Feb. 2, 1960 E. E. OLSON ET AL 2,923,104

FINISHING APPARATUS

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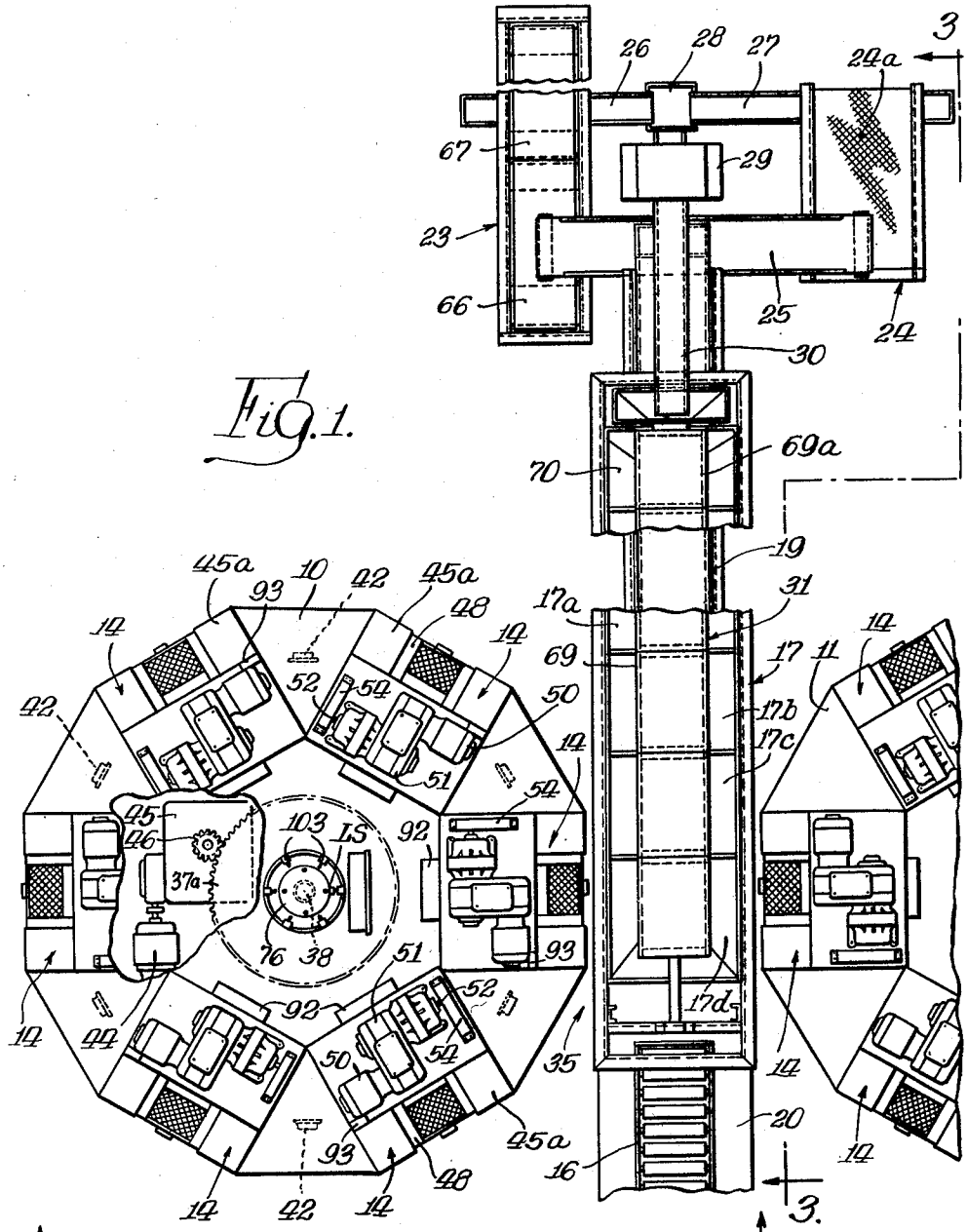


Fig. 1.

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Fig. 4.

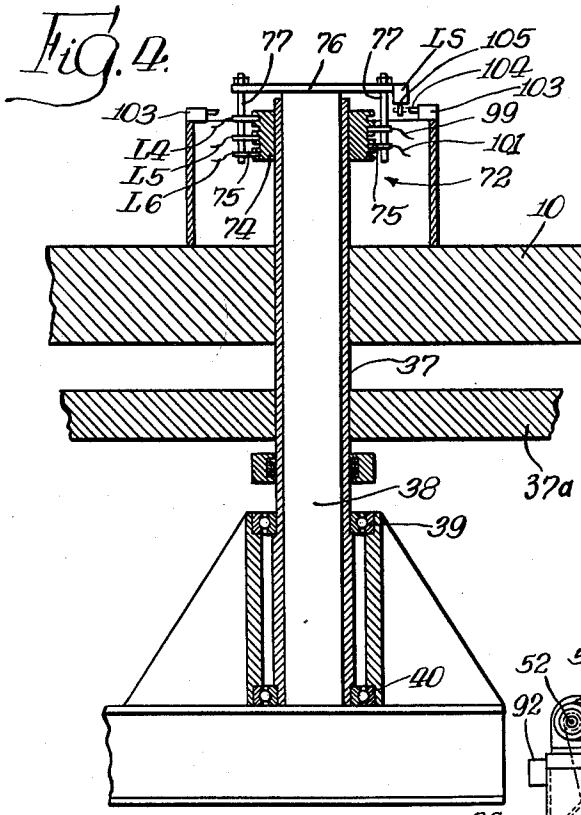


Fig. 2.

