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FEED CONTROL DEVICE FOR FLAT GRINDING MACHINES

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FIG. 1

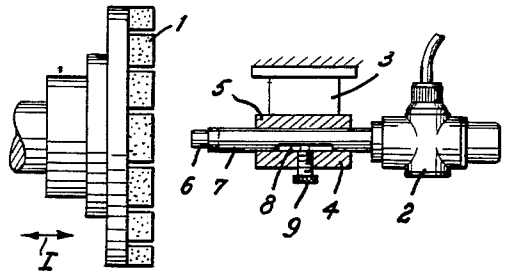


FIG. 2

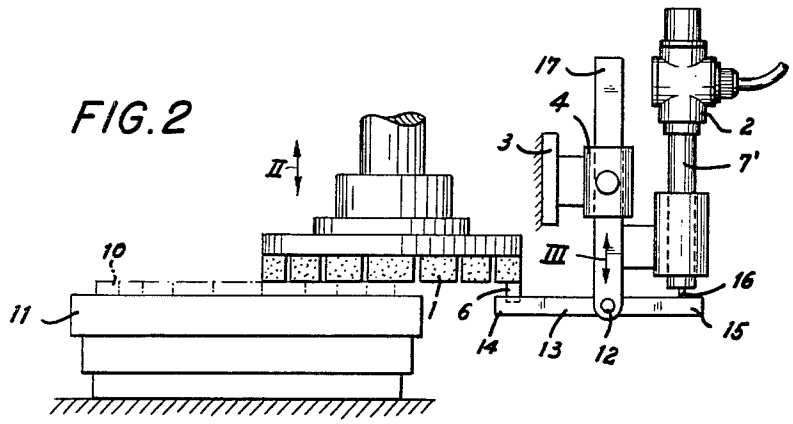
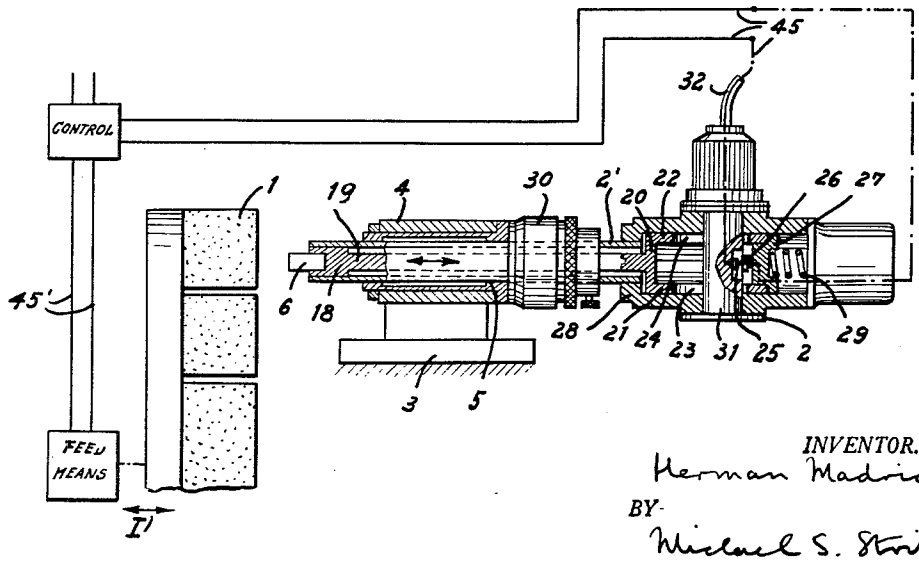


FIG. 3



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FEED CONTROL DEVICE FOR FLAT GRINDING MACHINES

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This invention pertains to flat grinding machines, and more particularly to a feed control device capable of limiting the feed movement of the grinding tool and including a preferably adjustable gauging means which cooperates with a feed disconnect member and can be installed at a suitable distance from the place where the work-piece is positioned.

The invention is characterized by the features that a gauging means including a feeler member having a contact portion of abrasion-resistant material is directly acted upon by the grinding tool; that this feeler member forms with the disconnect member a single operating unit, the feeler member being movably or displaceably arranged and subjected to adjustable spring action; that the gauging means is mounted on a support at suitable distance from the area where the grinding is done; and that the contact between the grinding tool and the feeler member only takes place immediately before the desired final dimension of the work-piece is produced (that is to say, within a distance of 0.002 to 0.005 mm. between the tool surface and the final surface of the piece), so that during an entire working operation the grinding tool is just once in contact with the gauging means for disconnecting the feed means via the disconnect member.

