

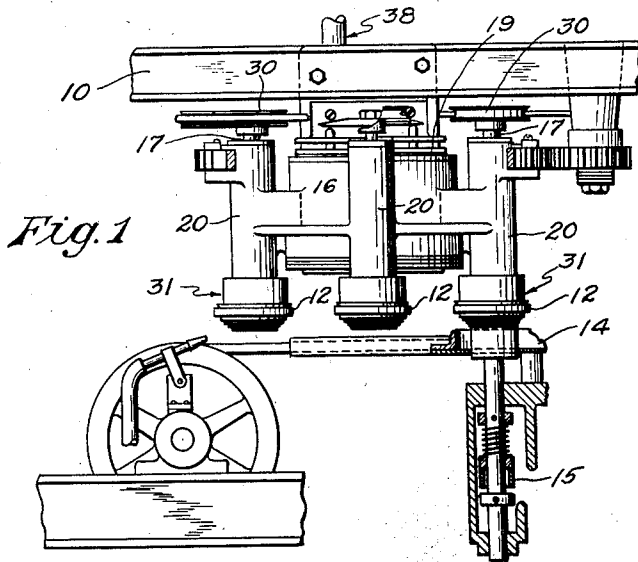
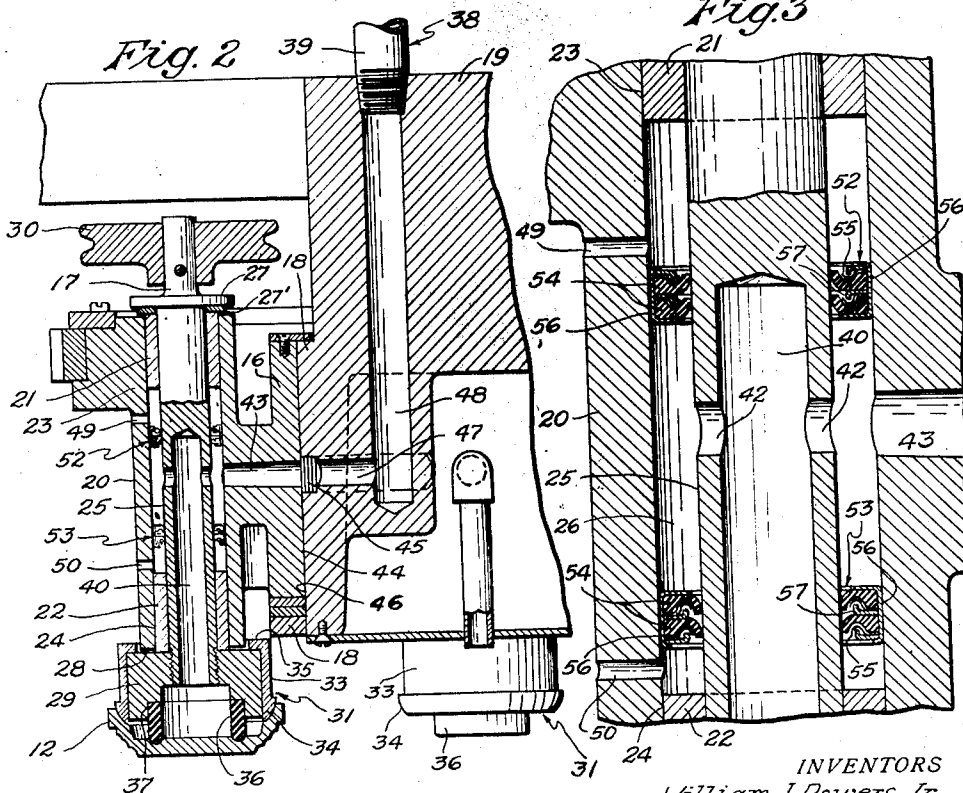
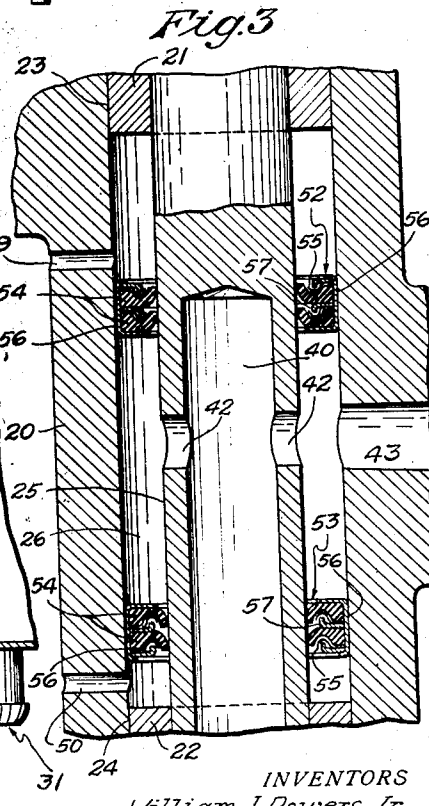
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TURRET CONVEYER

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TURRET CONVEYER

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This invention relates to automatic machines, and, particularly, to an improved sealing means for spindles of automatic machines of the turret type.

