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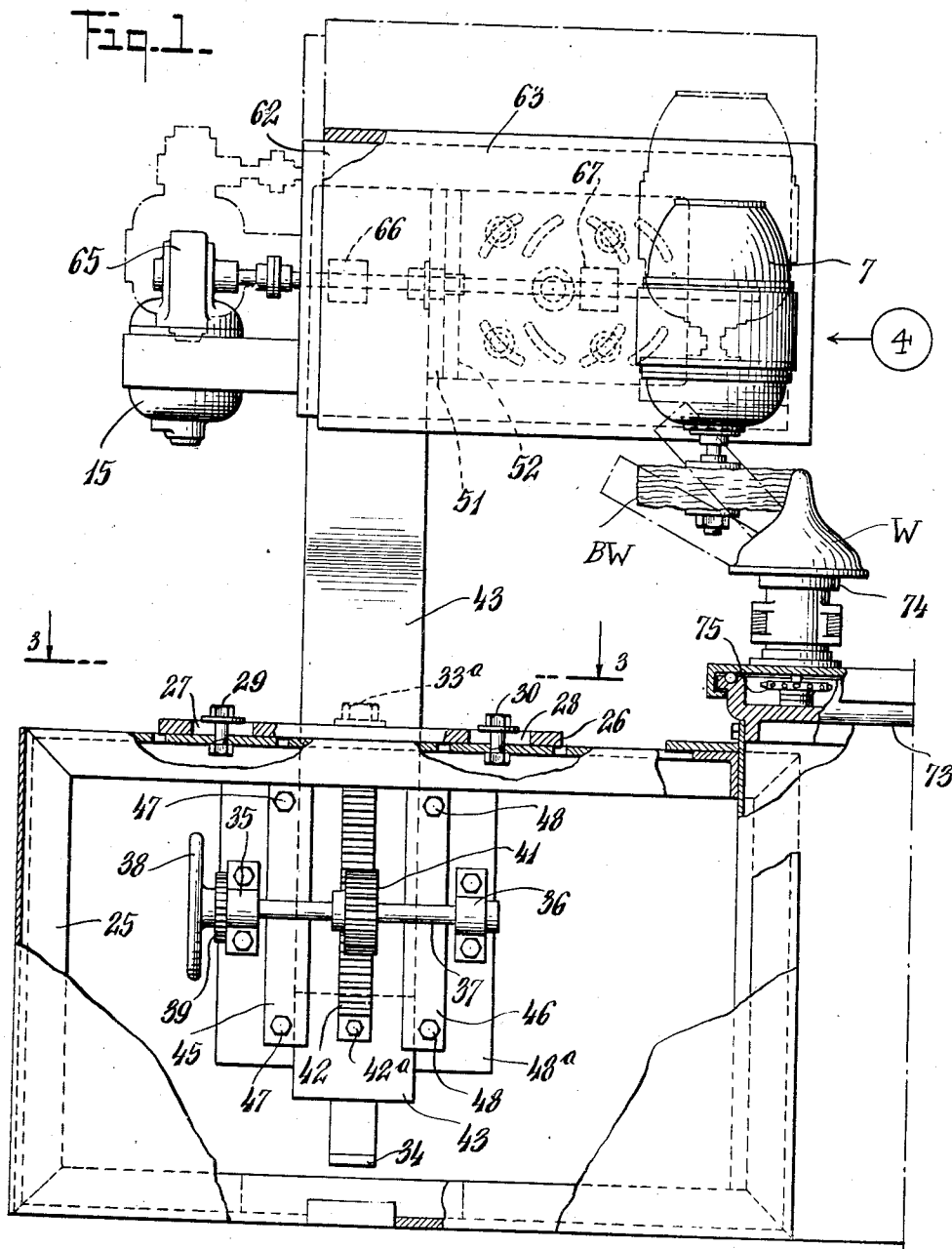
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2,386,649

AUTOMATIC MULTIPLE BUFFING MACHINE

Filed July 20, 1943

8 Sheets-Sheet 1.



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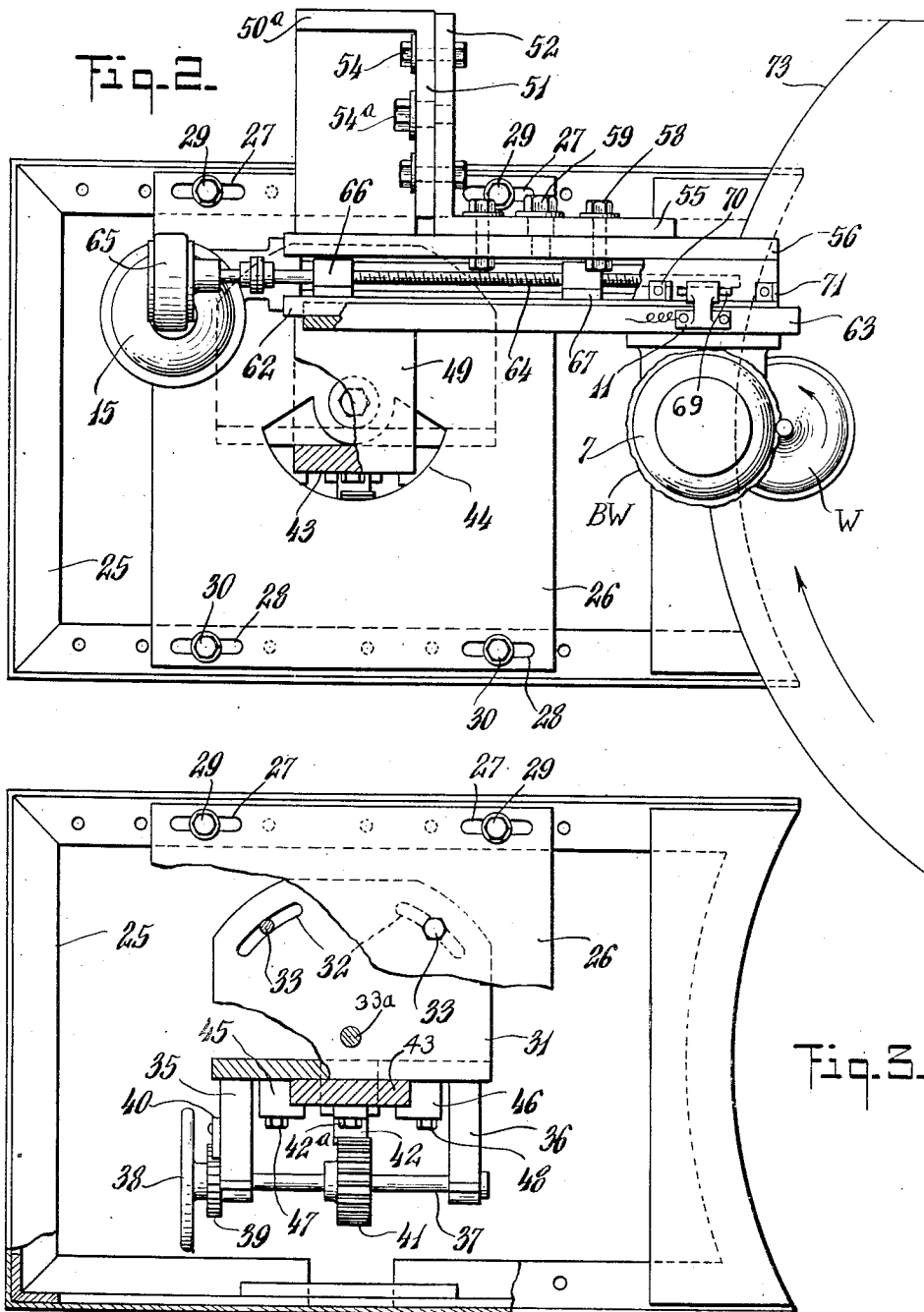
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8 Sheets-Sheet 2



