while the grinding wheel **7** is driven clockwise.

The frames **24** for wheels **6** and **7** are mounted adjustably on a supporting arm **21**. The supporting arm **21** is rather more than semi-circular (FIG. 2) and is aligned and generally coaxial with a conveyor **17** for the workpieces to be described hereinafter. On each side of the supporting arm **21** there is a dove-tail guide **21***a* so arranged that the frames **24** can be adjusted to any position around the supporting arm **21**, and can then be fixed in place by means of clamps of known kind, or eccentric levers, which are mounted pivotably in the frames **24** and clamp tight against the surface of the supporting arm **21**. Thus arm **21** supports two frames **24**, one on each side.

FIGURE 2 shows how the grinding devices **1** to **5** are

in different angular positions, i.e. angularly offset relative to the circumference of a workpiece **16**, so that each pair of abrasive wheels **6** and **7**, **8** and **9**, **10** and **11**, **12** and **13** and **14** and **15** abrades its own longitudinal strip on the workpiece **16**. Thus the device **1** is vertical, device **2** is inclined to the vertical at an angle of 15°, device **3** is at an angle of 45°, the device **4** is at an angle of 90° and the device **5** is at an angle of 65° on the other side of the vertical, each abrading assembly being offset relative to the others around the circular supporting arms **21** which are spaced axially along the line of movement taken by workpieces **16**.

As shown, the grinding devices **1** to **5** grind substantially one half of the circumferential surface of the workpiece. However, the number of grinding devices can, of course, be as great as desired, whereby they can grind most of the circumferential surface of the workpiece or even the entire surface.

Each of the two wheels of each abrading device for example, of the grinding device **1**, is controlled as to its position by a cam control including a cam **26**, the cam control acting against the bias of the compression spring (or pneumatic device) **22***a*. Thus each of the arms **22**, which supports the grinding wheels **6** to **15** is connected through a Bowden drive **27** (FIGS. 1 and 4) to one end of a pivoted cam follower lever **28**. The sheath **29** of the Bowden cable is connected at one end to a reaction bush **30**, which is mounted on the motor **25**, and at the other end to a common supporting strap **31**. The pivoted cam follower levers **28** are all mounted on a common pivot axis **32**. At one end of each lever is mounted a cam follower roller **33**, which follows the edge of the respective cam **26** under the influence of the spring **22***a*. Thus each arm **22** has its own cam **26** (FIG. 1), whose shape corresponds to the surface contour of the relevant strip of the workpiece being ground by the wheel attached to the respective arm. In this way the workpiece **16** is ground by the grinding wheels in predetermined strips, the shapes of which are precisely determined by the movement of the grinding wheels relative to the workpiece.

The cams **26** are all mounted on a common cylinder **34** (FIGURE 4) and are locked in place, in the correct rotational relationship to each other, by two flanges **35**, **36**. Together, the cams are mounted as a complete assembly on a shaft **37** in such a way that it cannot rotate relative to the shaft and is also secured against axial movement. The complete set of cams, constituting a program controller, can be exchanged for a different one, as required.

On the shaft **37** there are mounted two chain-drive sprocket wheels **38**, one of which is driven by a chain **39** from a sprocket wheel **40** of a gear-drive. The other sprocket wheel drives through a second chain **43** a spur-wheel **41** of one drum **42** of the conveyor **17**. The wheel **40** is driven through a chain-drive system **44**, **45**, **46** by a drive motor **47**. In this way the spur-wheel **40** drives the cam shaft **37** and the conveyor drum **42** at constantly related speeds.

The conveyor **17** passes over drum **42** at one end and over a further drum **48** at the other end. The workpieces **16** are firmly mounted on the conveyor **17**. Each workpiece rests on a support **20** which is adjustable in height and is situated between two clamps **18**, **19**, one of which is fixed while the other is spring-biased. After the workpiece has been placed in contact with the adjustable support **20**, the clamps **18** and **19** grip the workpiece at its ends. Each workpiece is positioned with its longitudinal axis in the direction of movement of the conveyor. All the workpieces are at the same height. Each workpiece remains firmly clamped to the conveyor all through the grinding operation, and does not change its position relative to the conveyor.

From FIGURE 2 it will be seen that the grinding devices are angularly displaced relatively to each other in planes at right angles to the direction of movement of the workpieces. Thus between them the grinding wheels process the surface of the workpiece through an angle of 180°. Each pair of grinding wheels, for example, the pair of wheels **6**, **7**, processes a single longitudinal strip of the surface of the workpiece.

The manner in which each pair of abrasive wheels are controlled by cams **26**, in addition to following the desired longitudinal contour, is illustrated in FIGURE 7. As a workpiece **16** proceeds from right to left as seen in FIGURE 7, the wheels **6** and **7** revolve as shown in opposite senses. Wheel **6** is effective along the broken line **6***a*, and the grinding wheel **7** grinds along the broken line **7***a*. The grinding wheel **6** grinds the end **16***a* of the workpiece but lifts away from the surface before reaching the other end **16***b*. On the other hand the grinding wheel **7** approaches the end **16***a* but does not touch it, but does grind the other end **16***b*. Thus each grinding wheel grinds one end only of the workpiece. Relative to the movement of workpiece **16**, the operative surface of wheel **6** (i.e. the lower portion thereof which contacts the workpiece) moves against the displacement of the workpieces whereas the operative surface of wheel **7** moves with it. Wheel **6** grinds the trailing edge of the workpiece and wheel **7** grinds the leading edge thereof whereby the grinding wheels form sharp edges at each end of the workpiece.