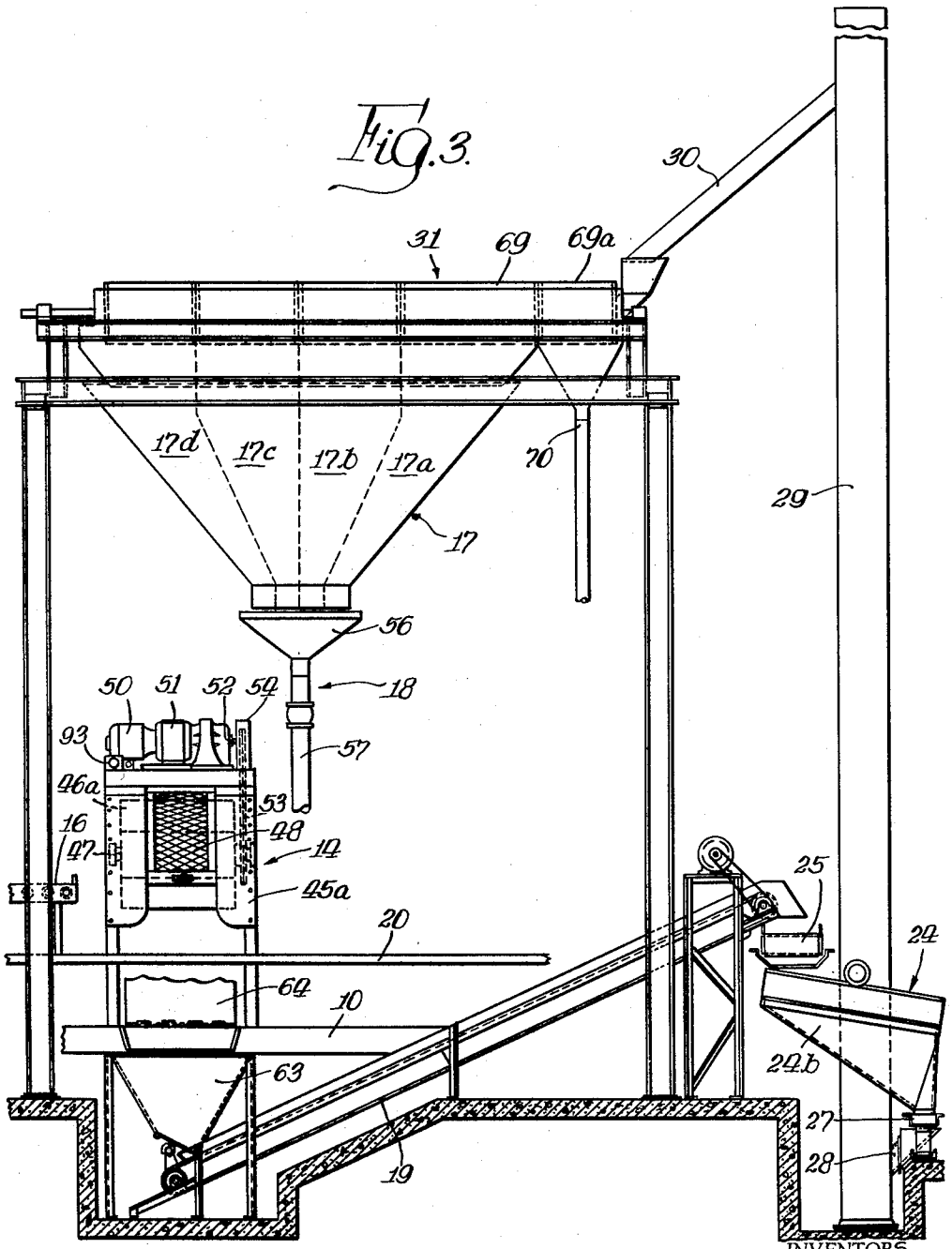
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FINISHING APPARATUS

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Fig. 3.



