Nov. 24, 1959 P. A. SOLEM 2,913,853

ENDLESS BED TYPE METAL SURFACE FINISHING MACHINES

Filed Aug. 24, 1955 4 Sheets-Sheet 1

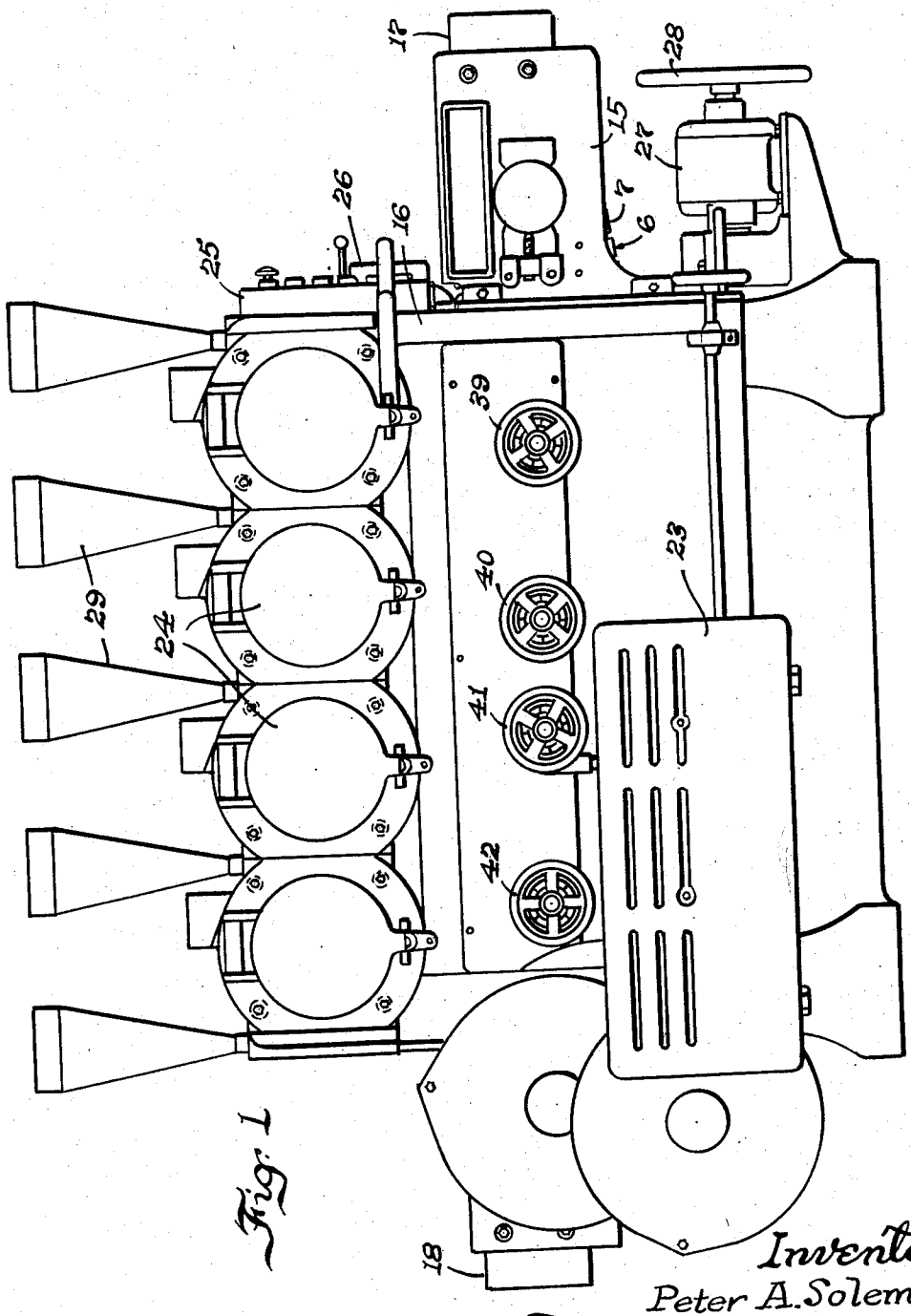


Fig. 1

Inventor
Peter A. Solem
Andrew F. Wintercorn
Atty

Nov. 24, 1959 P. A. SOLEM 2,913,853