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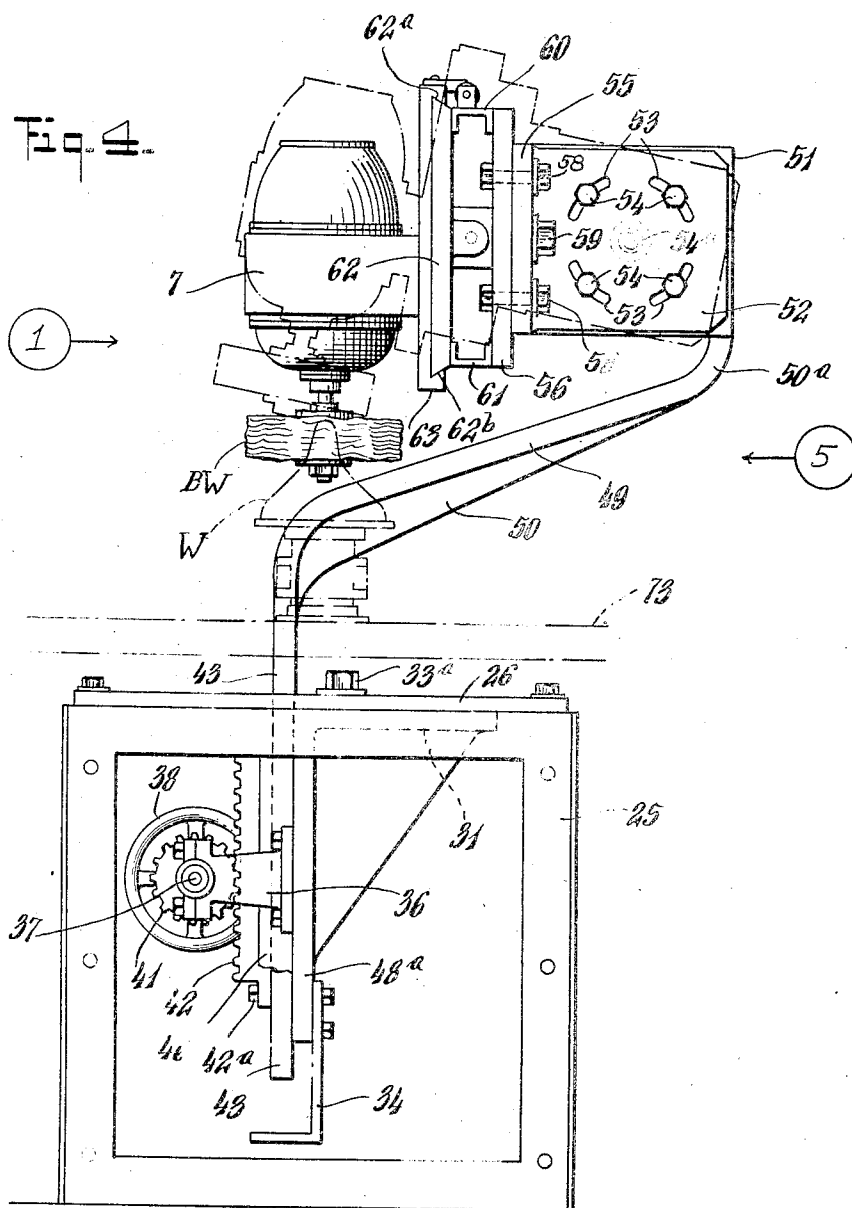
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AUTOMATIC MULTIPLE BUFFING MACHINE

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8 Sheets-Sheet 3



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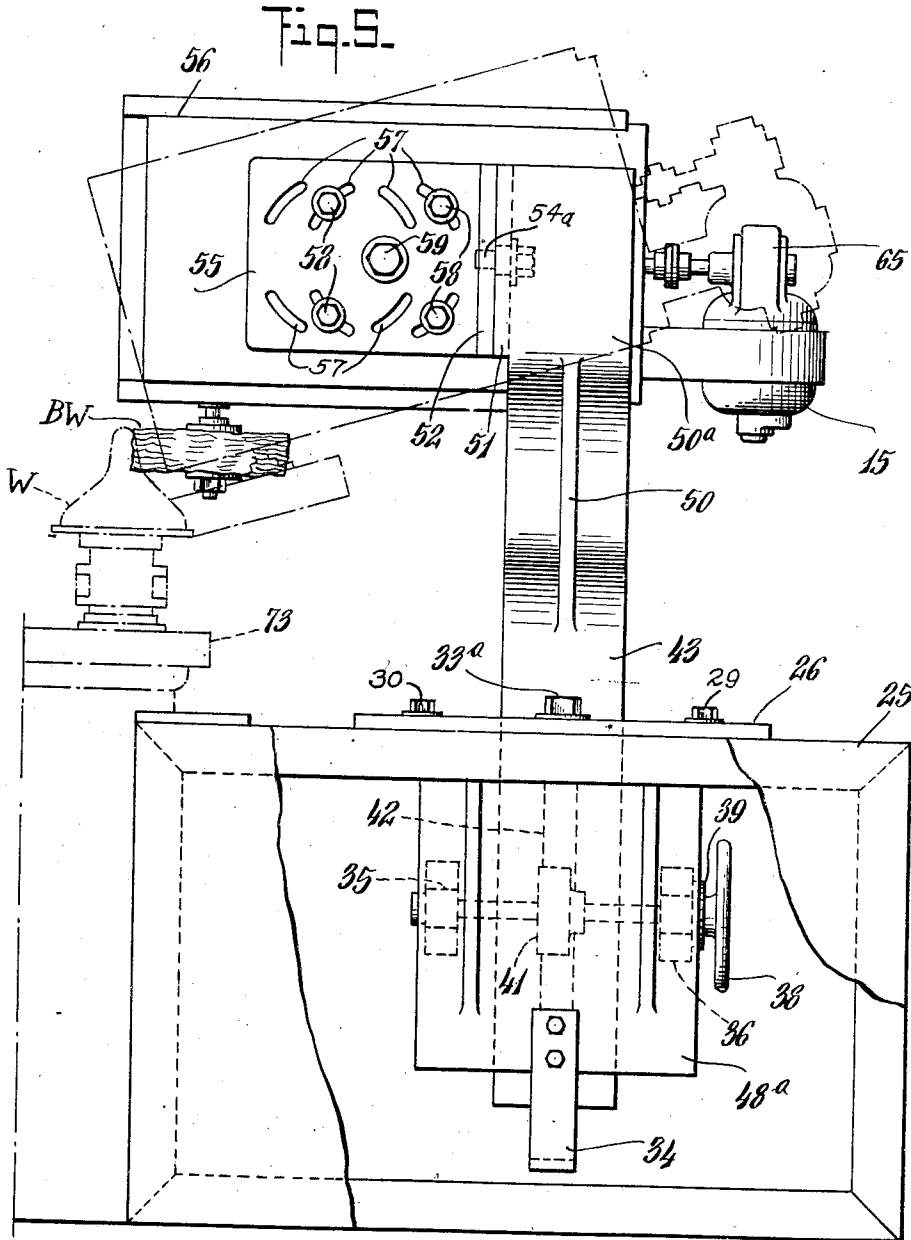
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AUTOMATIC MULTIPLE BUFFING MACHINE