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FINISHING APPARATUS

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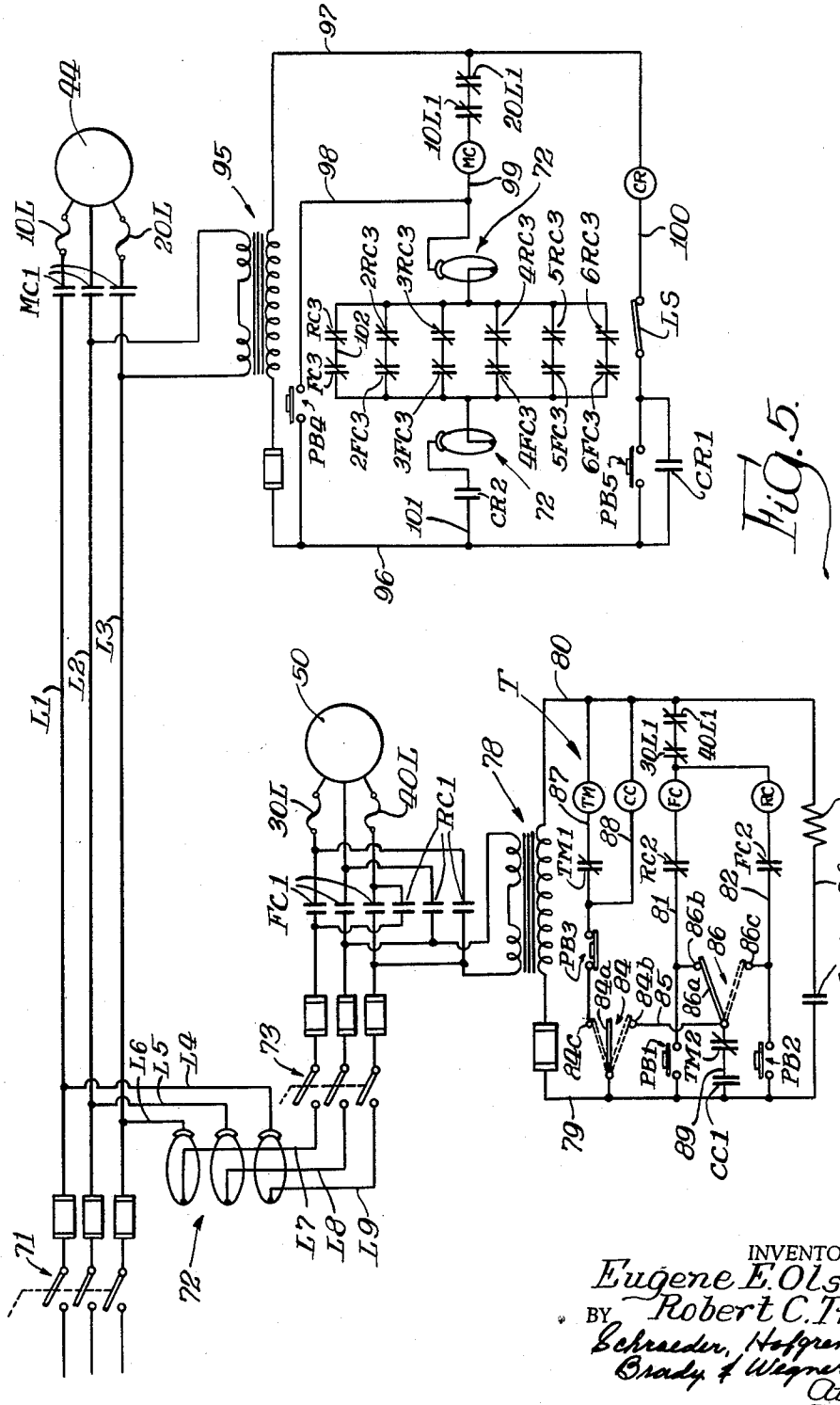


FIG. 5.

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FINISHING APPARATUS

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12 Claims. (Cl. 51—164)

This invention relates to finishing apparatus of the type employing a plurality of separate finishing machines for performing similar or dissimilar finishing operations on parts previously at least partially preformed.

It is a general object of the present invention to provide a new and improved apparatus of the character described.

In apparatus of the type described, the separate finishing machines may be of similar or dissimilar construction, and may be employed to perform similar or dissimilar finishing operations on similar or dissimilar parts. Under these circumstances, substantial economies in operation are realized if the separate machines are mounted for movement past a single loading and unloading station where the parts and any finishing media used may be placed in and removed from all machines at a single station. Such arrangements permit the provision of consolidated materials handling mechanism for conveying all materials to and from only a single station. But since the separate machines may perform different finishing operations, the different operations may require different periods of time for completion. For example, the finishing operation in the first loaded machine may require ten minutes, and the operation in the second loaded machine five minutes. Thus, in order to obtain maximum usage of the machines, it is not enough that the machines may be indexed successively to the unloading station, because a machine thus indexed to the unloading station may not have completed its operation, while other machines may have completed operations and be standing idle.

With the above and other considerations in mind, it is a more specific object of the invention to provide, in a finishing apparatus of the character described, a new and improved control for regulating the period of operation of the separate finishing machines and the movement of these machines to a loading and unloading station.

Another object is to provide a new and improved finishing apparatus including an indexable turntable having a plurality of finishing machines mounted thereon for operations of different time duration, and means for indexing the machine which first completes its operation to an unloading station.

Apparatus of the type described may include finishing machines of the barrel tumbling type for descaling, deburring, degreasing, burnishing, or the like, wherein parts to be finished and/or the finishing media are tumbled in a rotating barrel. Such machines may employ a variety of different finishing media for finishing similar parts or a variety of different parts.

It is also an object of the invention to provide, in finishing apparatus having a plurality of finishing machines all movable past a single loading and unloading station, a new and improved materials handling system for delivering parts and finishing media to and from the loading and unloading station.

Other objects and advantages will become readily apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary plan view of a finishing apparatus embodying the principles of the present invention;

Fig. 2 is a fragmentary front elevational view, partly in section, of the apparatus illustrated in Fig. 1, taken at about the line 2—2 of Fig. 1;

Fig. 3 is a side elevational view, partly in section, of the apparatus illustrated in Figs. 1 and 2, taken at about the line 3—3 of Fig. 1;

Fig. 4 is an enlarged, fragmentary sectional view taken at about the line 4—4 of Fig. 2; and

Fig. 5 is a wiring diagram illustrating electric circuits for controlling automatically the duration of operation of the various finishing machines and the indexing of the machines to an unloading station.

