Aug. 13, 1957 W. E. LINDEN ET AL 2,802,311

POLISHING DEVICE FOR DEEPLY CURVED SURFACES

Filed Jan. 6, 1955 3 Sheets-Sheet 1

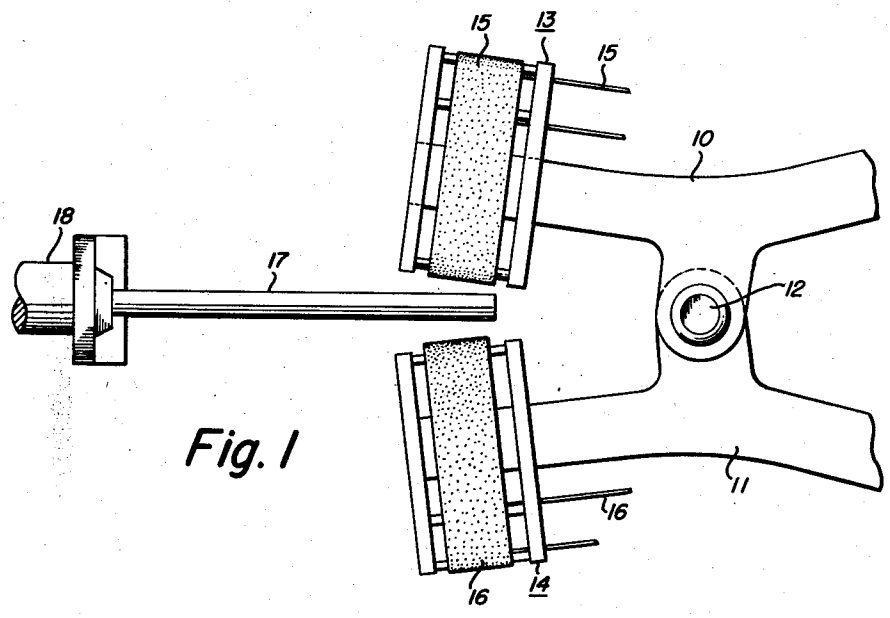


Fig. 1

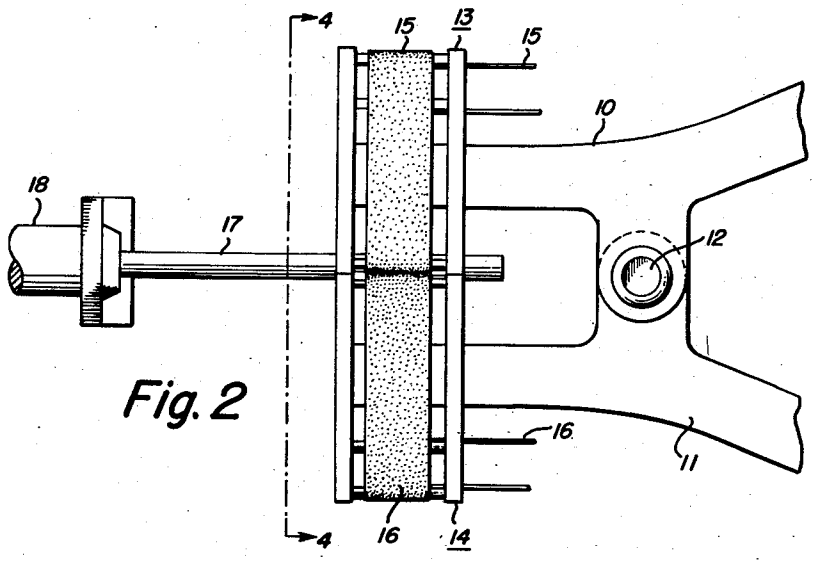


Fig. 2

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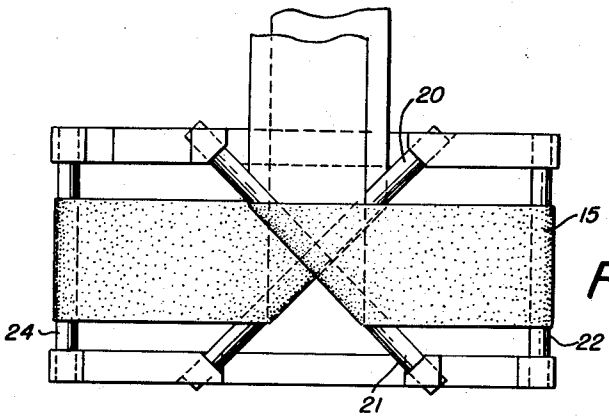