By means of an arrangement of the aforedescribed kind the invention achieves the result that the length of the displacement of the feeler member and of the moving part of the disconnect member as well as the number of disconnections of the feed means of the grinding tool are reduced to an absolute minimum, which in connection with the use on the feeler member of a portion of abrasion-resisting material guarantees highest precision and longest lifetime of the feed control device according to the invention.

In machines where the grinding surface of the grinding tool extends in a vertical plane the feeler member may be directly coupled to the disconnect member, so that upon displacement of said feeler member under the action of the grinding tool contacts are opened in the disconnect member for the disconnection of the electrically operated feed means.

On the other hand, in forms of machines where the grinding surface of the grinding tool extends in a horizontal plane, the feeler member may be a pivotally supported lever which operates the disconnect member via a transfer member.

Additional features and advantages of the invention will be understood from the following detailed description taken in connection with the accompanying drawings forming a part of this specification and in which two embodiments of the invention have been shown by way of example. However, I wish to say that the invention is not confined to any strict conformity with the showing of the drawings but may be changed or modified, so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appending claims.

In the drawings, in which like parts are referred to by the same reference numerals,

Fig. 1 is a lateral view, partly in section, of a feed control device according to the invention, showing a grinding tool extending in a vertical plane;

Fig. 2 is a lateral view of a modified form of machine showing a grinding tool extending in a horizontal plane in the same manner as the surface of the work-piece to be treated, and the feed control device is arranged parallel with the axis of the grinding tool;

Fig. 3 is a lateral view, partly in section, and on an enlarged scale, of the feed control device of Fig. 1.

In the embodiment illustrated in Fig. 1 the reference numeral **1** designates the grinding tool adapted to be fed in the directions indicated by the arrows I. The feed control device **2** is stationarily supported by a bearing block **3**. The bearing block **3** is provided with guiding means **4** having a cylindrical bore **5** along which the device **2** can be shiftably displaced. The checking portion **6** is secured in the rod-shaped feeler member **7** of the device and consists of relatively abrasion-resistant material. The feeler **7** is provided with an axially extending groove **8** which is engaged by a stop screw or locking screw **9** securing in this way the entire device in its adjusted position corresponding to the final working position of the tool **1** in which the grinding operation is desired to be stopped.

In the form of construction shown in Fig. 2 the work-pieces **10** are arranged on a circular supporting table **11**, with the grinding tool **1** being adapted to be fed in the directions indicated by the arrows II. Also in this form of construction the feed control device is stationarily arranged (similarly as in the construction shown in Fig. 1) by means of a bearing block **3** and adjustably supported by means of the bar **17** lockable in the guiding means **4**, whereby the rod **17** is shiftably adjustable in the directions indicated by the arrows III.

At the lower end of the shaft **17** a feeler in form of a two-armed lever **13** is arranged for rotation about a pivot **12**, the lever **13** carrying on its end **14** the checking portion **6** which cooperates with the grinding tool **1**, while the opposite end **15** of the lever **13** cooperates with the tip **16** of the shiftable transfer rod **7'** operating like the feeler **7**.

Fig. 3 shows the specific construction of the feed control device of Fig. 1. The checking portion **6** of the feeler member is a block mounted in a sliding support **18** positioned at the end of a supporting bar **19** of smaller cross-section than the support **18** and which at its opposite end terminates in a U-shaped end portion **20**. The two legs **21** and **22** of the U-shaped portion **20** are provided with bores **23**, **24** through which extends a shaft **31** carrying a stationary contact member **25**, while the ends of the legs **21**, **22** abut against the supporting means **27** of the shiftable contact member **26**. The U-shaped end **20** and the contact support **27** are positioned and guided within the cylindrical casing **28**. The contact-support **27** is acted upon by a pressure spring **29** in the direction toward the stationary contact **25**, the pretension of spring **29** of the shiftable contact **26** being adjustable by means not shown. On the other hand, the position of rest of the checking block **6** is adjustable in axial direction to the desired degree by means of a micrometer screw **30** mounted on the stationary block **3** and guide **4** and engaging an outside thread on the hollow shank **2'** attached to body **2** and slidable in the guide means **4**. Connected to the shaft **31** carrying the stationary contact **25** is a cable **32** leading to the switch box (not illustrated in the drawings) controlling the feed means for the feeding of the grinding tool and by means of which cable the switching operation consisting in the

separation of the contacts 25 and 26 when the feeler member is shifted, is passed on to the switch box.