ENDLESS BED TYPE METAL SURFACE FINISHING MACHINES

Filed Aug. 24, 1955 4 Sheets-Sheet 2

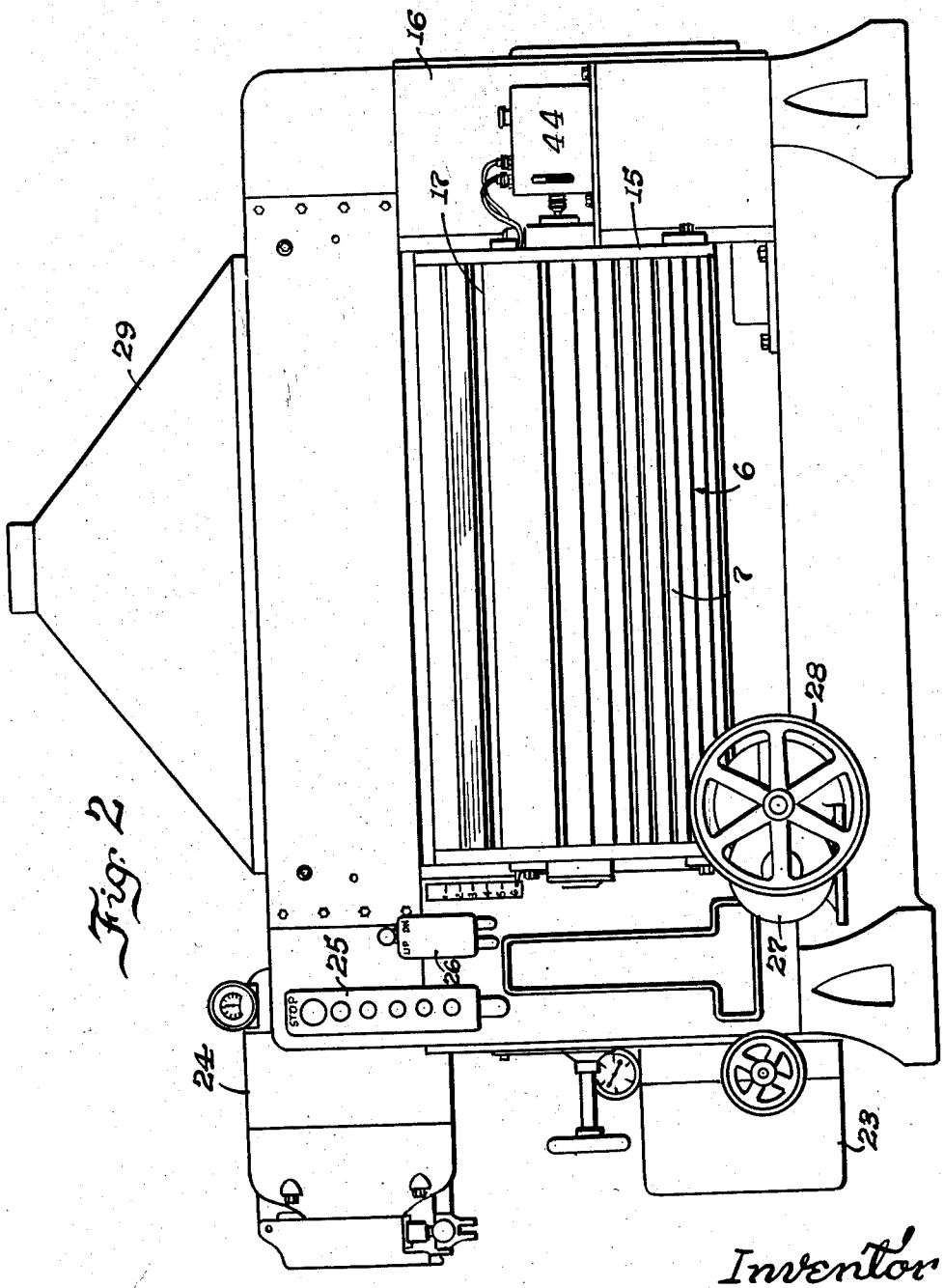


Fig. 2

Inventor
Peter A. Solem
Andrew F. Wintercorn
Atty

Nov. 24, 1959 P. A. SOLEM 2,913,853

ENDLESS BED TYPE METAL SURFACE FINISHING MACHINES