Filed July 20, 1943

8 Sheets-Sheet 4



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AUTOMATIC MULTIPLE BUFFING MACHINE

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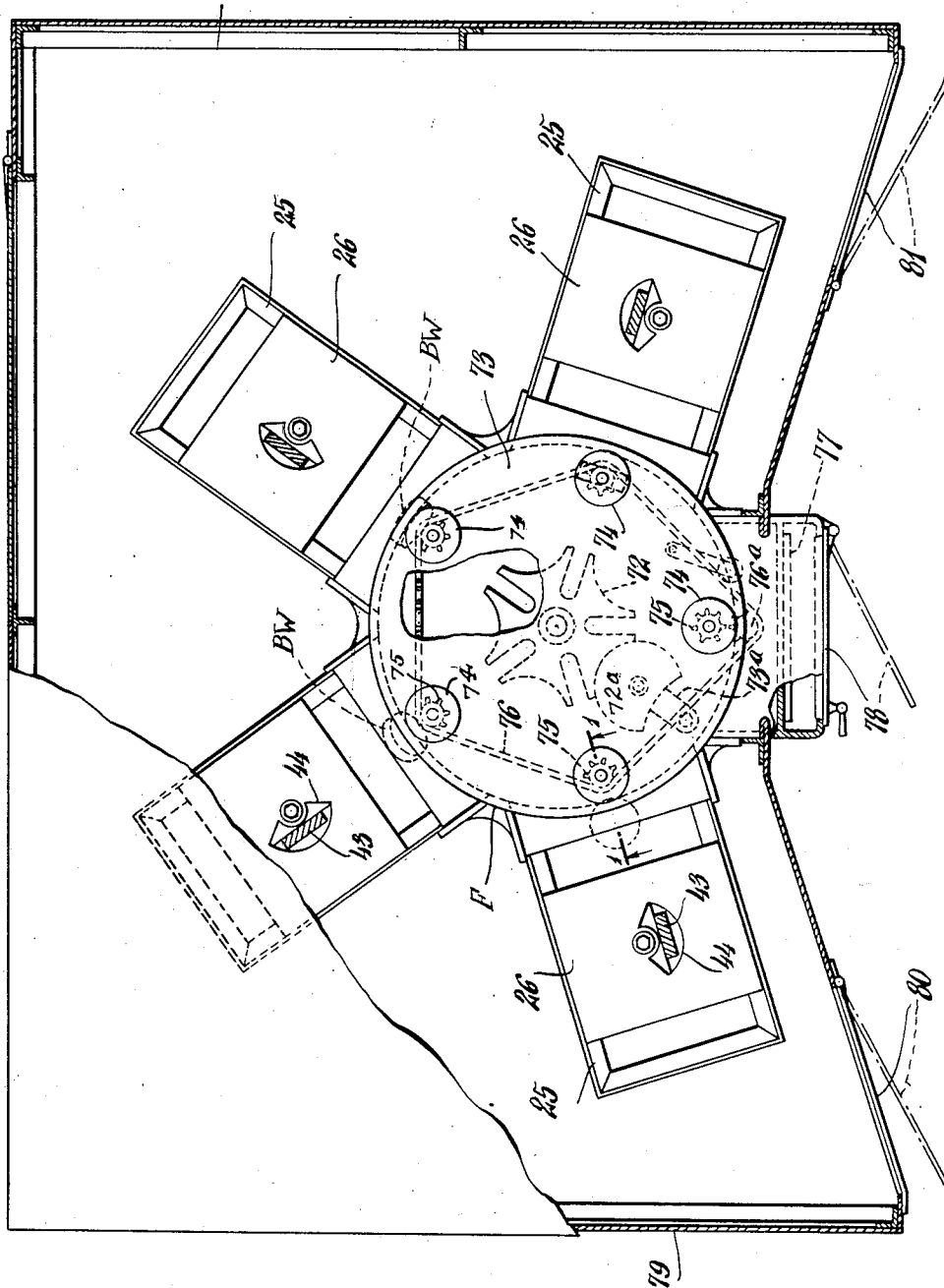


Fig. 6-

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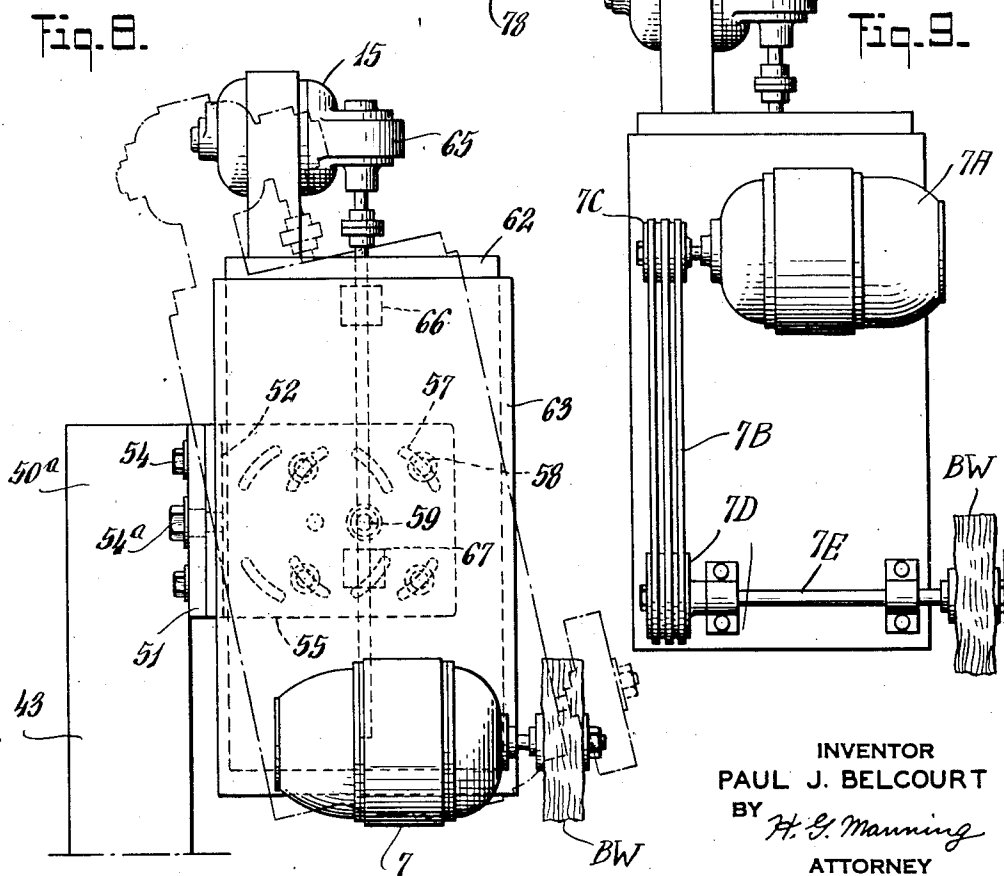
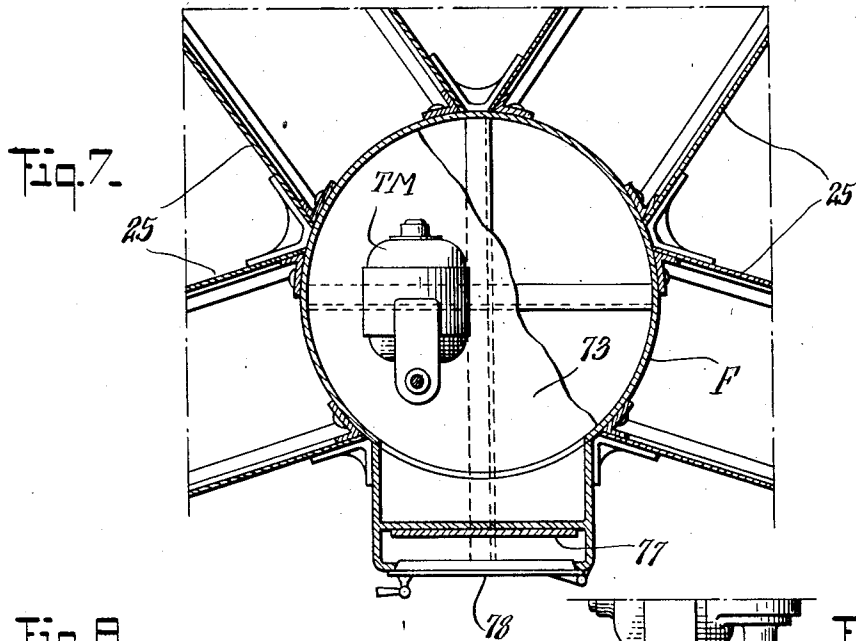
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2,386,649

