Jan. 6, 1942. C. O. JOHNSON 2,269,311

ABRADING MACHINE

Filed Nov. 3, 1939 3 Sheets-Sheet 1

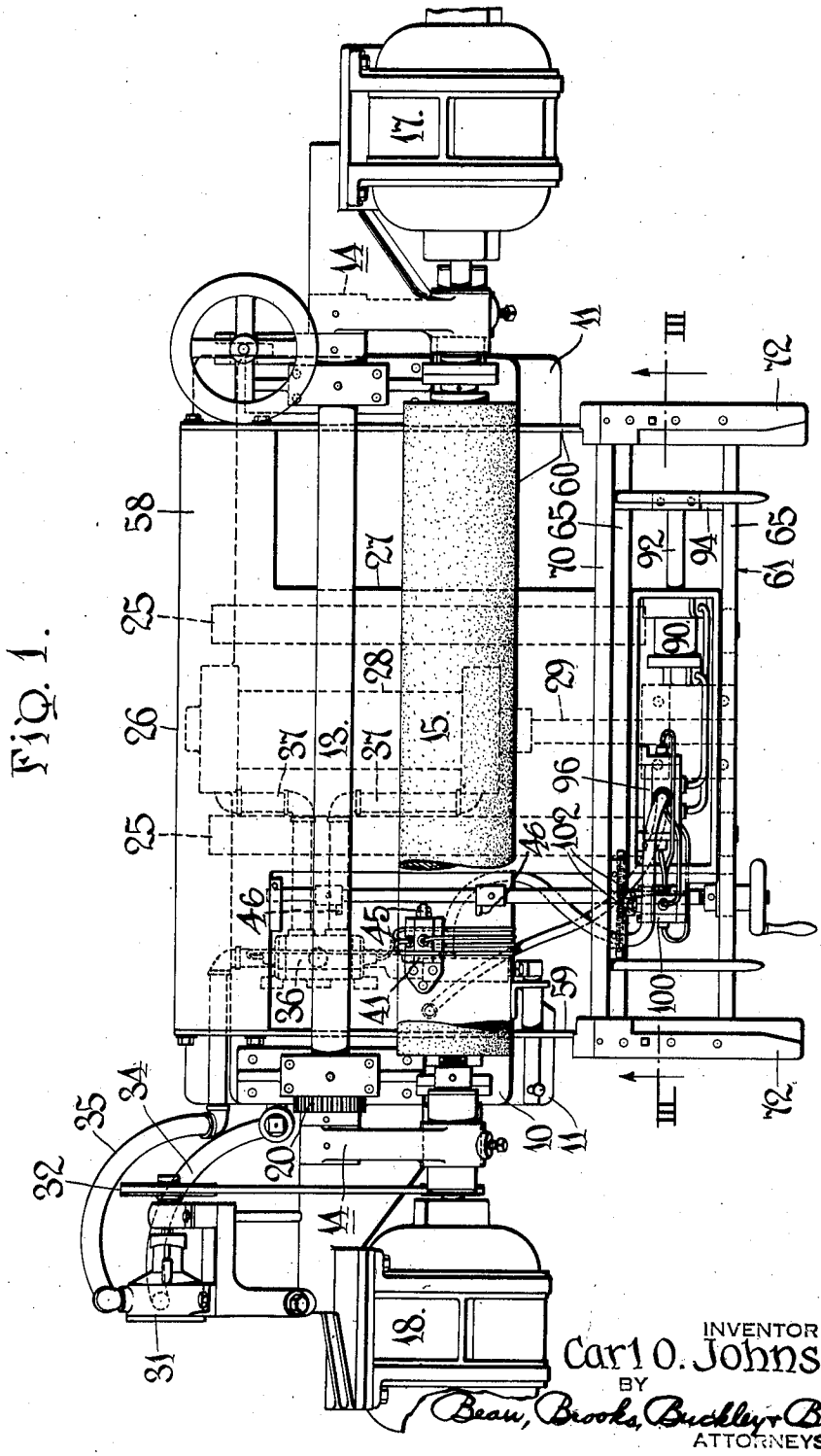


FIG. 1.