Filed Aug. 24, 1955 4 Sheets-Sheet 3

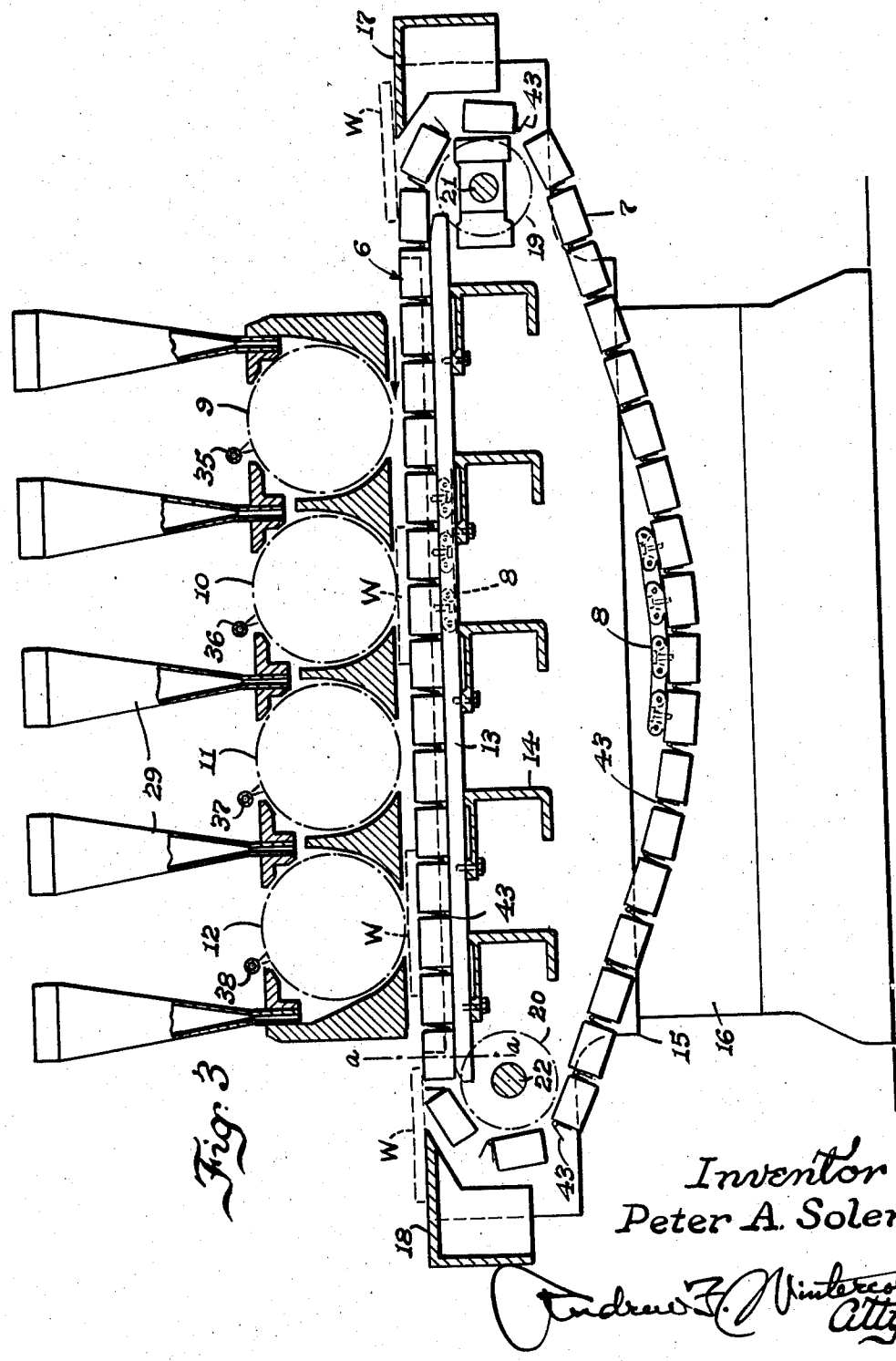


Fig. 3

Inventor
Peter A. Solem
Andrew F. Wintercorn
Atty

Nov. 24, 1959 P. A. SOLEM 2,913,853

ENDLESS BED TYPE METAL SURFACE FINISHING MACHINES

Filed Aug. 24, 1955 4 Sheets-Sheet 4

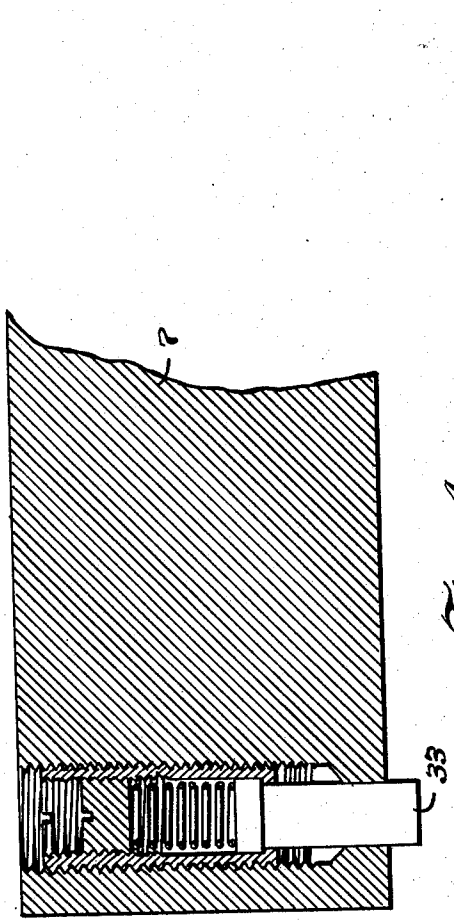