While an illustrative embodiment of the invention is shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, and particularly to Figs. 1, 2 and 3, as illustrated, the invention is embodied in a finishing apparatus which includes a pair of rotatable turntables 10 and 11, each having mounted thereon a plurality of barrel finishing machines 14 which may be of similar construction and of a type adapted for descaling, deburring, or the like, by tumbling the parts and/or finishing media in a rotating barrel. Parts to be finished are conveyed to a suitable station for loading into the various machines by means of a conveyor 16. The finishing media to be utilized in the finishing machines may be stored in a storage bin 17 (Fig. 3) and delivered to the various machines by delivery means generally designated 18. Upon completion of the finishing operations, the finished parts and the finishing media are delivered from the machines to a single conveyor mechanism 19 by which the parts and media are conveyed away for suitable disposal. A suitable operator's platform 20 may be provided adjacent the station at which the machines are loaded and unloaded.

A pair of separators 23 and 24 (Fig. 1) are provided for use alternatively to receive and separate finished parts and finishing media delivered from the machines 14. A cross conveyor 25 is provided to receive the parts and finishing media from the discharge conveyor 19 and to convey the same to either of the separators 23 and 24. At the separators 23 and 24 the parts and the finishing media are separated, the latter for return to the storage bin 17. The parts may be delivered from the separators to suitable parts conveyors (not shown), or they may be disposed of manually as desired.

Finishing media from the separator 23 is delivered to a cross conveyor 26, and media from the separator 24 is delivered to a cross conveyor 27. Both the conveyors 26 and 27 deliver the media to the boot 28 of a bucket type elevator 29 by which the chips are raised to an elevated position and delivered to a chute 30, and thence to a rotary classifier 31 for return to the storage bin 17.

Describing this general structure now in greater detail, the turntables 10 and 11 are arranged in spaced side by side positions to define between the tables a suitable area for use as a loading and unloading station generally designated 35 (Fig. 1). Since the construction of the two turntables 10 and 11 and the machines thereon may be similar in every respect, the construction of only the table 10 will be described in detail. Referring now par-

ticularly to Figs. 1, 2 and 4, the turntable **10** is supported at its center by means of a tubular trunnion **37** which is fixed in the table **10** and rotatable on a central post **38** and in bearings **39** and **40**. On its under side, adjacent the outer periphery, the turntable is provided with a plurality of circumferentially spaced anti-friction rollers **42** which rest upon and roll along a circularly arranged track **43** on rotation of the turntable.

Rotation of the turntable is effected by means of a table drive motor **44**, reduction gearing **45** including a drive gear **46**, and a large pinion **37***a* fixed on the trunnion **37** and meshing with the drive gear **46**. Suitable controls are provided for regulating the drive motor **44** as described more in detail hereinafter.

As the machines **14** utilized on both the tables **10** and **11** may all be similar in construction, only one of the machines will be described in detail. As best seen in Figs. 1, 2 and 3, each machine comprises a housing or guard structure **45***a* having a tumbling barrel **46***a* of suitable construction mounted therein for rotation as by having shaft end portions **47** for the barrel rotatably supported in the housing. Each of the housings **45***a* is provided with a suitable guard door **48** which substantially encloses the rotatable barrel against accidental contact by an operator during operation. The doors **48** may be opened manually to provide access to the barrels for loading and unloading, and each of the barrels may be provided with one or more suitable doors which provide access to the interior of the barrel for loading and unloading parts and any finishing media utilized.

Each of the machines **14** is provided with suitable variable speed drive means for the associated barrel, including a drive motor **50**, reduction gearing **51** and a drive shaft **52** having a chain and sprocket connection **53** to one of the shaft end portions **47** for the barrel. The chain and sprocket drive **53** is enclosed by a guard **54** seen in Figs. 1 and 3. Suitable control means are provided to control the operation of the drive motors **50** as described in detail hereinafter.

The turntable may be indexed by controls to be described to successively position the finishing machines **14** at the station **35**. Parts to be finished in the machines may consist of metal, plastic or other materials, and are delivered to the loading and unloading station **35** by the conveyor **16** previously referred to. The conveyor **16** is supported on the operator's platform **20**, as illustrated in Fig. 3, and the parts may be conveniently delivered to the operator at the station **35** in pans containing a lot to be finished and ready to be placed in the machine by the operator.

The finishing media may consist of chips of a plurality of different sizes for use in effecting different finishing operations. Accordingly, the media storage bin **17**, previously referred to, is divided into a number of separate compartments, four as illustrated, designated **17***a*, **17***b*, **17***c* and **17***d*. Chips from each of the compartments **17***a*, etc. flow to a common spout **56** having a flexible hose **57** adapted to reach each of the machines **14** on the two turntables when the machines are positioned at the loading and unloading station for delivery of the chips directly into the barrel of the machine. Flow of chips from the separate storage compartments may be controlled by suitable gate structures not illustrated.

If desired, one of the shaft end portions **47** for each of the barrels **46** may be of tubular form suitable for use in introducing water or other liquid compounds into the barrel for use in finishing or in flushing the barrel.

As seen best in Fig. 2, a suitable liquid drain pipe **59** having a pumping means **60** may be provided beneath each of the turntables at the loading and unloading station **35**. Liquid from the barrel of a machine positioned at the station **35** may be discharged from the barrel through suitable door structure previously referred to and directed by a deflector **61** and drain spout **62** to the drain pipe **59**.

Parts and media are discharged simultaneously from a machine positioned at the station **35** through the door structure previously described. The parts and media are directed from the barrel to a collection hopper **63** by means of a deflector **64** movable from a shielding position **64***a* (Fig. 2) to an operative deflecting position **64***b*. The collecting hopper **63** is open at the bottom and serves to deliver the finished parts and media to the conveyor **19** previously referred to. The conveyor **19** may be cleated and of a conventional construction. It delivers the parts and media upwardly and rearwardly of the apparatus to ultimately discharge the parts and media to the cross conveyor **25**. The cross conveyor **25** may be provided with suitable controls for operation in either a forward or reverse direction to deliver the parts and chips to either the separator **23** or the separator **24**.