Fig. 3

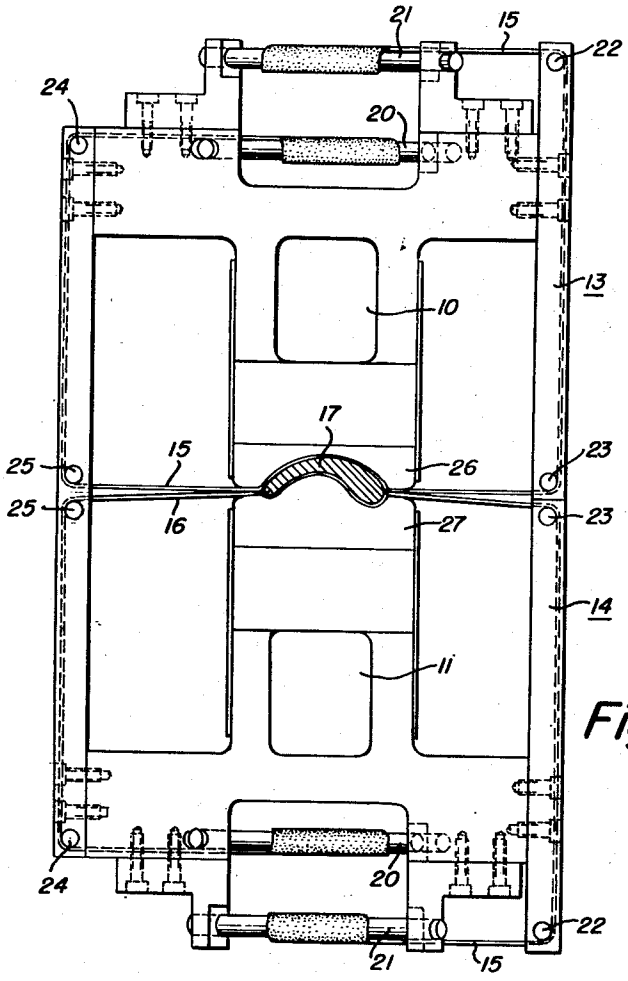


Fig 4

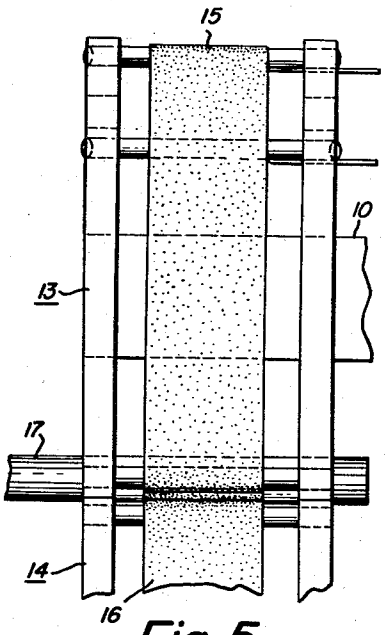


Fig. 5

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POLISHING DEVICE FOR DEEPLY CURVED SURFACES

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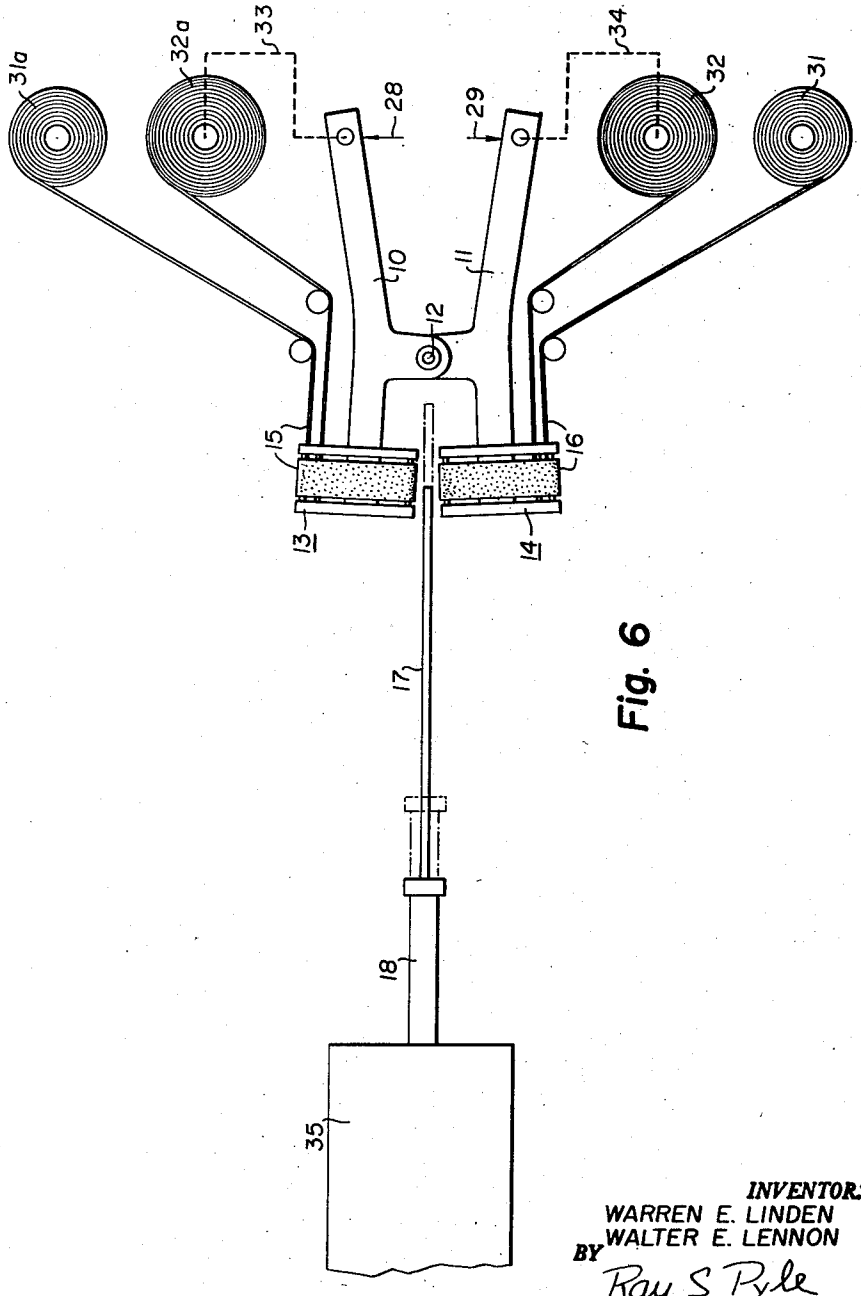