Fig. 5

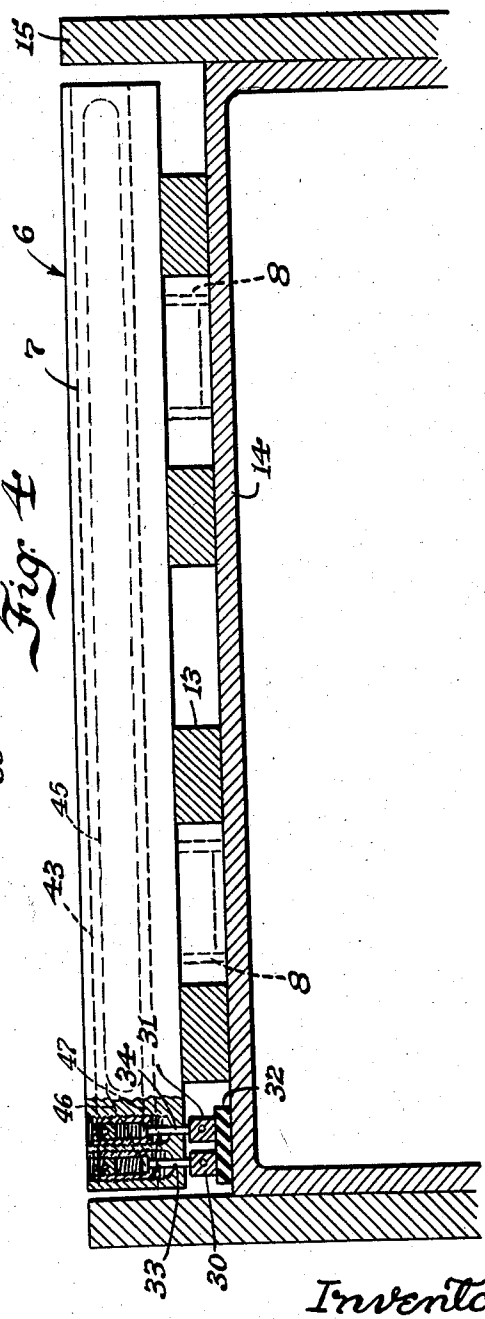


Fig. 4

Inventor
Peter A. Solem
Andrew F. Wintercorn
Atty

United States Patent Office 2,913,853 Patented Nov. 24, 1959

2,913,853

ENDLESS BED TYPE METAL SURFACE FINISHING MACHINES

Peter A. Solem, Rockford, Ill.