AUTOMATIC MULTIPLE BUFFING MACHINE

Filed July 20, 1943

8 Sheets-Sheet 6



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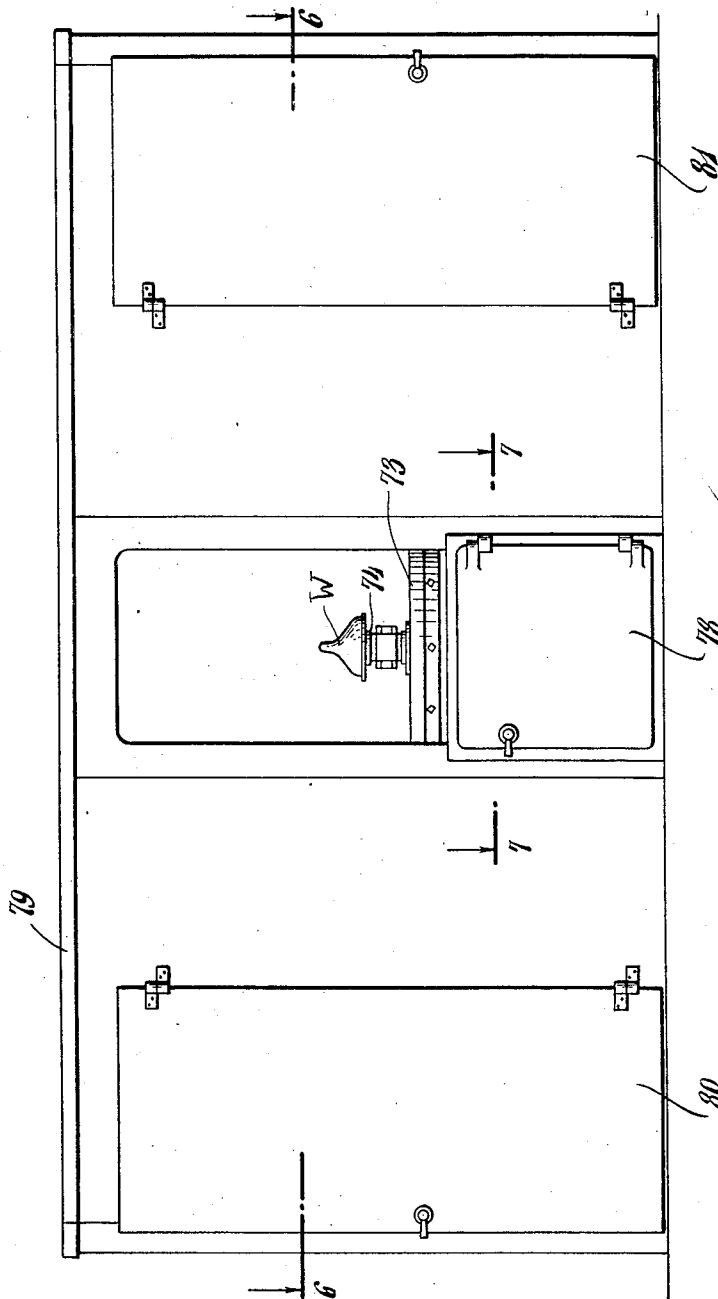
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AUTOMATIC MULTIPLE BUFFING MACHINE

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Fig. 10.



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AUTOMATIC MULTIPLE BUFFING MACHINE

Filed July 20, 1943

8 Sheets-Sheet 8

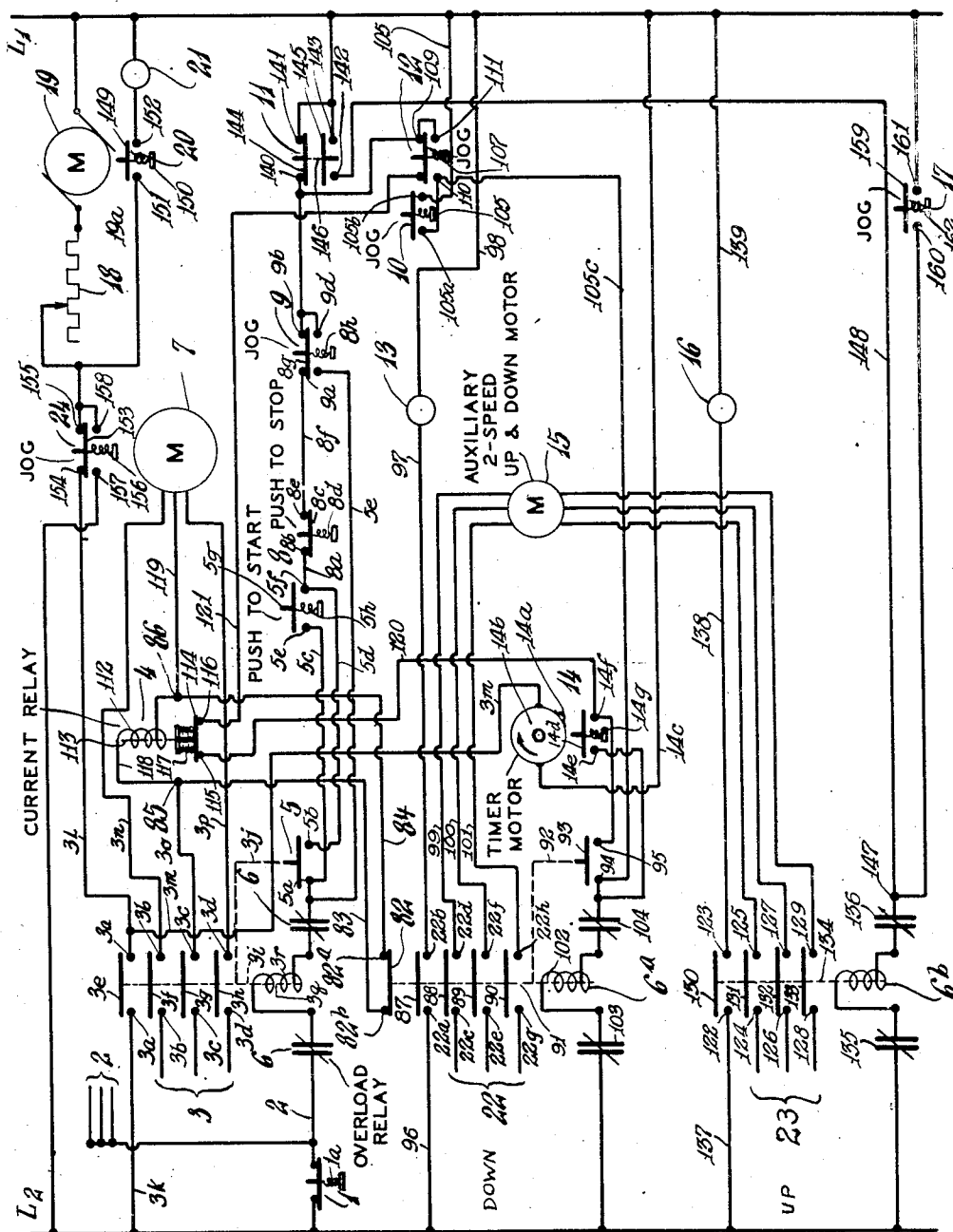


Fig. 11-

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UNITED STATES PATENT OFFICE

2,386,649

AUTOMATIC MULTIPLE BUFFING MACHINE

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Application July 20, 1943, Serial No. 495,473