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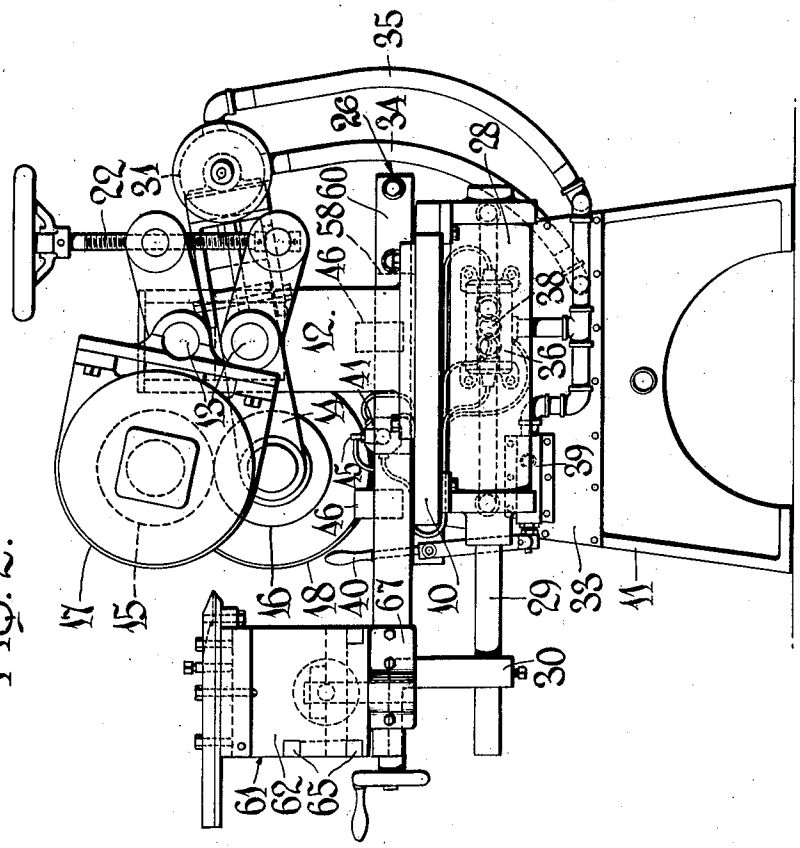


Fig. 2.

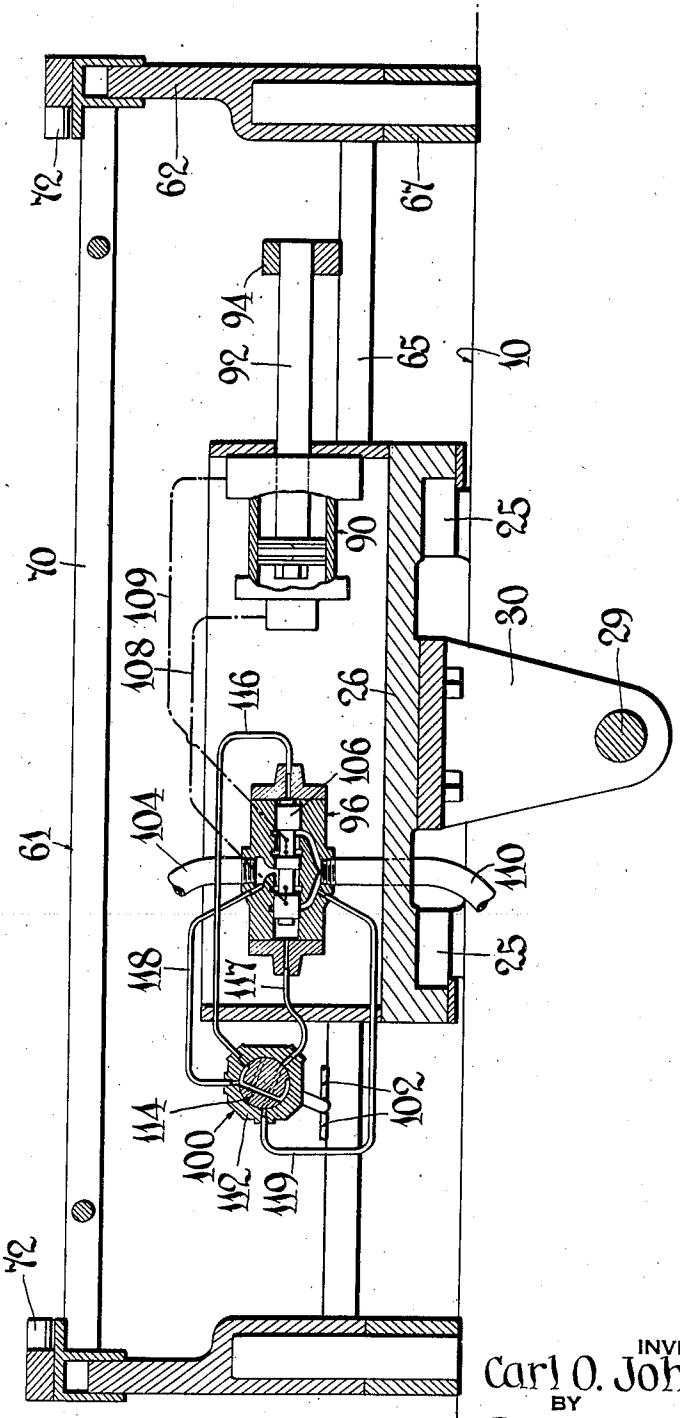
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Fig. 3.