Application August 24, 1955, Serial No. 530,340

18 Claims. (Cl. 51—5)

This invention relates to endless bed type metal surface finishing machines and, more specifically, one in which the endless bed carries magnetic chucks on the links thereof that are arranged to be automatically energized as they ride upon one end of the bed slides and de-energized when they leave said bed slides at the other end of the bed. The "surface finishing" referred to may be a light milling operation, surface grinding, or any other similar operation, depending upon how much metal is to be removed in one pass of the work under the one or more rotary heads or drums and the nature of the drums employed or the finishing material provided thereon, the object being to make available in this machine as nearly as possible the same high production output of an endless bed sander used heretofore only in wood-working in the milling, surface grinding, or other finishing on a wide range of small, medium, and large metal parts in what are commonly referred to as production jobs, where with one setup of the machine many parts of the same width or miscellaneous widths but of a given thickness may be fed through the machine.

The invention is illustrated in the accompanying drawings, in which—

Figs. 1 and 2 are a side view and end view, respectively, of an endless bed type metal surface finishing machine made in accordance with my invention;

Fig. 3 is a longitudinal section through the machine;

Fig. 4 is a cross-section showing a typical magnetic chuck, and

Fig. 5 is an enlarged sectional detail of one of the brushes.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawings, I have illustrated a machine having an endless work feeding bed or carrier indicated generally by the reference numeral **6** that is similar in general appearance to those used in the well known Solem sanding machines but having the slats or cross-bars **7** that are linked together on a pair of chains **8** in the form of elongated magnetic chuck bars, instead of being ordinary slats or cross-bars each designed to carry a row of the usual molded rubber traction blocks, the chuck bar bodies themselves forming the slats or cross-bars. The present invention contemplates magnetically holding one or more metallic work-pieces W on the endless bed **6** during their passage through the machine in a light milling operation, surface grinding, or other comparable operation, in contrast to the combined friction and suction cup hold afforded by the rubber traction blocks on wooden work-pieces to be sanded in the Solem sanders in the past. Any one of the circles numbered **9**, **10**, **11** and **12** is therefore not to be confused as representing a sander drum, as in a Solem sander, but is here to be understood as representing either a milling cutter, a grinding wheel, or a drum covered like a sanding drum but with heavy duty metal working abrasive cloth, depending upon the work being handled and the specific surface finishing being given on the metal work pieces.

Thus, wheel or drum **9** may, for example, be a grinding wheel or wheels set to grind to an initial depth, **10** being set to grind to a further depth, **11** being set to grind to a still further depth, and **12** being set to grind to the final depth desired. On the other hand, **9** may be a milling cutter to perform a light milling operation, **10** a grinding wheel to do a follow-up grinding operation, and **11** and **12** abrasive drums to do follow-up surface smoothing and finishing operations. On the other hand, units **9** and **10** may, for example, be grinding wheels set to grind to an initial depth and to a further depth, respectively, while units **11** and **12** are abrasive drums, one relatively coarse and one relatively fine for smoothing the freshly ground surfaces of the work-pieces. Or, unit **9** may be a grinding wheel, while units **10–12** are abrasive drums doing follow-up coarse, medium, and fine finishing operations, respectively. Or all four or only the first two or three of units **9–12** may be abrasive drums while the final one (or two) does a polishing, rubbing, or buffing operation. Various other combinations will readily occur to those skilled in the art to which this invention relates.

The chuck bars **7** run on spaced parallel bed slides **13** extending lengthwise of the machine under the units **9–12** in crosswise relationship to girts **14**. The latter are fastened at their ends in the bed frame **15** that is vertically adjustable on ways provided on the opposite sides of the machine main frame **16**. The bed **6** is accurately adjusted to and locked in the proper elevation relative to units **9–12** according to the thickness of the work-pieces W to be processed. These are fed in over table **17** at one end and are removed from table **18** at the other end. Sprockets **19** and **20** mesh with chains **8** and are provided on cross-shafts **21** and **22** at opposite ends of the bed frame **15**, and an electric motor is provided in housing **23** to furnish the drive to shaft **22** through suitable reduction gearing. Other electric motors **24** are provided, one for each of the units **9–12**, to drive the same at predetermined speeds. Variable speed drive for the units **9–12** is provided for in this machine similarly as in the Solem sanders, and infinitely adjustable feed speeds for the feed bed **6**. The control panel with push buttons on it for control of all of the motors is indicated at **25** on the front end of the machine. A separate control box **26** is provided associated with motor **27** for power adjustment of the bed frame **15** up or down. Fine adjustment can be made with hand-wheel **28**. Hoods **29** serve to conduct dust away from between the units **9–12**, there being enough of these hoods, as seen in Fig. 3 so that suction is at work on both sides of each drum to carry off dust and keep the machine operating clean.