The separator **23** is a magnetic separator utilized for separating the parts from the chips when the parts consist of magnetic material such as a number of metal materials. The chips usually consist of crushed rocks. The separator **23** includes a first conveyor belt **66** onto which the parts and chips are discharged by the conveyor **25**. A second magnetized conveyor belt **67** serves to lift the metallic parts from the finishing media and to deliver such parts rearwardly of the apparatus. The chips left on the conveyor **66** are delivered to the cross conveyor **26**. The separator **24** is of the vibrating screen type which serves to sift out the finishing media through a screen **24***a*, leaving the parts on the screen for movement rearwardly of the apparatus. Chips passing through the screen fall into a chute **24***b* and are directed to the cross conveyor **27**. The separator **24** is utilized when the parts are of non-magnetic material.

Chips from either of the cross conveyors **26** or **27** are delivered to the elevator **29**, and thence to a rotary classifier **31**. The rotary classifier **31** may be of conventional construction and includes an elongated cylinder **69**, constructed of a perforated material such as screen, rotatably mounted, and provided with suitable drive means (not shown). The rotary classifier cylinder **69** is divided axially into five sections, the first section **69***a* being constructed to separate out the chips of smallest size and of a size too small to be of further use as finishing media. These chips are delivered to a collector **70** for suitable disposal. The remaining four sections of the cylinder **69** successively sift out the chips which pass to the compartments **17***a*–**17***d*, the smallest chips passing to the first compartment and the largest to the last.

The circuit for controlling the turntable motors and the finishing machine motors is illustrated in Fig. 5. In order to simplify the disclosure, the circuit of Fig. 5 includes only one of the turntable motors **44** and one of the finishing machine motors **50**. It will be readily understood that similar controls may be provided for the other turntable and that these may be interlocked with or separate from the controls illustrated. In like manner, it will be appreciated that similar controls may be provided for the other finishing machine motors.

The turntable motor **44** is supplied from a three phase power source including lines **L1**, **L2** and **L3**, a fused master switch **71**, and relay controlled switch contacts **MC1**, the lines **L1** and **L3** having overload windings **10L** and **20L** respectively.

The finishing machine motor **50** is supplied with power through lines **L4**, **L5** and **L6** leading from the lines **L1**, **L2** and **L3**, to a collector ring and brush assembly **72**. Lines **L7**, **L8** and **L9** lead from the ring and brush assembly to the motor **50** and include a fused control switch **73**, relay controlled switch circuits **FC1** and overload windings **30L** and **40L**. Forward operation of the motor **50** is obtained by closure of the contacts **FC1**, and reverse rotation of the motor **50** is obtained by closure of reversely wired relay controlled switch contacts **RC1**.

Referring also to Fig. 4, the collector ring and brush assembly **72** includes a collector ring **74** fixed on the

rotatable table trunnion 37 and having a plurality of brushes 75 fitted in grooves on the ring and stationarily mounted. The brushes are supported by means of a mounting plate 76 secured to the upright 38 and provided with suitable bolts 77 which support the brushes 75. Lines L4, L5 and L6 lead to three of the brushes 75, and lines L7, L8 and L9 lead from the collector ring 74.

As previously noted, operation of the finishing machine motor 50 is controlled by operation of the contacts FC1 and RC1. These contacts are controlled by a control circuit which includes a transformer 78 having its primary connected with the lines L7, L8 and L9, and secondary connected to wires 79 and 80.

The motor 50, under control of the contacts FC1 and RC1, is subject to three different modes of operation. Firstly, the motor may be "jogged" to properly position the rotatable barrel 46*a* associated therewith so that the door structure provided is accessibly positioned for loading or unloading. Secondly, the entire cycle for the motor 50 to complete a finishing operation in the associated machine may be manually controlled. That is, the motor may be manually started, allowed to operate for a period of time, and then manually stopped. Thirdly, the motor is subject to automatic control for completing a finishing operation. That is, the motor may be manually started, automatically timed for a period of preselectable duration, and automatically stopped.

In order to operate the motor 50 in any of the three fashions described, assuming the circuit is in the condition illustrated, the master switch 71 must be closed, and the control switch 73 closed to supply a potential at the normally open contacts FC1 and RC1. If it is desired to jog the motor forwardly, a normally open push button switch PB1 is manually depressed by the operator. This completes a circuit through a wire 81 to relay coil FC, energizing this coil and closing the normally open contacts FC1 to energize the motor forwardly. When the switch PB1 is released, the coil FC is deenergized, opening the contacts FC1 and deenergizing the motor 50.

If it is desired to jog the motor 50 reversely, in similar fashion, a push button switch PB2 in wire 82 is depressed. This completes a circuit to the control relay coil RC, energizing this coil and effecting closure of the contacts RC1 to energize the motor reversely. On release of the switch PB2, the motor 50 is deenergized. In wire 81, normally closed contacts RC2 which open when the coil RC is energized, insure that the coil FC may not be energized when the coil RC is energized. Similarly, in wire 82, normally closed contacts FC2 are opened when the coil FC is energized to prevent energization of the coil RC. Normally closed contacts 30L1 and 40L1 in wire 81 open in response to an overload current in the windings 30L and 40L respectively to prevent damage when the motor 50 is overloaded.