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UNITED STATES PATENT OFFICE

2,269,311

ABRADING MACHINE

Carl O. Johnson, Springville, N. Y.

Application November 3, 1939, Serial No. 302,679

3 Claims. (Cl. 51—84)

This invention relates to machines for grinding and/or polishing flat metal, and has particular reference to machines for simultaneously buffing a multiplicity of work pieces such as knife blades or the like during manufacture thereof.

My machine functions in such manner that the work pieces are automatically moved alternately toward and between and away from oppositely disposed rotating rolls and are simultaneously oscillated in directions parallel to the rotational axes of said rolls. It is desirable in machines of this type that the work pieces be moved with an uninterrupted and smooth slow motion in all directions of movement so that the surfaces of the work pieces are subjected to uniform grinding or polishing action throughout their entire areas.

The present invention constitutes an improvement over my previous machines such as are covered by my Patent No. 2,188,223, and this application is a continuation in part of the latter. The primary object of the present invention is to provide an improved and more smoothly operating machine for the purposes specified. Other objects and advantages of the invention will appear from the specification herein.

In the drawings:

Fig. 1 is a plan of a machine constructed according to the invention;

Fig. 2 is an end elevation of the machine of Fig. 1 with a supporting member thereof removed.

Fig. 3 is a vertical section, on an enlarged scale, taken substantially along line III—III of Fig. 1.

In practicing the invention the machine is provided as shown in the figures of the drawings of a type generally comparable with the disclosure in the application of Carl O. Johnson hereinabove mentioned, and in general comprises a table 10 supported on standards 11. Upright bearing blocks 12 rise from each end of the table 10.

As shown in Fig. 2, a pair of rock shafts 13 are journalled in the upper ends of the uprights 12 and said rock shafts each carry a pair of rock arms 14 that rotatably support at their free ends upper and lower polishing rollers 15 and 16, respectively. The rollers 15 and 16 are connected through means of shafts to electric driving motors 17 and 18, respectively. The rock shafts 13 are geared together as at 20 to cause simultaneous movement of the polishing rolls 15 and 16 toward and away from each other when adjusted by means of an adjusting screw 22 threading through blocks carried by extensions on the free ends of the arms 14 at one end of the machine opposite the geared connections 20.

A pair of guide rails 25 are mounted upon the upper side of the table top 10 and extend in a direction at right angles to the longitudinal axes of the rollers 15 and 16. A slide plate 26 having opposite side edges 27 slidably and interlockingly engaged with the guides 25 is movable over said guides in a direction at right angles to the longitudinal axes of the rollers.