A feed control device as illustrated in Figs. 1 to 3 operates as follows:

The grinding tool 1 is adapted to machine a work-piece mounted on a circular supporting table 11 or other support means in cooperation with a feeding device of known construction. As soon as during the feeding action the grinding tool advances into close proximity of the required final dimension of the piece, that is to say, within between 0.002 and 0.005 mm. from the final dimension the checking block 6 is touched by the grinding tool, so that when the forward feeding of the grinding tool continues, the checking block is forced backward against the action of spring 29 and the contacts 25 and 26 are separated while the tool works substantially in the plane of the final surface of the work-piece, whereby the continuation of the forward feeding of the grinding tool is automatically stopped. After an adjustable period following said first separation of the contacts the machine may be returned to starting position and arrested.

Hence, according to the constructions disclosed in the present invention, merely one disconnection is required during an entire working operation, viz. the disconnection of the feeding means of the grinding tool. It will be seen, therefore, that according to the invention the number of the switching actions has been reduced to a minimum, making possible in this way a practically precise adjustment. Furthermore, the checking block performs in the course of every working cycle merely one control movement of minimum length (viz. 0.002 to 0.005 mm.) which applies also to the contacts 25 and 26, so that also in this way no wear can occur and no disadvantages affecting the accuracy of the gauging job. In addition to this, the stationary arrangement of the feed control device prevents the latter from interfering in any way with the normal handling of the work-piece arranged on the circular supporting table. It is possible, therefore, to arrange the work-piece on the supporting table in any suitable manner.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A flat grinding machine, comprising, in combination, grinding head means including a grinding tool having a grinding face adapted to effect the surface grinding of a work piece to a desired final dimension thereof; support means for supporting a work piece in grinding position; disconnectable feeding means arranged between said support means and said grinding head means for gradually moving, when operatively connected, said means relatively to each other towards a final working position in which said grinding face coincides with a ground surface of said work piece predetermined by said desired final dimension; and a pressure-responsive feed control device mounted stationarily with respect to said support means and at least partly opposite said grinding face, and having a gauging member held stationarily in a predetermined position of rest corresponding to said final working position of said grinding tool, for being subjected to pressure by said grinding face when contacted by the latter during the feeding operation of said feeding means, and adapted to be displaced from said position of rest and thereby to disconnect said feeding means when said grinding face arrives substantially in said final working position.

2. A flat grinding machine, comprising, in combination, a grinding head including a grinding tool having a grinding face adapted to effect the surface grinding of a work piece to a desired final dimension; disconnectable feeding means for feeding, when operatively connected with siad girnding head, said grinding tool gradually into a final working position in which said grinding face substantially coincides with a ground surface of said work piece predetermined by said desired final dimension; and a feed control device stationarily mounted at least partly opposite said grinding face and comprising gauging means for determining the arrival of said grinding face in said final working position, said gauging means including a movable feeler member mounted to be displaced, from a stationary position of rest, by said grinding tool upon being contacted by said grinding face during the feeding movement thereof, and a disconnect member operatively connected with said gauging member so as to be operated whenever said feeler member is displaced from its position of rest, and also operatively connected with said feeding means so as to disconnect the latter from operativeness with respect to said grinding head upon such displacement of said feeler member so that hereby further feeding of said grinding head is prevented.

3. A flat grinding machine, comprising, in combination, a grinding head including a grinding tool having a grinding face adapted to effect the surface grinding of a work piece to a desired final dimension; disconnectable feeding means for feeding, when operatively connected with said grinding head, said grinding tool gradually into a final working position in which said grinding face substantially coincides with a ground surface of said work piece predetermined by said desired final dimension; and a feed control device stationarily mounted at least partly opposite said grinding face and comprising gauging means for determining the arrival of said grinding face in said final working position, and adjustable to any desired one of a plurality of operative positions respectively associated with a predetermined final working position, said gauging means including a movable feeler member mounted to be displaced, from a stationary position of rest determined by said desired operative position of said gauging means, by said grinding tool upon being contacted by said grinding face during the feeding movement thereof, and a disconnect member operatively connected with said gauging member so as to be operated whenever said feeler member is displaced from its position of rest, and also operatively connected with said feeding means so as to disconnect the latter from operativeness with respect to said grinding head upon such displacement of said feeler member so that hereby further feeding of said grinding head is prevented.