The automatic machine, herein disclosed, is adapted specifically to de-fin and paint frangible targets, and, in this respect, is especially well suited to illustrate the present invention.

It will be understood, however, that the present invention may be used with other types of machines and moreover is not limited by the present disclosure, but is capable of many other embodiments and uses without departing from the spirit and scope of the invention as defined in the appended claims.

An important object of the invention is to seal the spindles in the turret head so as to maintain a pressure differential in the turret. A further object is to provide packing rings on the spindles for equalizing the pressure on opposite sides of the spindle bearings while a reduced pressure exists within the spindles.

Other objects, features and improvements will appear hereinafter.

In the drawing:

Fig. 1 is a schematic fragmentary front elevation of a machine especially adapted to illustrate the invention.

Fig. 2 is an enlarged sectional view of the details of the spindle supporting means.

Fig. 3 is an enlarged sectional view of a portion of the spindle showing the sealing means of this invention.

The frangible targets which are handled by the machine, illustrated herein, are substantially dish-shaped articles molded from a mixture comprising clay and pitch or possibly limestone and pitch in the proportions roughly of 45% clay (or limestone) and 55% pitch. These freshly molded targets are extremely fragile and hence require delicate handling while being subjected to the finishing operations.

As hereinafter described, the means for holding the targets while they are being de-finned and painted comprises a hollow spindle, the targets being held on the lower ends of the spindles by suction effected by a suitable exhaust pump.

The de-finning operation, which is of special interest in regard to the present invention, is performed by rotating the targets in contact with suitable abrading blocks which are yieldingly urged against the target so that fins and the like imperfections will be removed by the abrasive as the spindles and targets rotate.

Although machines of this type are used ex-

tensively and meet with considerable success, it has been found that, after continuous use for a relatively short period, the parts of the machine, and, in particular, the spindle bearings, are worn to such an extent as to interfere with the efficient operation of the machine. This excessive wear in the spindle bearings has been attributed to the fact that a reduced pressure exists within the spindle bearings whenever a target is held on the spindle by the suction means. Consequently, the fine dust-like particles of target material removed during the abrading operation are drawn into the spindle bearings. Moreover, since the target material itself is in the nature of a soft abrasive, its presence in the bearings wears out the bearings with great rapidity.

The present invention discloses means for overcoming the tendency for the dust-like abrasive material to enter the spindle bearings by maintaining a normal atmospheric pressure within the bearings.

Referring to the drawing, a part of the target painting and de-finning machine is shown schematically in Fig. 1. Briefly, the machine comprises a frame 10 which supports feeding mechanism for carrying the targets 12 to a loading mechanism (not shown). The loading mechanism includes selecting means for allowing only certain targets to pass to a loading platform 14 and transferring and lifting means 15 for moving the targets to a set of target holding spindles 17 supported on a rotatable turret 16. For a more complete disclosure of the invention, reference may be had to a copending application of Warren S. Reynolds, Serial No. 371,288, filed December 23, 1940.

The target supporting spindles 17 to which this invention particularly relates, are carried on the turret head 16 as shown in Fig. 2 which is rotatably supported on the shoulders 18 of a turret supporting member 19 fixed to the frame of a machine. The turret head includes a plurality of spindles 17, four being shown in the present embodiment, suitably supported for rotation in sleeves 20 of the turret head by sleeve bearings 21 and 22 which are fitted into the ends 23 and 24 respectively of the sleeves 20. These sleeve bearings 21 and 22 are hereinafter referred to as the spindle bearings. The outside or overall diameter of each spindle is less than the inside diameter of the sleeve 20 by an amount equal to twice the thickness of the walls of the spindle bearings plus sufficient clearance between the spindle and its bearings to provide a smooth ro-

tatable fit. Consequently, the portion 25 of each spindle intermediate its bearings 21 and 22 is spaced from the adjacent walls of the sleeve thus producing an annular passage 26 therein, see Fig. 3. Adverse vertical movement of each spindle in its bearings is prevented by a flange 27 and thrust washer 27' on the spindle adjacent the upper end of the sleeve and a shoulder or flange 28 formed by a nosepiece 29 screw threaded in the spindle adjacent the lower end of the sleeve. By properly tightening the nosepiece on the threaded end of the spindle, the thrust washer 27' and shoulder 28 are drawn against the respective ends of the spindle bearings as shown.

Each spindle has a suitable pulley 30 secured to its upper end for driving the spindle and a suitable work head, indicated generally at 31, at its lower end which comprises the nosepiece 29 and a locator ring 33. The latter comprises a closed ring having a tapered rim 34 adapted to provide a seat for the target and to this end is mounted loosely on the nosepiece 29 so as to move freely up and down thereon. The ring 33 has an inwardly projecting flange 35 on its upper edge adapted to extend over the shoulder 28 to keep the ring from sliding down off of the nosepiece 29. Each work head 31 is provided with an annular gasket 36 at its lower end fitted into a suitable recess 37 in the nosepiece 29. Thus a frangible target 12 may be pushed against the rim 34 of the locator ring 33 and the latter is free to lift or rise with respect to the nosepiece until the inside of the target is in engagement with the face of the rubber gasket 36, whereupon suitable suction means, indicated generally at 38, is used to retain the target in this position while it is transferred to the several operating stations.