The movement of the wheels **6** and **7** is controlled by their respective cams **26**, the relative positions of these being determined before they are clamped in place on the shaft **37**.

The cams **26** all have characteristic shapes, these being determined by the predetermined profile which it is desired to impart to the workpieces **16**. One process for making these cams is shown in FIGURE 5. The arrangement comprises a conveyor belt **54** guided over two rollers **52**, **53**. A model **51** is secured to the conveyor belt by means of two clamp pieces **55** and **56**, which hold it at its ends. A blank **26′** for the cam is mounted tight on a shaft **57** of roller **52**, in such fashion that the speed of rotation of the blank **26′** is the same as that of the drum **52**. The surface of the model **51** is followed by a copying roller **60** which is mounted on a slider **59** and pushed against this surface of the model by a spring **58**. The position of the model in the clamps **55** and **56** is such that the copying roller **60** travels along that part of the surface for which the cam **26** is intended. The slider **59** can slide up and down in guides **61**, and the model **51** can be adjusted by rotating about its longitudinal axis so as to bring the copying roller **60** to the desired strip on the surface of the model. The other end of the slider **59** is attached to a cable **62** of a Bowden drive whose flexible sheath **63** is attached at one end to the guide frame of the slider, and at its other end to a reaction bush **64**. The other end of the cable **62** is attached to a shorter arm of a double arm lever **65**, which is mounted on a shaft **66** of a drive motor **67**, but so that it can pivot freely on the shaft. At the end of the longer arm of this lever **65** is mounted a milling wheel **66**, which is driven by the motor **67** through a power train **68**, **69**, **70**. This lever **65** pushes the milling wheel **66** against the circumference of the blank **26′** according to the control provided by the copying roller **60** acting on the model **51**. The movement of the copying roller **60** along the surface of the model **51** at the same speed causes the longitudinal profile of the particular longitudinal strip of the surface of the model to be transferred precisely to the circumferential edge of the blank **26′**.

Since the control movements applied by cams **26** to each pair of grinding wheels must be different in lifting one of them from each end of the workpiece, the two cams **26** for each pair must also be differently made. To make each pair of cams, the model **51** can be provided with spacer pads to lift the copying roller from the front edge or rear edge of the model, as required. On the other hand, there can be used for this purpose two different models, one for making the cam for the first

grinding wheel and therefore having a raised portion at the rear, and the second model for the second grinding wheel and therefore having a raised portion at the front.

When the workpieces have completed their journey along the grinding line as seen in FIGURE 1, they are removed from the conveyor **17** and pass down a steep sliding surface **49** to a second simple conveyor belt **50**, which either takes them away for further processing or, for example, can convey it to a further grinding line. FIGURE 6 shows how two grinding lines A and B can be arranged next to each other and operated from a single control station C. The raw blanks are taken from a storage hopper D and attached to the conveyor for the first grinding line A. After passing along the grinding line A the workpieces are returned to the front of the system by the conveyor belt **50** and then fed to the second grinding line B by the operator. Passing along the grinding line B the workpieces are given a second surface-strip treatment, and then pass out of the system.

It will be appreciated that many variations and alterations may be effected to the described embodiments without departing from the scope of the present invention, as defined by the appended claims. Thus Bowden cables need not be used for connecting the cams **26** to the abrasive wheels, hydraulic or electrical drives may be used. The arms **21** need not be arcuate but could be of any other shape provided the grinding devices **1** to **5** can be disposed at angularly spaced locations about the conveyor **17**. The motors **25** could be mounted on the arms **22** with the grinding wheels **6** to **15** and thus a solid drive could be provided therebetween in place of the flexible drive **23**. However, the mobile mass will be correspondingly higher and this is not welcome. The workpieces need not be mounted on an endless conveyor, nor need they be clamped in the manner described above, provided they can be moved past the series of grinding wheels and held rigid relative thereto.