4. A flat grinding machine as set forth in claim 1, wherein said gauging means are constructed to prevent, upon said feeler means being contacted by said grinding face, further feeding of said grinding head beyond a working position of said grinding face within .002 to .005 mm. from said work piece surface predetermined by the desired final dimension.

5. A flat grinding machine comprising, in combination, a grinding head including a grinding tool having a grinding face adapted to effect the surface grinding of a work piece to a desired final dimension; disconnectable electrically controllable feeding means for feeding, when operatively connected with said grinding head, said grinding tool gradually into a final working position in which said grinding face substantially coincides with a ground surface of said work piece predetermined by said desired final dimension; and a feed control device stationarily mounted at least partly opposite said grinding face and comprising gauging means for determining the arrival of said grinding face in said final working position, said gauging means including a movable feeler member mounted to be displaced, from a stationary position of rest, by said grinding tool upon being contacted by said grinding face during the feeding movement thereof, and an electrical disconnect member operatively connected with said gauging member so as to be operated whenever said feeler member is displaced from its position of rest, and also electrically connected with said feeding means so as to disconnect electrically the latter from operativeness with respect to said grinding head upon such displacement of said feeler

member so that hereby further feeding of said grinding head is prevented.

6. A flat grinding machine, comprising, in combination, a grinding head including a grinding tool having a grinding face adapted to effect the surface grinding of a work piece to a desired final dimension; disconnectable feeding means for feeding, when operatively connected with said grinding head, said grinding tool gradually into a final working position in which said grinding face substantially coincides with a ground surface of said work piece predetermined by said desired final dimension; and a feed control device stationarily mounted at least partly opposite said grinding face and comprising gauging means for determining the arrival of said grinding face in said final working position, said gauging means including a movable feeler member having a checking portion of relatively abrasion-resistant material and being mounted to be displaced, from a stationary position of rest, by said grinding tool upon being contacted at its checking portion by said grinding face during the feeding movement thereof, and a disconnect member operatively connected with said gauging member so as to be operated whenever said feeler member is displaced from its position of rest, and also operatively connected with said feeding means so as to disconnect the latter from operativeness with respect to said grinding head upon such displacement of said feeler member so that hereby further feeding of said grinding head is prevented.

7. A flat grinding machine as set forth in claim 6, wherein said gauging means include a substantially rod-shaped feeler member having said contact portion arranged at one end thereof and abutting means at the opposite end thereof, guide means for shiftably supporting said feeler member, a disconnect member mounted in the path of said shiftable rod-shaped feeler member and equipped with a stationary contact and a movable contact piece respectively electrically connected with said feeding means, and bias means mounted to urge said movable contact piece into contact with said stationary contact, said abutting means being arranged to abut against said movable contact piece for moving the latter out of contact with said stationary contact against the action of said bias means, so that whenever said feeler member is displaced said feeding means are electrically disconnected by the separation of said stationary contact and movable contact piece.

8. A flat grinding machine as set forth in claim 6, wherein said gauging means includes a lever-type feeler member supported for being pivotally moved when its contact portion is contacted by said grinding face, a shiftable rod-shaped transfer member having an abutting portion at one end in operative contact with a portion of said lever-shaped feeler member, and having abutting means at the opposite end thereof, guide means for shiftably supporting said transfer member, a disconnect member mounted in the path of said shiftable rod-shaped transfer member and equipped with a stationary contact and a movable contact piece respectively electrically connected with said feeding means, and bias means mounted to urge said movable contact piece into contact with said stationary contact, said abutting means being arranged to abut against said movable contact piece for moving the latter out of contact with said stationary contact against the action of said bias means, so that whenever said feeler member is moved and said transfer member is displaced thereby, said feeding means are electrically disconnected by the separation of said stationary contact and movable contact piece.

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