Manual operation of the motor 50 for a complete cycle is controlled by a manually operable "manual-automatic" switch 84. In order to operate under manual control, a movable switch contact 84*a* is closed against a stationary switch contact 84*b* to complete a circuit through a wire 85 to a manually operable "forward-reverse" switch 86. The switch 86 includes a movable contact 86*a* which may be closed against a stationary contact 86*b* or a stationary contact 86*c* depending on whether forward or reverse operation of the motor 50 is desired. Closure of both switches 84 and 86 as described initiates operation of the motor 50 by energizing one or the other of the coils FC or RC. After the desired period of time has elapsed, the motor 50 may be stopped by opening the switch 84.

Automatic operation of the motor 50 is obtained by closing the movable switch contact 84*a* against a stationary contact 84*c*. This serves to energize a timer which initiates operation of the motor 50, controls the length of operation, and automatically stops the motor 50.

The timer includes a timer motor TM in a wire 87 connected across the wires 79 and 80. The motor TM is connected through reduction gearing (not shown) and a clutch (not shown) to drive cams (not shown) for controlling switch contacts in the control circuit. The clutch referred to is controlled for energization by a clutch coil CC in a wire 88 in parallel with the timer motor TM. The timer construction is conventional and may be adjusted so as to permit the selection of a desired period of operation for the motor 50.

On closing the movable switch contact 84 against the contact 84*c*, a circuit is completed through the wire 87 to energize the timer motor TM. At the same time, the clutch coil CC is energized, engaging the timer clutch and initiating rotation of the cams referred to to begin the timing operation. Energization of the clutch coil CC also effects closure of normally open switch contacts CC1 in a wire 89 leading from the wire 79 to the "forward-reverse" switch 86. Closure of the contacts CC1 serves to energize one of the coils FC or RC, depending on the position of the switch 86, to initiate operation of the motor 50. After lapse of the preselected time, the timer cams serve to open normally closed switch contacts TM1 in wire 87, deenergizing the timer motor TM. At the same time, normally closed switch contacts TM2 in wire 89 are also opened to deenergize the coil FC or RC, thus deenergizing the finishing machine motor 50. Simultaneously, the timer cams also effect closure of normally open contacts TM3 in a wire 90 to effect energization of a solenoid winding 91 for a purpose described more in detail hereinafter.

After the machine has completed its finishing operation and "timed out," as described above, the turntable is indexed to move the timed out machine to the loading and unloading station where the parts and media are removed, and the machine reloaded. After the machine is reloaded, the circuit may be reset for automatic operation again by depressing a "reset" push button switch PB3 in wire 87. Depression of the switch PB3 serves to open the contacts, deenergizing the clutch coil CC, and releasing the timer cams for return, as by springs, to starting position. Return of the cams to starting position also effects return of the switch contacts TM1 and TM2 to the normally closed positions, and return of the contacts TM3 to the normally open position.

The control circuit described above leading from the ring and brush assembly 72 for controlling the motor 50 may be housed on the machine 14 in a wiring box 92 (Fig. 1), and the switches for controlling the circuit may be mounted on a readily accessible control panel 93 mounted atop the machine housing 45. Circuits for controlling the other machines on the turntable would be connected to the lines L7, L8 and L9 between the ring and brush assembly 72 and the control switch 73 and would include components similar to those contained in the circuit described beyond the ring and brush assembly.

The operation of the turntable motor 44 is controlled by operation of the normally open relay controlled switch contacts MC1 in the lines L1, L2 and L3. The contacts MC1 are operated under control of a control circuit which includes a transformer 95 having its primary connected across the lines L2 and L3, and its secondary connected to wires 96 and 97.

In automatic operation of the apparatus, utilizing the circuits illustrated for automatically controlling the finishing machine motors and the turntable motors, the procedure normally followed is to manually index the turntable to successively position the various machines at the loading station 35. As each machine is loaded, it is set to perform an automatic cycle of operation as described above, after which the succeeding machine is indexed to the loading station. Manually controlled indexing of the turntable is effected by depressing a normally open push button switch PB4 in a wire 98. Closure of the switch PB4 serves to complete a circuit to a con-

trol relay coil MC in a wire **99**, energizing this coil and effecting closure of its normally open contacts MC1 to energize the turntable motor **44**. When the desired finishing machine reaches the loading station, the switch PB4 is relased and the turntable motor stops. After the machine at the loading station is loaded and set for automatic operation, the turntable is again indexed to position the succeeding machine. These steps are repeated until all machines are loaded.

After all the finishing machines **14** on the turntable have been loaded, the operator presses a normally open "all clear" push button switch **PB5** in a wire **100**. This serves to set the controls to automatically index the turntable to position the machine which first completes its finishing operation at the loading and unloading station **35**.

When the switch PB5 is closed, a circuit is completed through wire **100** to energize a control relay coil CR. Energization of the coil CR serves to close its normally open switch contacts CR1 in parallel around the switch PB5 to provide a holding circuit for maintaining the coil CR in an energized state when the switch PB5 is released. Energization of the coil CR also serves to close its normally open switch contacts CR2 in a wire **101** in circuit with the motor control coil MC. When the timer runs out in the first machine to complete its finishing operation the coil FC or RC controlling the machine motor **50** is deenergized, as previously described. Deenergization of the coil FC or RC effects closure of the normally closed switch contacts FC3 or RC3 controlled thereby and located in a wire **102** connected in series circuit with the wires **99** and **101**. A circuit is thereby completed to energize the coil MC, closing its contacts MC1 and energizing the turntable index motor **44** to initiate indexing movement of the turntable. Thus, assuming the "all clear" switch PB5 has been depressed, the turntable will automatically index upon the completion of the finishing operation in any machine to index that machine to the unloading station.