13 Claims. (Cl. 51-108)

This invention relates to abrading, and more particularly to an automatic multiple unit buffing machine in which all of the units of said machine are located in a single large ventilated dust exhaust housing and are controlled from a single panel board located in a portion of the machine frame projecting outside of said housing in full view and within easy reach of the operator.

One object of the present invention is to provide a machine of the above nature in which the buffing wheels of all of said units are automatically controlled individually by switch and timer apparatus mounted on the panel board.

A further object is to provide a machine of the above nature in which the buffing wheel of each unit will be intermittently moved against the work being buffed by the operation of an individual auxiliary electric motor, so as to maintain said wheel automatically in contact with said work at all times.

A further object is to provide a machine of the above nature in which the downward movement of the buffing wheel in each unit will be interrupted by means of a current relay arranged in circuit with the buffing wheel motor of said unit, which relay will be operated whenever the current in said circuit has increased to a predetermined amperage caused by the pressure of the buffing wheel against the work.

A further object is to provide a machine of the above nature in which the motion of the buffing wheel against the work in each unit will be repeated automatically at regular intervals under the control of motor-driven timing apparatus located on the common panel board.

A further object is to provide a machine of the above nature in which apparatus is provided for each unit for automatically stopping the rotation and downward motion of the buffing wheel when it has been worn down sufficiently to require replacement, and to provide a signal at such a time indicating to the operator when it is necessary for him to enter the housing for making such a replacement.

A further object is to provide a machine of the above nature in which the buffing wheel of each unit will be mounted "universally" and for vertical adjustment to permit the buffing wheel to engage the work in any desired horizontal, vertical, or angular position.

A further object is to provide a machine of the above nature in which the separate buffing wheel supports may be quickly attached to and detached from the central frame of the machine.

A still further object is to provide a machine

of the above nature which will be relatively simple in construction, inexpensive to manufacture, easy to adjust, accurately controlled, compact, labor-saving, and very efficient and durable in use.

With these and other objects in view there have been illustrated on the accompanying drawings two forms in which the invention may conveniently be embodied in practice.

In the drawings:

Fig. 1 represents a side elevation of one of the buffing units embodying the present invention, with certain parts broken away for clearness, looking in the direction of the arrow 1 of Fig. 4, and showing in dotted lines a raised adjusted position of the buffing wheel carriage and two adjusted angular positions of the buffing wheel.

Fig. 2 is a top plan view of the same, shown partly broken away, and partly in section.

Fig. 3 is a cross-sectional view of the same, taken along the line 3-3 of Fig. 1, looking downwardly in the direction of the arrows.

Fig. 4 is a rear view of the same, looking in the direction of the arrow 4 of Fig. 1, and showing in dotted lines an adjusted angular position of the buffing wheel carriage.

Fig. 5 is a side elevation of the same, looking from the direction of the arrow 5 of Fig. 4.

Fig. 6 is a horizontal sectional view taken through the exhaust housing, partly broken away, looking downwardly along the line 6-6 of Fig. 10, and showing the central machine frame, the four attached buffing units and the control panel board located outside the housing.

Fig. 7 is a sectional view of the same, taken along the line 7-7 of Fig. 10, looking downwardly and illustrating the machine frame and the location of the motor which drives the work table.

Fig. 8 is a side view of one of the buffing units, showing in dotted lines an adjusted angular position of the buffing wheel carriage.

Fig. 9 is a view similar to Fig. 8, showing a modified form of mechanism for driving the buffing wheel, in which a multiple belt is employed instead of a direct motor drive.

Fig. 10 is a front view of the dust exhaust housing enclosing the automatic multiple buffing machine, as it appears from in front of the operator's position.

Fig. 11 is an electrical diagram of the wiring circuits of one unit of the multiple buffing machine, and including the associated electrical apparatus for automatically starting and stopping the compound applicator whenever the buffing wheel motor is turned on or off respectively.

Electrical Apparatus

Referring now to the drawings, in which like reference numerals denote corresponding parts throughout the several views, the numeral 1 indicates a master stop push-button switch (see Fig. 11), said switch being adapted to be held closed by a spring 1a and by the manual opening of which, the buffing wheels BW and associated apparatus of all units of the machine may be simultaneously stopped whenever desired.

The numeral 2 indicates a plurality of conductors (four in this instance) leading to the individual wheel motor switches of the various units of the multiple machine, which machine is adapted to receive control power from a pair of line wires L1 and L2 which are supplied from any suitable A. C. source.

The numeral 3 indicates generally a unitary switch which controls the wheel motor 7, the motor of the timer 14, and the applicator motor 19 of one individual unit of the machine.

The switch 3 consists of four pairs of stationary contacts 3a, 3a; 3b, 3b; 3c, 3c; 3d, 3d, and four movable contacts 3e, 3f, 3g, 3h, adapted to bridge said stationary contacts 3a, 3a; 3b, 3b; 3c, 3c; 3d, 3d, respectively. These four movable contacts are rigidly connected together and insulated from each other by a common carrier rod 3i (shown in dotted lines in Fig. 11).

The carrier rod has a rigid offset angular section 3j provided with an electrical interlock movable contact 5 which is adapted to bridge a pair of stationary contacts 5a, 5b located on the frame of the switch 3 to keep all the contacts of switch 3 closed during the buffing operation.

The switch 3 may be opened at any desired time by the manual actuation of the stop section of the push-button 8, and automatically opened by the operation of the mechanical limit switch 11, as will be described later.

The conductor 3k connects the left stationary contact 3a to the line wire L2. The right hand stationary contact 3a is connected by a conductor 3L to the applicator circuit 19a, and by a conductor 3m to the motor circuit of the timer 14.

The conductors 3n, 3o, and 3p indicate three 3-phase conductors connecting the right hand stationary contacts 3b, 3c, 3d to the motor 7 of the buffing wheel BW.

The carrier rod 3i has an extension 3g located within a solenoid coil 3r connected on each side to a pair of safety overload relays 6 which are adapted to open the switch 3 in case an accidental excessive current should pass through the wheel motor 7.

The control circuit for the switch 3 includes the lower conductor 2, the overload relays 6, the coil 3q, the contacts 5a, and 5b, and the three conductors 5c, 5d, 5e. The pair of conductors 5c and 5d are connected to the stationary contacts 5e, 5f of the "start" side of the push button 8, which contacts 5e, 5f are bridged by a movable contact 5g normally held in open position by a spring 5h.