In operation, bus bars **30** and **31** are mounted longitudinally of one side of the bed frame **15** in spaced parallel relation on insulation **32** and they are suitably connected with a source of low voltage direct current. The chuck bars **7** each have spring-pressed brushes **33** and **34** slidable on bars **30** and **31** to connect the windings **45** in the bars with the current source as the bars **7** ride up onto slides **13** at the infeed end **17**, and disconnect the windings automatically as the bars **7** ride off the slides **13** at the outfeed end **18**. When the bars reach the outgoing end of slides **13**, as when they reach the position indicated by line *a—a* in Fig. 3, the chuck bars **7** are de-energized by a brief reversal of current through their windings **45** in a well known way so that the work W is freed and can be removed easily. It has not been deemed necessary to illustrate the internal construction of the magnetic chuck bars **7** inasmuch as magnetic chucks are well known and any suitable or preferred design, such as that manufactured by Sundstrand Magnetic Products Co. of Rockford, Illinois, can be used. It is, therefore, considered sufficient to illustrate an energizing coil or winding di-

agrammatically at 45, connected as shown at 46 and 47 with brushes 33 and 34, respectively. The work-pieces W may be plates or castings, gears, or any one of a large variety of small, medium size, or large pieces requiring surface grinding or other similar work. The work-pieces may be clamped directly or with adaptors, because the chucks have such deep penetration to work easily through an adaptor. It will, of course, be understood that the showing herein of four units 9–12 is not to be taken as placing any limitation whatsoever upon the present invention, inasmuch as in some machines only one, or two, or three units might be employed, whereas in others a greater number might conceivably be required, depending, of course, upon the kind of work to be done. Also, while most grinding operations are done dry, the present machine is well adapted for wet grinding, it being only necessary to supply water or other liquid through pipes indicated at 35–38 in Fig. 3, extending parallel to and above the units 9–12, respectively, to spray the liquid on said units all along the length thereof. Separate supply lines and separate valves will be provided to control the delivery of water or other liquid sprayed from each of these pipes, to obtain the desired results and permit delivering the special kind of liquid to each unit that that unit requires. The liquid supplied, for example, through pipe 35 will be a cutting fluid in the event unit 9 is a milling cutter. If unit 10 is another milling cutter, the same will, of course, be true of the liquid then delivered through pipe 36. Separate hand-wheels 39–42 are provided on the side of the machine, as seen in Fig. 1, for manual adjustment up and down of the units 9–12, respectively, similarly as for the drums in the Solem sanders. In conclusion, attention is called to the elongated V-shaped leaf spring trough strips 43, one of which is attached by its one edge portion to the back of each chuck bar 7 longitudinally thereof. These trough strips serve to catch chips dropped in a milling operation and whatever heavier metallic particles and dust particles are not carried away by the suction through hoods 29 in a grinding or abrading operation, for example, the slides 13 being thereby shielded against contamination of the lubricant that is delivered onto the surfaces thereof continuously under pressure during the operation of the machine by unit 44 (Fig. 2). Metallic particles and chips will, of course, be retained magnetically on bars 7 anyway until the demagnetization at *a*—*a*, and when the bars are inverted as they start their return travel in passing under sprockets 20, all loose particles on the bars and in the troughs will be dropped and may be caught in a suitable receptacle placed under the bed 6.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. A machine of the character described comprising a frame, an endless bed operable in said frame to convey magnetizable metallic work-pieces through the machine, rotary cylindrical metal surface finishing units mounted in said frame in parallel relationship to one another in a plane spaced from and parallel to the work supporting surface of said endless bed to operate on the surface of a metal work-piece supported on and conveyed by said bed, magnetic chucks secured in substantially coplanar relation to and moving with said bed, and means for supplying current to said chucks, so that the chucks are energized only for their straightaway travel past the aforesaid units.