Fig. 6

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POLISHING DEVICE FOR DEEPLY CURVED SURFACES

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Application January 6, 1955, Serial No. 480,146

1 Claim. (Cl. 51—140)

This invention relates to surface polishing devices in general, and relates more particularly to a belt polishing machine to polish the convex and concave surfaces of a longitudinal workpiece.

An object of the invention is to provide a polishing machine having a travelling ribbon of abrasive material oriented and guided to said machine to conform to and polish deeply formed convex and concave surfaces.

Another object of the invention is to provide a frame for driving and directing an abrasive ribbon, the frame providing drive and storage means for the ribbon along said frame, and converting the longitudinal direction of the ribbon to a transverse direction at the work head of the frame.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claim, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a diagrammatic side view illustration of a pair of frame members with work head portions embodying the principles of this invention, together with a workpiece held by a suitable indexing and reciprocating holder device;

Figure 2 is a view similar to that of Figure 1 with the frame members pivoted to close the work head portions upon a workpiece;

Figure 3 is a top view of the work head area of the polishing device as viewed from above in Figure 2;

Figure 4 is a view as taken along line 4—4 of Figure 2;

Figure 5 is a fragmentary side view of the closed work head portions of Figure 4; and,

Figure 6 is a diagrammatic illustration of the working relationship between the abrasive indexing and workpiece reciprocating members, as employed in the preferred embodiment of this invention.

The drawings are intended to set forth a more or less diagrammatic illustration of the principles embodied in this invention without resorting to illustration and description of any particular associated machinery or device old and well known to the industry. Frame numbers **10** and **11** are pivoted about a pivot **12** in order to provide a scissors type of closing action. Work heads **13** and **14** carried at the forward end of the frames **10** and **11** constitute the major portion of the novel and improved invention. Preferably, a hydraulic cylinder is mounted to apply force in the direction of arrows **28** and **29** to close the work heads **13** and **14** with respect to one another and with respect to a work piece presented therebetween, and in the direction opposite said arrows **28** and **29** to reverse the procedure. Accordingly, the frames **10** and **11** operate on a scissors principle. The work heads **13** and **14** are provided to hold and present abrasive material for the purpose of operating a work piece by relative reciprocal movement. Accordingly, abrasive material must be fed to the heads **13** and **14**. In the preferred method of operating the machine, supply rolls **31** and **31–A** are positioned to supply a continuous strip of abrasive ribbon. Rolls **32** and **32–A** are provided to take-up the used ribbon returning from the heads **13** and **14**. Any suitable means of drive may be employed to drivingly rotate the take-up rolls **32** and **32–A**, and accordingly dotted lines **33** and **34** illustrate an interconnection with the end of frames **10** and **11** to thereby designate a driving force on such rolls. The drive may be continuous or intermittent as desired, but such take-up rolls being driven will draw the ribbons through the apparatus, and therefore greatly simplify the abrasive ribbon feed. Since the only requirement is that the abrasive ribbon be gradually renewed in the work heads **13** and **14**, an intermittent ratchet drive take-up is quite satisfactory.