We claim:

1. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and said workpiece along the length thereof, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement controlling movement of said wheels into and out of contact with said workpiece, said cam-drive arrangement ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

2. A machine for abrading the surface of an elongated workpiece which is contoured in its longitudinal direction and which has sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and said workpiece along the length thereof, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement controlling movement of said wheels into and out of contact with said workpiece, said cam-drive arrangement controlling movements of said wheels corresponding to the contour required on said workpiece and ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

3. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, a frame member, a pair of arms slidably mounted on said frame member for movement at right angles to said linear movement, means rotatably mounting said first and second abrasive wheels on the respective arms, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

4. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels biased towards said workpiece, means for effecting relative linear movement between the wheels and workpiece along the length thereof, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement for controlling movement of said wheels into and out of contact with said workpiece and including a control connection between each said wheel and a respective control cam acting against the bias of said wheels in controlling the positions of said wheels, and ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

5. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels biased towards said workpiece, means for effecting relative linear movement between the wheels and said workpiece along the length thereof, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement for controlling movement of said wheels into and out of contact with said workpiece, said cam-drive arrangement including a Bowden-cable drive for each wheel continuously tensioned by the bias of said wheels toward said workpiece, and respective cams controlling each Bowden-cable drive and so constructed and arranged that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof, and that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

6. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal dimension, said machine comprising first and second abrasive wheels biased towards said workpiece, means for effecting relative linear movement be-

tween the wheels and workpiece along the length thereof, a frame member, a respective arm assigned to each of said wheels and slidably mounted on said frame member for movement at right angles to said relative linear movement, means rotatably mounting said first and second abrasive wheels on said arms, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement for controlling movement of said wheels into and out of contact with said workpiece, said cam-drive arrangement comprising a respective cam assigned to each wheel, a respective pivoted lever forming at one end a cam follower riding against the respective cam, and a respective Bowden-cable drive having a sheath and a flexible cable continuously tensioned by the bias of the respective wheel toward said workpiece, one end of said cable being attached to the respective arm, the corresponding end of the sheath for the cable being fixed relative to said frame member, the other end of the respective cable being fixed to the other end of the respective pivoted lever, said cams, cables and levers being so constructed and arranged that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof, and that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

7. A machine as defined in claim **6**, further comprising a respective roller mounted on said one end of each pivoted lever and resting on the periphery of said cam, the roller being urged into contact with the cam by the bias of the respective wheel.

8. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, a respective frame member assigned to each wheel, an arm slidably mounted on each frame member for movement at right angles to said relative linear movement, means mounting a respective one of said wheels on each of said arms, a respective compression spring disposed between each arm and the respective frame member to bias the respective wheel against said workpiece, means for rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

9. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising first and second abrasive wheels, means of effecting relative linear movement between the wheels and workpiece along the length thereof, a frame member assigned to each wheel, arms slidably mounted on said frame member for movement at right angles to said relative linear movement, means mounting each of said wheels on a respective one of said arms, a motor for each wheel mounted on said frame member, a flexible drive extending from the motor to the respective wheel, the motors rotating the wheels in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

10. A machine for abrading the surface of an elongate workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising a plurality of pairs of abrasive wheels, each pair comprising first and second abrasive wheels adapted to abrade a predetermined portion only of the surface of the workpiece, means for effecting relative linear movement between the wheels and workpiece along the length thereof, means for rotating the wheels of each pair in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of each pair of first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel of each pair contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel of each pair does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

11. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising a plurality of pairs of abrasive wheels, each pair comprising first and second grinding wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, said pairs of abrasive wheels being axially spaced apart in said direction and being disposed angularly with respect to one another whereby each pair of wheels is adapted to abrade a predetermined limited portion only of the surface of said workpiece, means for rotating the wheels of each pair in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of each pair of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel of each pair contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel of each pair does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

12. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising a plurality of pairs of abrasive wheels, each pair comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, a respective frame member for the wheels of each pair, a respective arm assigned to each wheel of a respective pair slidably mounted on each said frame member for movement at right angles to said relative linear movement, means rotatably mounting a respective wheel on each arm, a plurality of arcuate supports axially spaced apart along the line of said relative linear movement, said frame members being clamped to said arcuate supports such that the frame members are offset angularly with respect to one another and each pair of wheels can abrade a predetermined portion only of the surface of said workpiece, means for rotating the wheels of each pair in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of the first and second abrasive wheels of each pair are respectively with

and against the movement of said workpiece relative to said wheels, and actuating means for ensuring that the first wheel of each pair contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and for ensuring that said second wheel of each pair does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

13. A machine as defined in claim 12 wherein sliding dovetail connections are provided on each said arcuate support to support said frame members.

14. A machine for abrading the surface of an elongated workpiece having sharp edges disposed transversely of its longitudinal direction, said machine comprising a plurality of pairs of abrasive wheels, each pair comprising first and second abrasive wheels, means for effecting relative linear movement between the wheels and workpiece along the length thereof, means for rotating the wheels of each pair in a common plane containing a line of said linear movement and in opposite senses whereby the movements of the operative surfaces of said first and second abrasive wheels are respectively with and against the movement of said workpiece relative to said wheels, and a cam-drive arrangement for controlling movement of said wheels into

and out of contact with said workpiece, said arrangement comprising a separate cam for each wheel, a common shaft supporting all of said cams and a drive for said shaft to rotate said cam in common, said cam-drive arrangement being so constructed and arranged that the first wheel of each pair contacts the leading transverse edge of the workpiece but does not contact the trailing edge thereof and that said second wheel of each pair does not contact said leading edge but does contact said trailing edge during abrading of said workpiece whereby the transverse edges are maintained sharp.

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