The suction or vacuum means 38 for holding the targets against the work heads comprises a system of passages leading from the work head 31 through the spindle 17 and turret head 16 into the turret supporting member 19 to which a suction pipe 39 is connected. Specifically, each spindle 17 includes an axial bore 40 in communication with the rubber gasket 36 and extending through the hollow work head 31 upwardly to a point somewhat beyond the center of the spindle. It will be evident that the bore 40 occupies a major portion of the spindle 17 and hence the latter will be hereinafter referred to as a substantially hollow spindle. Adjacent the upper end of the axial bore 40, there are provided suitable transverse holes 42, see Fig. 3, which open into the annular passage 26. Thence a radial bore 43 extends from the annular passage 26 through the turret head 16 to an inner wall 44 thereof where it becomes associated at intervals during the rotation of the turret with grooves or channels 45 which extend around the wall 46 of the fixed turret supporting member 19, these channels being connected in turn by suitable passages 47 and 48 to the pipe 39 of a suitable exhaust pump (not shown). It will be evident that, when the exhaust pump creates suction in the above identified passages, a partial vacuum or reduced pressure exists within the sleeve 20 and hollow spindle 17 as a consequence of which a target will be held on the work head 31 of the spindle. The annular passage 26 insures suction within the bore 40 of the spindle from the radial bore 43, even while the spindle is rotating. Moreover, inasmuch as the spindle is adapted to have a freely rotatable fit in its bearings 21 and 22, this reduced pressure exists in these bearings and also at the bearing surface formed between the

shoulder 28 and the lower end of the bearing 22. It will be clear then that, during the abrading process, the dust-like abrasive particles will be drawn into the spindle bearings due to the pressure differential between the outside and inside of the sleeve.

To prevent this adverse circumstance, means are provided for equalizing the pressure on opposite sides of the spindle bearings.

To this end, a pair of apertures 49 and 50 are made in the wall of the sleeve 20 of the turret head, the aperture 49 being slightly below the upper spindle bearing 21 and open to the atmosphere and the aperture 50 being slightly above the lower spindle bearing 22 and also open to the atmosphere. Furthermore, a pair of pneumatic seals or packing rings indicated generally at 52 and 53 are supported on the portion 25 of the spindle adjacent opposite ends thereof which make a tight sealing fit with the inner walls of the sleeve and the periphery of the spindle. The upper ring is positioned slightly below the upper aperture 49 and the lower ring is slightly above the lower aperture 50. Rings well adapted to this purpose may comprise a duplex structure consisting of molded rings 54 of sealing material, such as suitable rubber, neoprene or other sealing composition assembled with V-shaped flexible metal springs or spreaders 55 into a metal case 56 and combined into a unit by an adapter ring 57 which holds the sealing rings and springs firmly in place. The metal case 56 is fitted securely into the bore of spindle holder or sleeve 20, the margin of each body of sealing material 54 being in sealing contact with the periphery of the portion 25 of the spindle.

It will be manifest, therefore, that that portion of the annular passage between the sealing rings 52 and 53 is effectively sealed from the extremities of the passage 26 adjacent the apertures 49 and 50. Consequently, the extreme ends of the passage 26 and hence the spindle bearings 21 and 22 will be at atmospheric pressure and will remain so irrespective of any change in pressure within the sealed passage 26 of the sleeve; that is to say, a partial vacuum may exist in the sleeve and hollow spindle to hold a target on the head without creating suction in the spindle bearings 21 and 22 and thus the probability of drawing dust or other abrading materials into the bearings is effectively prevented.

What is claimed is:

1. In an automatic target de-finishing machine, a frame; a turret head supported on said frame; a sleeve carried by said turret head, said sleeve having radial apertures at opposite ends thereof open to the atmosphere; a substantially hollow spindle; spindle bearings in said sleeve adjacent said apertures for rotatably supporting said spindle, said bearings being constructed and arranged to form an annular passage in said sleeve intermediate the ends of said spindle; packing means on said spindle for sealing said passage from said bearings and said apertures whereby atmospheric pressure is positively maintained on both sides of said bearings; and suction means carried by said turret head for securing reduced pressure within said annular passage and said hollow spindle to hold a target on one end of said spindle.

2. In a multiple spindle turret target de-finishing machine, a fixed central support; a turret mounted on said support; sleeves carried by said turret, at least one of said sleeves having radial apertures through its walls at opposite ends thereof open to the atmosphere; a substantially hollow

spindle; spindle bearings at the extreme ends of said sleeve beyond said apertures for rotatably supporting said spindle, said bearings defining the ends of an annular passage formed between the inner wall of said sleeve and the periphery of said spindle and in communication with the hollow of said spindle; suction means carried by said central support and turret for securing reduced pressure within said annular passage and the

hollow of said spindle to hold a target on one end of said spindle; and a pair of sealing rings in said sleeve between said apertures and on opposite sides of the turret suction means for sealing said annular passage from said bearings whereby atmospheric pressure is positively maintained at the opposite ends of each spindle bearing.

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