The work pieces to be polished or sanded may conveniently be held by a reciprocating piston and cylinder construction **35** and therefore rapidly reciprocated by conventional control means between the forward position illustrated in phantom outline and the retracted position illustrated in full lines in this Figure 6.

The drawings illustrate a frame **10** and a frame **11** pivotally joined together by the pivot **12**. Frame **10**, according to this invention, is provided with a work head **13**, and the frame **11** with the work head **14**. The relationship of the work heads **13** and **14** with respect to the frames **10** and **11** is best set forth in Figures 1 and 2 of the drawings. Also carried by each frame **10** and **11** is a drive and guide mechanism positioned on the side of the pivot **12** opposite from the work heads **13** and **14**. Such guide and drive mechanism may comprise any suitable roller guide and power mechanism adapted to impart movement of a ribbon of abrasive material longitudinally of the frame to and from the work heads **13** and **14**. Such a ribbon is indicated by the reference characters **15** and **16** in the drawings. The drive and guide mechanism is provided at the particular location indicated for the purpose of placing such mechanism rearwardly of the work heads in an out of the way position and to reduce the bulk of the mechanism at the work head ends.

The placement of drive and guide means at the rearward portion of the frames with respect to the work heads, requires that the abrasive ribbons **15** and **16** extend longitudinally along the frames **10** and **11**. It has been found that in the prior method of using rollers or pads at the end of the frames in place of the work heads **13** and **14**, the abrasive ribbons **15** and **16** are difficult to shape down into deep concave surfaces or over short radius convex surfaces. Accordingly, this invention provides for changing of the normal longitudinal direction of travel of the abrasive ribbons **15** and **16** from the longitudinal path to a transverse path with respect to such longitudinal travel from the drive and guide mechanism. In the illustrated embodiment of the invention, such change of direction is accomplished by providing the heads **13** and **14** with turnboard direction converter rods **20** and **21**. According to the direction of movement of the abrasive belts, one of these rods converts the longitudinal travel of the ribbon to a lateral path and the other converts the ribbon back from the lateral path into the longitudinal path. The lateral work path in the area of the work heads is produced by pulley rods **22**, **23**, **24**, and **25**. Such rods cause the abrasive ribbon to travel in a substantially closed annular path which constitutes the active work path of the ribbon.

As best illustrated in Figure 4 of the drawings, resilient pads **26** and **27** are provided within the annular path of the heads **13** and **14**. Such pads form a backup for the abrasive ribbon. Because of the resilient nature of the pads they will form to the curvature of the workpiece surface and both guide the ribbon in a path closely adhering to the surface of the workpiece and provide pressure for efficient polishing.

In the drawings, a workpiece **17** is represented by a typical jet blade bucket having a deep curved surface extending transversely of the longitudinal blade. In order to hold the workpiece **17** to receive the polishing action, and to aid in the polishing action, a holder **18** is provided which both clamps the workpiece and reciprocates the workpiece between the relatively limited area of active polishing produced by the ribbons **15** and **16**. In actual practice a plurality of such holders **18** are mounted upon an indexing table in order that the workpieces may be loaded and unloaded from the machine at a convenient station and will be indexed around the table to the polishing heads before being returned in finished condition to the loading stations.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

A polishing machine for polishing curved surface workpieces, comprising a first and second track system, a first and second abrasive ribbon directed by said first and second track system respectively against the curved surfaces, each said track system having a longitudinal frame with a work head portion, each longitudinal frame having a drive and guide means directing an abrasive ribbon to said work head portion of that frame and return along a first course, each said work head portion having guide track means directing said ribbon in a substantially annular path transverse to the longitudinal frame, first turnboard surface means converting said first direction of the ribbon to the transverse work path, second turnboard surface means converting said ribbon travel in the transverse work path back to the said first direction for return to the guide and drive means of the said drive portion, a resilient pad carried by each said head portion internally of said annular path, said pad serving as a backup for said ribbon and having the facility of conforming to the shape of a curved workpiece when pressed against said workpiece to thereby hold said ribbon in surface contact with a workpiece having a form other than the form of the belt path, a workpiece holder adapted to hold a workpiece and reciprocate said workpiece in a path transverse to the surfaces thereof to be polished, and pivot means joining said first and second track system longitudinal frames for mutual pivotable closing of the work head portions upon the workpiece, whereby polishing action is accomplished by lateral movement of the ribbons in surface contact with the workpiece as the workpiece is reciprocated in a fixed path between the moving ribbons.

References Cited in the file of this patent

UNITED STATES PATENTS

572,812	Longden	Dec. 8, 1896
2,391,322	Lundquist	Dec. 18, 1945
2,424,044	Miller	July 15, 1947
2,431,795	Elmes	Dec. 2, 1947
2,453,972	Clave et al.	Nov. 16, 1948
2,581,270	McVey	Jan. 1, 1952
2,581,754	Cosmos	Jan. 8, 1952