The indexing movement of the turntable is automatically terminated by deenergizing the motor **44** to position the proper machine at the unloading station. Stoppage is effected by opening a normally closed limit switch LS in the wire **100** to deenergize the coil CR. Deenergization of this coil causes the contacts CR2 in wire **101** to open, deenergizing the coil MC. The limit switch LS may be actuated by any one of a plurality of switch actuating means provided on the turntable, one switch actuating means associated with each of the finishing machines. Each of the switch actuating means **103** may comprise a solenoid operated switch actuating plunger **104** (Fig. 4) which is normally disposed in a retracted position. The plunger is controlled by the solenoid winding **91** (previously referred to) in the wire **90** and is energized upon closure of the contacts TM3 when the timer for the associated machine runs out. Energization of the winding **91** serves to extend the switch actuating plunger **104** to an advanced position wherein it is engageable with a switch actuating member **105** for opening the limit switch LS on movement of the turntable and the switch actuating means **103** angularly to the position of the limit switch LS. The physical location of the limit switch LS is illustrated in Figs. 1 and 4.

Each of the wiring boxes **92** and the switch panels **93** includes similar circuitry for each of the machines, and each of these circuits includes contacts FC3 and RC3 in series circuit with the motor control coil MC. The contacts FC3 and RC3 for each of the six machines on a turntable are wired in parallel circuits as illustrated in Fig. 5 and have been identified by prefixing the designation FC3 and RC3 with the numerals **2**, **3**, etc. for the second, third, etc. finishing machines. Thus, upon completion of the finishing operation in any of the machines, the turntable will be automatically indexed to position that machine at the unloading station. The contacts FC3 and RC3, 2FC3 and 2RC3, etc., are located in the wiring boxes **92** associated with the machines on the turntable, and are connected in the turntable control circuit by means of the ring and brush assembly **72** as illustrated in Figs. 4 and 5.

Operation of the turntable to automatically index upon the completion of a machining operation in one of the machines is dependent, as described, upon an operator having previously depressed the all clear switch PB5. If, however, the operator has not completed the initial loading of all the machines by the time that one machine completes its finishing operation, the "all clear" switch PB5 will not have been depressed. Thus, closure of the contacts FC3 or RC3 in circuit with the relay MC will not be effective to energize the coil MC until such time as the operator has completed the loading of the machines and depresses the all clear switch PB5. When the switch PB5 is depressed, the coil CR is energized, closing the contacts CR2, energizing the coil MC and the turntable motor **44** to index that machine which has completed its finishing operation to the loading and unloading station.

When all of the machines **14** have been initially loaded and set for automatic operation for periods of predetermined duration, the operator presses the all clear switch PB5. This serves to energize the coil CR, which closes its contacts CR2 in wire **101**. Thus, when the timer runs out in the first machine to complete its finishing operation, say for example, the first machine which was loaded, the coil FC or RC controlling the machine motor **50**, is deenergized, as previously described. Deenergization of the coil FC or RC allows the normally closed contacts FC3 or RC3 to close and thereby complete a circuit energizing the turntable motor coil MC. Energization of the coil MC effects closure of the contacts MC1 to energize the turntable motor **44** and automatically index the idle machine to the loading and unloading station in the manner previously described.

If, during the time the operator is unloading and reloading the machine positioned at the station **35**, another machine, say the second loaded machine, completes its finishing operation, its timer runs out permitting closure of the contacts 2FC3 or 2RC3. But, since the operator has not completed the unloading and reloading of the first machine, the all clear switch PB5 will not have been depressed. Thus, no circuit is completed at this time to the turntable motor coil **44** and the turntable is not indexed. When the reloading of the first machine has been completed, the operator depresses the all clear switch PB5, energizing the coil CR and closing the contacts CR2. A circuit is then completed through the contacts 2FC3 and 2RC3 effecting energization of the turntable motor to automatically index the second machine to the loading and unloading station.

If, while the operator is still reloading the first machine, two additional machines complete their finishing operations, say the second and third machines, this will effect closure of contacts 2FC3 and 2RC3 and also the contacts 3FC3 and 3RC3. Now, when the operator completes the reloading of the first machine and pushes the all clear switch PB5, the turntable will be automatically indexed to position at the station **35** the first of the idle machines to arrive at the station. This occurs by virtue of the fact that each of the machines **14** includes a switch actuating member **104** for energizing and opening the limit switch LS to stop the turntable motor. Thus, the second machine will be next positioned at the station **35**. When the reloading of the second machine is completed, and the all clear switch PB5 is again closed, the third machine will then be automatically indexed to the station **35** in the manner described since the contacts 3FC3 and 3RC3 remain closed to initiate the turntable indexing.

While the invention has been illustrated in connection with a finishing apparatus including barrel finishing ma-

chines for tumbling the parts and/or the finishing media, it will be appreciated that the principles of the invention are not necessarily confined to these machines, but may have application in other apparatus as well.

We claim:

1. A finishing apparatus, comprising, in combination, at least three separately operable finishing machines, separate means for controlling the operation of each of said finishing machines for preselected periods of time, means mounting said finishing machines for movement to and from an unloading station, means for moving the machines successively past the unloading station, and means responsive to each of said control means for initiating operation of said moving means to move the machine which first completes its operation to the unloading station.