2. A machine as set forth in claim 1 wherein the last mentioned means comprises brushes on said chucks connected to the energizing coils in said chucks, and bus bars connected to a source of current supply and mounted in said machine for slidable engagement by said brushes.

3. A machine as set forth in claim 1 wherein the magnetic chucks are in the form of bars extending crosswise

the width of the bed, and the last mentioned means comprises brushes on the ends of the bars and connected to the energizing coils in said chuck bars, and bus bars connected to a source of current supply and mounted in said machine for slidable engagement by said brushes.

4. A machine as set forth in claim 1 wherein the endless bed is mounted in a frame slidable vertically on ways in the machine frame, the machine including means for adjusting said bed frame up or down relative to the rotary units.

5. A machine as set forth in claim 1 wherein the endless bed is mounted in a frame slidable vertically on ways in the machine frame, the machine including means for adjusting said bed frame up or down relative to the rotary units, the rotary units being separately adjustable vertically relative to the bed.

6. A machine as set forth in claim 1 wherein at least the first of said units is a milling cutter.

7. A machine as set forth in claim 1 wherein at least the first of said units is a milling cutter and at least one of the other units is a grinding wheel.

8. A machine as set forth in claim 1 wherein at least the first of said units is a milling cutter and at least one of the other units is an abrading drum.

9. A machine as set forth in claim 1 wherein at least the first of said units is a milling cutter and at least one of the other units is a grinding wheel, at least one of the units being an abrading drum.

10. A machine as set forth in claim 1 wherein said rotary cylindrical units are grinding wheels for performing surface grinding operations on the work-pieces.

11. A machine as set forth in claim 1 wherein at least one of said rotary cylindrical units is a grinding wheel for performing surface grinding operations on the work-pieces, at least one of the other units being an abrasive drum for smoothing the freshly ground surface on the work-pieces.

12. A machine as set forth in claim 1 wherein said rotary cylindrical units are abrasive drums for operation on the surfaces of the work-pieces.

13. A machine as set forth in claim 1 wherein said rotary cylindrical units are abrasive drums for operation on the surfaces of the work-pieces, at least one of said drums carrying coarse abrasive, at least one of said drums carrying medium coarse abrasive, and at least one of said drums carrying fine abrasive.

14. A machine as set forth in claim 1 wherein the magnetic chucks are in the form of bars extending crosswise the width of the bed, the machine including resilient V-shaped troughs extending lengthwise of one side of the bars for compression to a narrower V-form between the bars during straightaway travel of the bars past the rotary units to catch work particles during the operation of the machine.

15. A machine as set forth in claim 1, including at least one pipe for discharging liquid onto at least one of the rotary units.

16. A machine as set forth in claim 1, wherein at least one of said rotary cylindrical units is a milling cutter, the machine including means for discharging cutting fluid onto said cutter.

17. A machine as set forth in claim 1, wherein at least one of said rotary cylindrical units is a grinding wheel, the machine including means for discharging water or other fluid onto said wheel.

18. A machine of the character described comprising a frame, an endless bed operable in said frame to convey magnetizable metallic work-pieces through the machine, rotary cylindrical metal surface finishing units mounted in said frame in parallel relationship to one another in a plane spaced from and parallel to the work-supporting surface of said endless bed to operate on the surface of a metal work-piece supported on and conveyed by said bed, magnetic chucks secured in substantially coplanar relation to and moving with said bed, and means for supplying

current to said chucks, so that the chucks are energized only for their straightaway travel past the aforesaid units and are demagnetized at the end of the straightaway travel.

References Cited in the file of this patent

UNITED STATES PATENTS

224,473	Pelstring	Feb. 10, 1880
543,475	Fraser	July 30, 1895
1,453,022	Philips	Apr. 24, 1923
1,508,727	Sheehan	Sept. 16, 1924
1,512,413	Fitzsimmons	Oct. 21, 1924
1,653,741	Solem	Dec. 27, 1927
1,815,547	Byrnes	July 21, 1931
2,708,022	Pettigrew	May 10, 1955

FOREIGN PATENTS

432,582	Italy	Mar. 23, 1948