The contact 5f is connected by a conductor 8a to a stationary contact 8b at the "stop" side of the push-button 8. A movable contact 8c, normally held closed by a spring 8d, connects the contact 8b to another stationary contact 8e, which in turn is connected by a conductor 8f to a normally-closed jog push button switch 9 located in the control circuit of the switch 3. This switch 9 includes a movable contact 8g normally held by a spring 8h against a pair of fixed

contacts 9a, 9b, which are adapted when the push-button is depressed to engage fixed contacts 9c, 9d. This construction permits the buffing wheel to be operated momentarily and independently from the inside of the exhaust housing for test purposes. It will be understood that the wheel BW will be operated only so long as the switch 9 is manually held on.

In order to control the length of the time interval between the inward motions of the buffing wheel BW under the operation of the auxiliary two-speed reversible motor 15, to be described later, provision is made of an adjustable motor driven timer 14 of the continuously operating repeating cycle type.

The timer 14 includes a rotating cam 14a mounted on a shaft 14b and driven continuously by a motor (not shown) which receives power from the conductors 3m and 14c, the latter being connected to the line wire L1. The rotation of the cam 14a will cause a movable contact 14d to be momentarily bridged across a pair of fixed contacts 14e and 14f, said movable contact being normally held open by a spring 14g.

The closing of the timer switch by the action of the cam 14a will cause a "down" switch 22 to be closed automatically for controlling the auxiliary motor 15.

The down switch 22, which is similar to the wheel motor switch 3, previously described, consists of five pairs of stationary contacts 22a, and 22b, 22a, and 22b, 22c and 22d, 22e and 22f, 22g and 22h, and five movable contacts 22i, 22j, 22k, 22l, and 22m, respectively, which movable contacts are rigidly connected together and insulated from each other by a common carrier rod 91 (shown in dotted lines). The carrier rod 91 has a rigid offset angular extension 92 provided with an electrical interlock movable contact 93 which is adapted to bridge a pair of stationary contacts 94, 95 located on the frame of the switch 22 and which serve to keep the upper movable contact 22i open and the four movable contacts 22j, 22k, 22l, 22m closed during the operation of the auxiliary motor.

The conductor 96 connects the stationary contact 22a to the line wire L2 and the contact 22b is connected by a conductor 97 to the pilot lamp 13 which in turn is joined by a conductor 98 to the line wire L1.

The conductors 99, 100, and 101 indicate three 3-phase conductors which connect the stationary contacts 22d, 22f, and 22h to the auxiliary motor 15 in such a manner as to drive the wheel head carriage toward the work W when the switch 22 is closed.

The carrier rod 91 has an extension 102 located within a solenoid coil 6a connected to a pair of overload relays 103, 104 which are adapted to open the switch 22 in case of an accidental overload of the auxiliary motor 15.

The numeral 10 indicates a push-button switch movable contact normally held open by a spring 105 and adapted to be momentarily closed against a pair of fixed contacts 105a, 105b by the manual operation of the push button of said switch 10 to permit the "down" or "in" switch 22 to be closed to operate the auxiliary motor 15 independently of the timer 14. This switch 10 is used immediately after the installation of a new wheel. The contact 105a is connected with contact 94 by a conductor 105c, while the contact 105b is joined to the line wire L1 by a conductor 105d.

The numeral 12 indicates a normally "on" jog push button switch located within the exhaust

housing, and includes a movable contact 106 normally held closed by a spring 107 against a pair of fixed contacts 108, 109.

When the contact 106 is pushed downwardly it will engage a pair of fixed contacts 110, 111 and cause the auxiliary motor 15 to run in the "down" or "in" direction, as long as said contact 106 is held down. This will permit the auxiliary motor 15 to drive the buffing wheel carriage BW toward the work W independently of the timer 14 as long as the push button 12 is held on.

The current relay 4 serves to stop the auxiliary motor 15 whenever the current in the circuit of the wheel motor 7 has attained a predetermined value, in response to the increase in pressure of the buffing wheel BW against the work, as the wheel is advanced toward said work.

The relay 4 includes a coil 112 which loosely surrounds an iron rod 113 having a movable contact 114 connected thereto. The contact 114 is normally held closed against a pair of stationary contacts 115, 116 by a coiled spring 117.

The coil 112 is connected to the conductor 30 by a conductor 118 at the terminal 85. The other end of the coil 112 is connected at the terminal 85 to a conductor 119 leading to the motor 7.

The stationary contact 115 is connected to the stationary contact 14f by a conductor 120, while the stationary contact 116 is joined by a conductor 121 to the fixed contact 108 of the jog switch 12.

Provision is also made of a pair of pilot lamps 13 and 16, which automatically indicate when the auxiliary motor 15 has started to move downwardly or upwardly, as the case may be.

Provision is also made of an "up" switch 23 for operating the auxiliary motor 15 in the reverse direction at a high speed in order to raise said buffing wheel rapidly from the work when it is worn down to the hub, and thus minimizing the time required for changing buffing wheels.

The up switch 23 consists of four pairs of stationary contacts 122 and 123, 124 and 125, 126 and 127, 128 and 129 which cooperate with four movable contacts 130, 131, 132, 133 respectively, said movable contacts being rigidly connected together and insulated from each other by a common carrier rod 134, the lower end of which is located within a solenoid coil 6b. The coil 6b is connected to a pair of safety overload relays 135, 136 which are adapted to open the up switch 23 in case of an accidental overload of the auxiliary motor 15.

The fixed contact 122 is connected by a conductor 137 to the line wire L2 and the fixed contact 123 is connected by a conductor 138 to the pilot signal lamp 16 which in turn is joined to the line wire L1 by a conductor 139.

The numeral 11 indicates a combination normally closed and a normally open non-overlapping maintained contact limit switch, (see Figs. 2 and 11), which when tripped by the limit lug 71 will stop the wheel motor 7, the applicator motor 19, and the timer 14, and at the same time will reverse the auxiliary motor 15.

The limit switch 11 which is of the double pole double throw maintained contact type, as shown in Fig. 11, consists of two pairs of stationary contacts 140 and 141, 142 and 143 which are adapted to be engaged by a pair of movable contacts 144 and 145, respectively, the latter contacts being mounted on a common insulated carrier rod 146.

The fixed contact 142 is joined to a junction 147 at the overload relay 136 by a conductor 148.

The left hand fixed contacts of the switches 3, 22 and 23 are all supplied with A. C. from any suitable source of 3-phase power.

The numeral 17 indicates an "up" jog push-button located in the exhaust housing, for permitting the operator to produce an upward motion of the buffing wheel independently of the limit switch 11. A movable contact 159 is normally held in open position by a spring 162, and when momentarily closed engages a pair of fixed contacts 160, 161.

The application of buffing compound to the buffing wheel BW is controlled by means of a variable resistance 18 located in circuit with a compound applicator motor 19, and in operation, said resistance 18 is adapted to control the automatic successive feeding strokes of the block of compound to said applicator (not shown).

Provision is also made of a normally "off" limit switch 20, associated with the applicator, to light up a signal pilot lamp 21, in circuit with said switch 20, when said switch closes to indicate that the compound cake is worn down and requires renewal.

The applicator switch 20 has a movable contact 149 normally held open by a spring 150 and is adapted to engage a pair of fixed contacts 151 and 152.

Provision is also made of a "jog" push-button 24, located within the exhaust housing, for permitting each applicator to be operated independently of its associated buffing wheel control circuit. The push button 24 has a movable contact 153 normally held against a pair of fixed contacts 154 and 155 by a spring 156. When the button 24 is depressed, the contact 153 engages fixed contacts 157 and 158.