2. A finishing apparatus, comprising, in combination, at least three separate finishing machines each having a separate drive means, separate manually operable means for initiating operation of each of the drive means, separate means for determining the duration of the period of operation of each drive means and for stopping the drive means, means mounting the machines for movement to an unloading station, means for moving the machines to the unloading station, and means responsive to each of said stopping means for controlling operation of said moving means to move the machine which first completes its finishing operation to the unloading station.

3. A finishing apparatus, comprising, in combination, three or more separate barrel finishing machines each having a separate drive motor, separate manually operable switch means for initiating operation of the associated motor, and separate adjustable timer means for deenergizing the associated drive motor, means mounting the machines for movement past a single unloading station, means for moving the machines successively past the unloading station; means responsive to each of said timers upon completion of a finishing operation for initiating operation of said moving means to move the machine which first completes its finishing operation to the unloading station, and means responsive to each of said timers and to the positions of said machines for stopping the moving means with the proper machine at the unloading station.

4. A finishing apparatus, comprising, in combination, a plurality of separate finishing machines, an endless carrier having the machines mounted thereon, means for driving the carrier to move the machines past a loading and unloading station, manually operable means for controlling operation of said driving means to successively position the machines at the loading and unloading station for loading; means for controlling the machines to operate separately and simultaneously and for different periods of time, and means responsive to each of the machines upon completion of its finishing operation for controlling operation of the driving means to automatically move the carrier to position the machine which first completes its finishing operation at the loading and unloading station for unloading.

5. A finishing apparatus, comprising, three or more separate finishing machines, separate means for controlling respectively the operation of each of said machines, a turntable having the machines mounted thereon, a drive motor for moving the turntable to move the machines successively past an unloading station, means responsive to each of said control means for initiating operation of the drive motor upon completion of the finishing operation in any machine to move the turntable for moving said machine to the unloading station, and means responsive to each of said control means and to movement of said turntable for stopping the drive motor to position said machine at the unloading station.

6. A finishing apparatus, as defined in claim 5, including switch means adjacent the turntable actuatable to deenergize the drive motor, and separate switch actuating means mounted on the turntable, one associated with each machine, responsive to the associated control means and positionable at the completion of the finishing operation of the associated machine to engage and actuate said switch means on movement of the turntable.

7. A finishing apparatus, comprising, in combination, at least three separate finishing machines, separate control means, one associated with each of the machines, each manually operable to initiate operation of the associated machines for a preselectable length of time, a turntable having said machines mounted thereon, drive means for indexing the turntable to move the machines past a loading and unloading station, a circuit controlling energization of said drive means, first switch means in said circuit responsive to each of said control means and operable upon completion of the finishing operation in any machine for completing a circuit to energize the drive means for indexing said machine to the loading and unloading station, and second switch means in series with the first switch means in said circuit and closable under manual control before or after said first switch is closed, so that indexing depends upon closure of both switch means.

8. A finishing apparatus, as defined in claim 7, including means responsive to movement of said machine to the loading and unloading station for opening the second switch means to deenergize said drive means.

9. A finishing apparatus, comprising, at least three separate barrel finishing machines, separate manually operable means for initiating operation of said machines for preselectable periods of time, separate means for stopping the operation of said machines, a carrier having said machines mounted thereon for movement to a loading and unloading station, drive means for the carrier, manually operable means for controlling said drive means to index the machines successivey to said station for loading, means responsive to each of said stopping means for controlling operation of said drive means to automatically index any machine which first completes its finishing operation to said station, and means responsive to said stopping means and to movement of said carrier for stopping said drive means to position said machine at said station for unloading.

10. A finishing apparatus, comprising, a plurality of barrel finishing machines, a carrier having the barrel finishing machines mounted thereon, drive means for indexing the carrier, manually operable means for controlling the carrier drive means to index the machines successively to a loading and unloading station for loading, conveyor means for delivering parts to be finished to said station, delivery means for delivering finishing media to the machines while positioned at said station, a plurality of separate control means, one associated with each machine and each operable to initiate operation of the associated machine for a preselectable length of time, means responsive to each of said control means and effective when the finishing operation in any machine is complete to control said drive means to index said machines to said station for unloading; and conveyor means for receiving parts and finishing media from the machines while positioned at said station.

11. A finishing apparatus, comprising, in combination, at least three separately operable barrel finishing machines, separate means for controlling the operation of the machines for preselectable lengths of time, means mounting the machines for movement to and from a loading and unloading station, means for moving the machines successively past said station, means responsive to each of said control means for controlling operation of said moving means to move the machine which first completes its finishing operation to said station, and means for delivering parts to be finished and finishing media to and from said station.

12. A finishing apparatus, comprising, three or more separate barrel finishing machines, separate means for controlling the operation of said machines for preselect-

table periods of time, a turntable having the machines mounted thereon, a drive motor for indexing the turntable to move the machines successively past a loading and unloading station, means responsive to each of said control means for initiating operation of the drive motor upon completion of the finishing operation in any machine to index the turntable for moving said machine to said station, means responsive to each of said control means and to movement of said turntable for stopping the drive motor to position said machine at said station, conveyor means for delivering parts to be finished to said station, delivery means for delivering finishing media to said machines while positioned at said station, a single conveyor means for receiving both parts and

finishing media from said machines while positioned at said station, means for separating finished parts and finishing media, and means for returning said finishing media to said delivery means.

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