A device for effecting reciprocatory movements of the slide plate 26 is provided including in general a fluid cylinder 28 secured to and depending from the table top 10 with a piston rod 29 projecting from one end of the cylinder 28 engaged with an arm 30 at a point forwardly of the front edge of the table top 10 with the arm 30 extending upwardly for attachment to the underside of the slide plate 26. For effecting reciprocation of the piston rod 29 within the fluid cylinder 28, a pump 31 is provided with a belt and pulley connection 32 with the shaft of the electric motor 18; the pump 31 drawing fluid from a tank 33 in a standard 11 by way of a pipe 34, and feeding the fluid under pressure by way of a pipe 35 to a multi-way valve 36. Pipes 37 from the multi-way valve 36 deliver the fluid to the fluid cylinder 28 to effect reciprocation of the piston 29 and reciprocatory movements of the slide plate 26; the fluid in the cylinder 28 passing through the pipe lines 37 through the multi-way valve 36 and being returned by way of the conduit 38 to the fluid tank 33. If desired, the fluid flowing through the pipe 35 from the pump 31 may be returned or by-passed to the tank 33 before delivery to the multiple-valve 36 by way of the valve device 39 controlled by a hand operated lever 40.

The valve 36 is of standard displaceable plunger type having passageways for selective communication with conduits in the casing thereof in such manner that when the plunger is at one end of the casing fluid pressure from the compressor 31 is admitted through the valve 36 to one end of the cylinder 28; and when the plunger is at the other end of its stroke the fluid pressure from the pump is admitted through the valve 36 to the opposite end of the cylinder 28.

A pilot valve 41 is provided for automatic shifting of the plunger of the valve 36 through control of fluid pressure alternately admitted to opposite ends of the plunger of the valve 36. The pilot valve 41 comprises a casing and a rotatable core provided with passages for selective

communication with pairs of conduits through the casing in such manner that when the core is in one position of adjustment fluid pressure from the pump 31 is enabled to pass through the pilot valve and into the valve 36 against one end of the plunger thereof; and when the rotatable core is in another position of adjustment the fluid pressure from the compressor is cut off from the first mentioned end of the plunger and is admitted to the valve 36 at the opposite end of the plunger. A finger 45 extends laterally from the core of the pilot valve 41 and is adapted to engage spaced blocks 46 mounted upon the plate 26 for shifting the position of the valve core at opposite ends of the strokes of the plate as are procured by the application of fluid pressure at opposite ends of the hydraulic cylinder 28. The blocks 46 are independently adjustable for varying the spacing therebetween, and also the ultimate limits of carriage movement relative to the base may thus be varied as desired.

The rear end of the slide plate 26 carries integral laterally projecting plate portions 58 (Fig. 1) to which a pair of resilient blade-like arms 59 and 60 are attached at their rear ends in rigidly anchored relation, and the arms are substantially co-extensive with the length of the slide plate 26. The forward or free ends of the resilient arms carry in mounted relation thereon a work holder frame 61 comprising upright blocks 62 and cross arms 65 connected at their ends to the blocks 62 to provide a rigid box like structure. Pivot bearings 67 connect the box structure to the free ends of the arms 59 thus permitting the work supporting frame to remain substantially parallel to the roll axes during lateral movement thereof. Clamping plates 70 and 72 are carried by the upper ends of the box structure for detachable mounting of the articles to be polished or buffed, as shown and described in my previous patent applications.

Arrangement is made for effecting reciprocating movement of the work holder parallel to the roll axes in a manner identical to that provided for reciprocation of the plate 26 back and forth perpendicular to the rolls. As shown, the arrangement includes a hydraulic cylinder 90 and a piston 92 connected to a cross arm 94 of the work holder frame. A displaceable plunger type valve 96 is provided as in the case of the slide reciprocation device hereinabove described and a pilot valve 100 is similarly provided for control of the valve 96; the pilot valve 100 being operated by adjustable fingers 102 mounted on the slide plate 26.