In order to permit the plunger 113 of the current relay 4 to reset quickly after each operation, provision is made of a movable normally "on" bridging contact 82 secured to the common holder rod 91 of the movable contacts of the switch 22. The contact 82 engages a pair of stationary contacts 82a, 82b, which are connected by conductors 83 and 84 to the points 85 and 86 of the current relay 4, as shown in Fig. 11. It will thus be seen that when the switch 22 opens, the contact 82 will bridge the contacts 82a and 82b causing the conductors 83 and 84 to be shunted across the coil of the current relay 4, thus destroying the magnetism thereof.

This will permit the movable contact 114 of the relay 4 to drop or reset instantly and thus avoid hesitation or chattering of said contact 114 with respect to the fixed contacts 115, 116.

No attempt has been made in the diagram of Fig. 11 to show the complete circuits, and only the essential details have been illustrated which should be sufficient to enable a person skilled in the art to properly understand the operation of the invention.

Mechanism

Each individual buffing machine unit comprises a support casing 25 having an adjustable top plate 26 provided with four straight slots 27, 27 and 28, 28 which permit a sliding adjustment of said plate with respect to the center work table 72, to be described later, and which is housed within a central machine frame F. The plate 26 is adapted to be secured in adjusted position by means of two pairs of bolts 29, 29 and 30, 30 passing through said slots 27, 27 and 28, 28 respectively.

Provision is also made of an angle bracket 31

located beneath the top plate 26, which bracket 31 is also provided in its upper horizontal section with a pair of arcuate slots 32, 32 for receiving a pair of bolts 33, 33 which serve to clamp said angle bracket 31 in adjusted angular position with respect to a vertical bolt 33a depending from the top plate 26.

In order to limit the downward movement of the buffing wheel post 43, to be described later, provision is made of an angular stop member 34 secured to the bottom of the bracket 31.

The vertical position of the buffing wheel carriage may be manually adjusted whenever desired, by means of a pair of horizontal bearing journals 35 and 36 secured as by bolts (as shown in Figs. 1 to 4) to the vertical depending section 43a of the angle bracket 31. A horizontal shaft 37 having a hand wheel 38 on one end thereof is mounted to rotate within said journals 35 and 36. The shaft 37 is provided with a ratchet wheel 39 adjacent the hand wheel 38, and said ratchet wheel is prevented from rearward rotation by means of a pawl 40 pivoted on the journal 35.

The shaft 37 is provided at its center portion with a pinion 41 which is adapted to mesh with a vertical rack 42, secured as by bolts 42a, 42a, to the bottom part of the upstanding support post 43, which is preferably of thin rectangular cross-section. The post 43 passes upwardly through an arcuate slot 44 in the top plate 26, said slot permitting angular twisting of the support post within the limits of its adjustable motion.

After the support post 43 has been adjusted to the desired vertical position, it may be clamped tightly in such position by means of a pair of gib plates 45 and 46, and two pairs of bolts 47, 47 and 48, 48, the threaded ends of which are screwed into the vertical section 43a of the angle bracket 31.

Above the support casing 25, the post 43 is offset laterally by means of an upwardly inclined section 49 which is strengthened by a reinforcing rib 50, and is provided at its upper vertical end 50a with a vertical flange 51 extending at right angles to said upper end 50a.

In order to provide for a universal angular adjustment of the buffing wheel BW with respect to the work W, provision is made of an angle plate 52 secured upon the upper flange 51 of the post 43, which plate is adapted to be swiveled in a vertical plane upon the flange 51, and held in any desired adjusted angular position thereon by means of four bolts, 54, 54, 54, 54, located in curved slots 53, 53, 53, 53 (as clearly shown in Figs. 2 and 4), the swiveling taking place about a horizontal center bolt 54a.

As clearly shown in Fig. 5, the base 55 of the angle plate 52 serves as a rigid carrier for a head or carriage plate 56, which is adapted to be swiveled about a bolt 59, projecting from said base 55. The head plate 56 is adapted to be clamped in adjusted position upon said base 55 by means of four bolts, 58, 58, 58, 58, located in four arcuate slots 57, 57, 57, 57, formed in said plate 55. The wheel head plate 56 also carries a gib plate 62 to which it is connected by means of a pair of channel irons 60 and 61 (see Fig. 4), and said gib plate is provided with opposed bevelled edges 62a and 62b which fit within and guide a dovetailed movable slide plate 63, which carries the buffing wheel motor.

The buffing wheel is adapted to be driven toward and away from the work by means of an elongated worm screw 64 connected at one end to a worm gear box 65 mounted on the auxiliary two-speed

motor 15, and said worm screw 64 is adapted to rotate within a bearing 66 rigidly connected to the gib plate 62, and a nut 67 rigidly secured to the slide plate 63. The limit switch 11 is rigidly mounted on the slide plate 63 and in cooperation with a stop pin 69 and a pair of limit lugs 70 and 71, which are attached to the gib plate 62, automatically controls the operation of the auxiliary two-speed reversible motor 15 for rapidly moving the buffing wheel away from the work when said wheel needs replacement, and stopping said wheel at the outer limit of its motion.

In order to index the work table 73, provision is made of a Geneva "motion" wheel 72 (see Fig. 6), which is rotated intermittently by means of an arm 73a carried on a constantly driven mutilated cam 72a. The work table 73 carries a plurality of work spindles 74 (one for each of the four buffing units of the machine). Each of the spindles 74 is provided with a sprocket gear 75 which is adapted to be engaged by a chain 76 at all of the five stations, except at the work changing position at the front of the casing 25, where the chain 76 is maintained out of engagement with the sprocket gear 75 by an idle pinion 75a, so that the work chuck does not rotate at that point. The arm 73a is driven by an electric motor TM (see Fig. 7).

Provision is also made of a single common control panel board 77 located within the portion of the machine frame projecting outside the dust housing 79 in a position convenient to the operator for permitting him to adjust the various electrical apparatus on said panel board to control all the units of the multiple buffing machine without leaving his operating position. The panel board 77 is protected by a pivoted door 78.

The exhaust dust housing 79 serves to prevent the escape of dust from the buffing wheel operations into the room where the machine is located, and surrounds the machine frame F which encloses the multiple buffing machine. Dust is thereby excluded from the panel board 77. Access to the interior of the housing 79, for the purpose of changing buffing wheels, is permitted by means of a pair of side doors 80 and 81.

Operation

In the normal operation of the machine, the buffing wheel of each unit will be automatically controlled individually and independently of the other units by the electrical apparatus previously described herein.

In the cycle of operation of each buffing wheel BW, when the push button 8 of its unit is pressed, the wheel motor switch 3 will start the motor-driven timer 14 into operation, and at the same time will turn on the buffing wheel motor 7 and the applicator motor 19. At the end of the interval for which the timer 14 is set, the relay switch 22 will be actuated, throwing on the auxiliary motor 15 at slow speed which will drive the buffing wheel forwardly toward the work. This forward motion of the buffing wheel will continue until said wheel exerts a predetermined pressure against the work, which will cause an upsurge of current in the buffing wheel motor circuit sufficient to actuate the current relay 4, which will stop the slow downward motion of the auxiliary motor 15, until the timer 14 again starts said auxiliary motor 15. This cycle will continue repeatedly until the buffing wheel has been worn down to its hub (or has been reduced to a predetermined diameter). At this time, the limit switch 11 will be actuated by means of the stop lug 71 thus

stopping the buffing wheel motor 7, the applicator motor 19, and the motor of the timer 14. At the same time, the "down" switch 22 will also be opened and the "up" switch 23 closed. The signal lamp 16 will also be lighted for visually indicating to the operator that a new buffing wheel is needed, so that he may enter the exhaust dust housing through one of the doors 80, 81 for the purpose of installing it. The closing of the switch 23 will reverse the auxiliary motor 15 which will cause the buffing wheel carriage to move upwardly at twice its normal "down" speed, until the limit switch 11 is actuated by the stop lug 70, thus shutting off the auxiliary motor 15, the motor of the timer 14, and the applicator motor 19.