As illustrated more specifically in Fig. 3, the mechanism for providing transverse oscillation of the work holder frame 61 comprises a fluid pressure inlet conduit 104 leading from the fluid pressure reservoir 33 into the interior of the casing of the plunger valve 96 at the center thereof. A reciprocatable plunger 106 is slidably mounted within the valve 96 and is provided with enlarged center and opposite end portions engaging the cylinder casing in fluid-tight relation. Conduits 108 and 109 lead through suitable ports through the cylinder casing 96 at opposite sides of the longitudinal center thereof into connection with the cylinder 90 at opposite ends thereof so as to apply fluid pressure forces against the enclosed piston head upon shifting of the plunger 106 to opposite end portions of the valve casing 96. Outlet ports leading through the casing 96 from positions at opposite sides of the longitudinal center thereof are arranged in open communication with a fluid discharge conduit 110 which provides an arrangement for return of the pressure applying fluid to the reservoir 33; the conduits 108—109 functioning alternately as pressure supplying and fluid-returning conduits in connection with the operation of reciprocating the piston 92 for the work holder frame oscillation process. To cause the plunger 106 to be reciprocated longitudinally within the valve casing 96, the pilot valve 100 is provided to comprise a casing 112 carrying a fluid-tight fitted rotor 114 which is perforated to provide for two-way transmission of fluid under pressure through conduits 116—117 into the interior of the valve casing 96 at opposite ends thereof so as to apply fluid pressure forces against opposite ends of the plunger 106. A fluid pressure inlet conduit 118 is in open communication with the primary fluid pressure inlet conduit 104 so as to provide available fluid under pressure to the interior of the pilot valve casing 114, and a fluid escape conduit 119 is arranged in communication with the interior of the casing 114 for return of fluid to the primary return conduit 110 as it is ejected ahead of the plunger 106 during its reciprocative movements in response to application of fluid pressure forces at the oppoite ends thereof.

From the above detailed description of the invention it will be apparent that as the fluid means effects reciprocation of the slide plate 26 the motors 17 and 18 rotate the polishing or buffing rollers 15 and 16. Simultaneously the hydraulic cylinder-piston device coupled to the cross arm 94 provides sidewise reciprocation of the work holder frame; the side arms 59 and 60 being flexed during movement thereof in either direction. Thus the work holder is given oscillative movement in a curvilineal path, and the movements in either direction are smooth and uninterrupted. In this respect the mechanism of the present invention provides a distinct advantage over prior mechanisms for the purpose because there is no possibility of lost motion in the reciprocation control devices, and it will be understood that the resiliency of the spring arms 59 and 60 cooperates with hydraulic transverse reciprocation mechanism to obviate any possibility of lost motion in the lateral movement of the workholder with the result that the work pieces are moved in an improved manner relative to the rolls and more uniformly processed as a result thereof.

Although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. In a polishing and buffing machine, a pair of buffing and polishing rolls, means to drive the rolls, a slide member movable towards and away from the rolls in a line at right angles to the longitudinal axes of the rolls, a pair of resilient arms anchored at one end to the slide member, a work holder carried by the other ends of the resilient arms by means of pivotal connections therewith, and means for moving the arms against resiliency thereof to cause the work holder to oscillate through arcuate paths traversing the path of movement of the slide member, said arm moving means comprising a reversible hydraulic pressure transforming device

mounted upon said slide member and movable therewith.

2. In a polishing and buffing machine, a pair of buffing and polishing rolls, means to drive the rolls, a slide member movable towards and away from the rolls in a line at right angles to the longitudinal axes of the rolls, hydraulic means for moving said slide member towards and away from said rolls, a pair of resilient arms anchored at one end to the slide member, a work holder carried by the other ends of the resilient arms by means of pivotal connections therewith, and independently operating hydraulic means mounted upon said slide member and operatively associated therewith and with said work holder for independently imparting reciprocating movements in transverse directions to said work holder against the resiliency of said arms, whereby said work holder is moved through a culvilineal path.

3. In a polishing and buffing machine, a pair of buffing and polishing rolls, means to drive the rolls, a slide member movable towards and away from the rolls in a line at right angles to the longitudinal axes of the rolls, a pair of resilient arms anchored at one end to the slide member, a work holder carried by the other ends of the resilient arms by means of pivotal connections therewith, and independently operating hydraulic means mounted upon said slide member and operatively associated therewith and with said work holder for independently imparting reciprocating movements in transverse directions to said work holder against the resiliency of said arms, whereby said work holder is moved through a curvilineal path, said hydraulic means comprising independent two-way piston cylinder devices and independent control valves therefor, said control valve devices each comprising a fluid pressure operable valve member and a pilot fluid valve therefor and means connected with the pilot-valve and responsive to the work holder movement for operating the pilot valve in response to the reciprocating movement controlled thereby.

CARL O. JOHNSON.