When the motor switch is closed by the operation of the "starting" push button 8, the buffing wheel motor, the timer motor, and the compound applicator motor 19 will be simultaneously turned on.

After a predetermined period of time, 12 to 15 minutes, for example, the timer motor 14 will cause the down switch 22 to close, which in turn will start the auxiliary motor 15 and move the buffing wheel carriage down a short distance toward the work. This motion will continue until the increase of current in the buffing wheel motor circuit due to the increased pressure between the buffing wheel and the work will actuate the current relay 4, and throw off the down switch 22, thus stopping the auxiliary motor 15. These conditions will continue until the down switch is again closed by the continued operation of the adjustable timer motor 14. After this operation has been repeated a good many times, the buffing wheel (BW) will be worn down to a predetermined hub size, and at that time, the limit switch 11 will be actuated by the adjustable stop lug 70 mounted on the carriage plate 56. The motor switch 3 will thus be opened, which of course will stop the operation of the timer motor 14 and the applicator motor 19.

At this time, the "down" switch 22 will be automatically opened, and the "up" switch 23 will be closed.

It will thus be seen that the timer motor 14 controls the successive operations of the auxiliary motor 15 merely on the down strokes, and that the timer motor will run only so long as the buffing wheel 7 is operated.

It will also be noted that the contacts 82a and 82b on the "down" switch 22 serve to introduce a shunt or "short circuit" across the terminals 85, 86 of the current relay 4. Also, when the switch 22 is open, the upper movable arm 82 will be connected with the wires 83, 84, and under these conditions the two contacts of the current relay 4 will be prevented from objectionable vibrations.

In the modified form of the invention shown in Fig. 9, the buffing wheel BW is mounted on a shaft 7E, having a pulley 7D, driven by a multiple belt 7B receiving power from a pulley 7C mounted on the shaft of an electric motor 7A.

It will be understood that wherever reference has been made to a "buffing" wheel in the specification and claims, this expression is to be construed as also covering polishing, grinding, scratch-brushing, burring, and other types of abrading wheels within the spirit and scope of the invention.

One advantage of the present invention is that the buffing wheel motor and the auxiliary motor are both mounted on the same head or frame, whereby they will be moved together as a unit

when the angular position of the buffing wheel is being adjusted.

A further advantage is the provision of apparatus for automatically throwing on the automatic buffing compound applicator and the timer motor whenever and only when the buffing wheel is rotating.

A still further advantage is that the buffing wheel motor can never become overloaded due to manual maladjustments and therefore the full use of said motor at its maximum rated horsepower will be permitted.

While there has been disclosed in this specification two forms in which the invention may conveniently be embodied in practice, it is to be understood that the invention is not to be limited to such forms, but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new and for which it is desired to obtain Letters Patent is:

1. In an automatic buffing machine, a bottom support frame, a post mounted in said frame and projecting upwardly out of the top thereof, a carriage for a motor-driven buffing wheel mounted for universal adjustment upon the top of said post, means within said frame for adjusting the elevation of said post, and other means in said frame for swinging said post within limits about a vertical axis.

2. A machine as defined in claim 1, in which the intermediate portion of said post is inclined so as to offset the buffing wheel carriage laterally substantially over the center of said support frame.

3. A machine as defined in claim 1, in which the intermediate portion of said post is inclined laterally and provided on its under surface with a reinforcing rib.

4. In an automatic buffing machine, a buffing wheel carriage, a bottom support frame, an up-standing post supported at its bottom end in said frame, means for varying the angular position of said post around a vertical axis, means to vary the elevation of said post, and means to mount said carriage universally upon the upper end of said post whereby said buffing wheel may engage the work at any desired horizontal, vertical, or angular position within limits.

5. In an automatic buffing machine, a support frame, a buffing wheel carriage mounted in said frame, a motor-driven buffing wheel mounted on said carriage, a carriage feeding auxiliary motor also mounted on said frame, timer means to cause said auxiliary motor to automatically drive said buffing wheel intermittently toward the work, means to stop said auxiliary motor when the pressure of said buffing wheel against the work attains a predetermined value so as to maintain said wheel in constant engagement with said work with a pressure varying within a limited range, a switch for reversing said auxiliary motor, and means for operating said switch when said buffing wheel is worn down to a predetermined diameter.

6. In an automatic buffing machine as defined in claim 4, the upper end of said post being provided with a transverse flange, an angle plate swiveled on said flange, said carriage being swiveled on said angle plate.

7. In an automatic buffing machine as defined in claim 4, wherein said buffing wheel carriage is

mounted to slide toward the work, and electrical apparatus for causing said carriage to be fed forward intermittently so as to maintain said buffing wheel in constant engagement with the work with a pressure varying within a limited range.

8. In an automatic buffing machine, a stationary supporting frame, a carriage slidably mounted in said frame, a motor-driven buffing wheel mounted on said carriage, a carriage-feeding auxiliary motor mounted on said frame, a motor-operated timer to start said auxiliary motor intermittently at predetermined cycles of time intervals, and means to stop said auxiliary motor when the pressure of said buffing wheel against the work attains a predetermined value so as to maintain said buffing wheel in constant engagement with said work with a pressure varying within a limited range.

9. In an automatic buffing machine as defined in claim 8 having a motor-operated applicator mechanism to automatically apply buffing compound to said buffing wheel, and unitary switch means for simultaneously starting and stopping said buffing wheel motor, said timer motor, and said applicator motor.

10. In an automatic buffing machine as defined in claim 8 having a motor-operated applicator mechanism to automatically apply buffing compound to said buffing wheel, unitary switch means for simultaneously starting and stopping said buffing wheel motor, said timer motor, and said applicator motor, and signal means for indicating to the operator when the rouge cake of said applicator requires renewal.

11. In a buffing machine, a sliding carriage, a motor-operated buffing wheel mounted on said carriage, an auxiliary motor, means driven by said auxiliary motor to slide said carriage and cause the buffing wheel to move closer toward the work being buffed, a timer-operated switch

for intermittently starting said auxiliary motor at predetermined cycles, a current relay in circuit with said buffing wheel motor, means responsive to the development of a predetermined rise of current in the buffing wheel motor circuit due to the increasing pressure of said wheel against the work, to operate said relay, means responsive to the operation of said relay to stop said auxiliary motor whereby said buffing wheel will be maintained in constant engagement with said work with a pressure varying within a limited range.

12. A buffing machine as set forth in claim 11, in which said auxiliary motor switch has a pair of fixed contacts, and means to connect said contacts across the terminals of said current relay whereby the relay will be deenergized when said auxiliary motor switch is opened, to permit said current relay to be reset rapidly after each operation thereof and to thus prevent the chattering of said relay.

13. In an automatic buffing machine unit, a stationary frame, a carriage slidably mounted in said frame, a rotating work-holding spindle, a motor-driven buffing wheel mounted on said carriage, an auxiliary carriage-driving motor mounted on said stationary frame, means to cause said auxiliary motor to intermittently and automatically drive said carriage toward the work at predetermined adjustable time intervals so as to maintain said buffing wheel in constant engagement with the work with a pressure varying within a limited range, and a current relay in circuit with the buffing wheel motor for temporarily stopping said auxiliary motor when the current in the buffing wheel motor circuit has risen to a predetermined value, and timer mechanism to thereafter start said auxiliary motor again at the end of a predetermined interval of time.

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