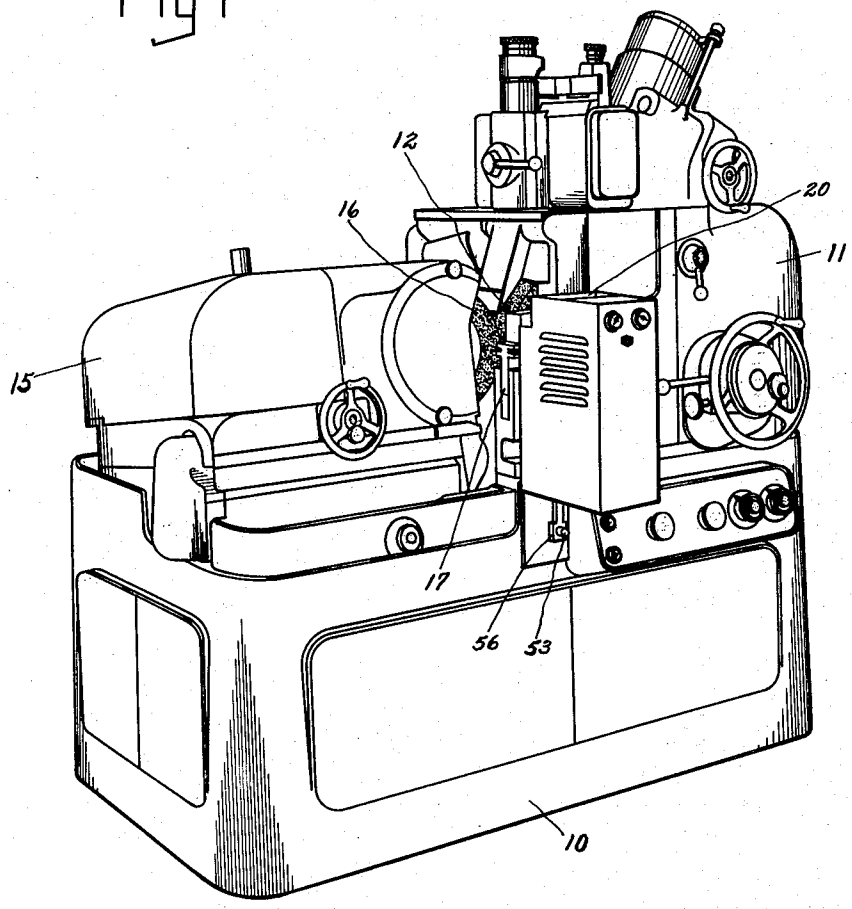
June 7, 1949. A. J. JONES ET AL 2,472,707

WORK LOADING DEVICE FOR GRINDING MACHINES

Filed Sept. 20, 1945 3 Sheets-Sheet 1

Fig 1



INVENTOR
ALVIN J. JONES
C. C. WALKER WILLIAMS
BY
Hugh D. Rocke
ATTORNEY

June 7, 1949. A. J. JONES ET AL 2,472,707

WORK LOADING DEVICE FOR GRINDING MACHINES

Filed Sept. 20, 1945 3 Sheets-Sheet 2

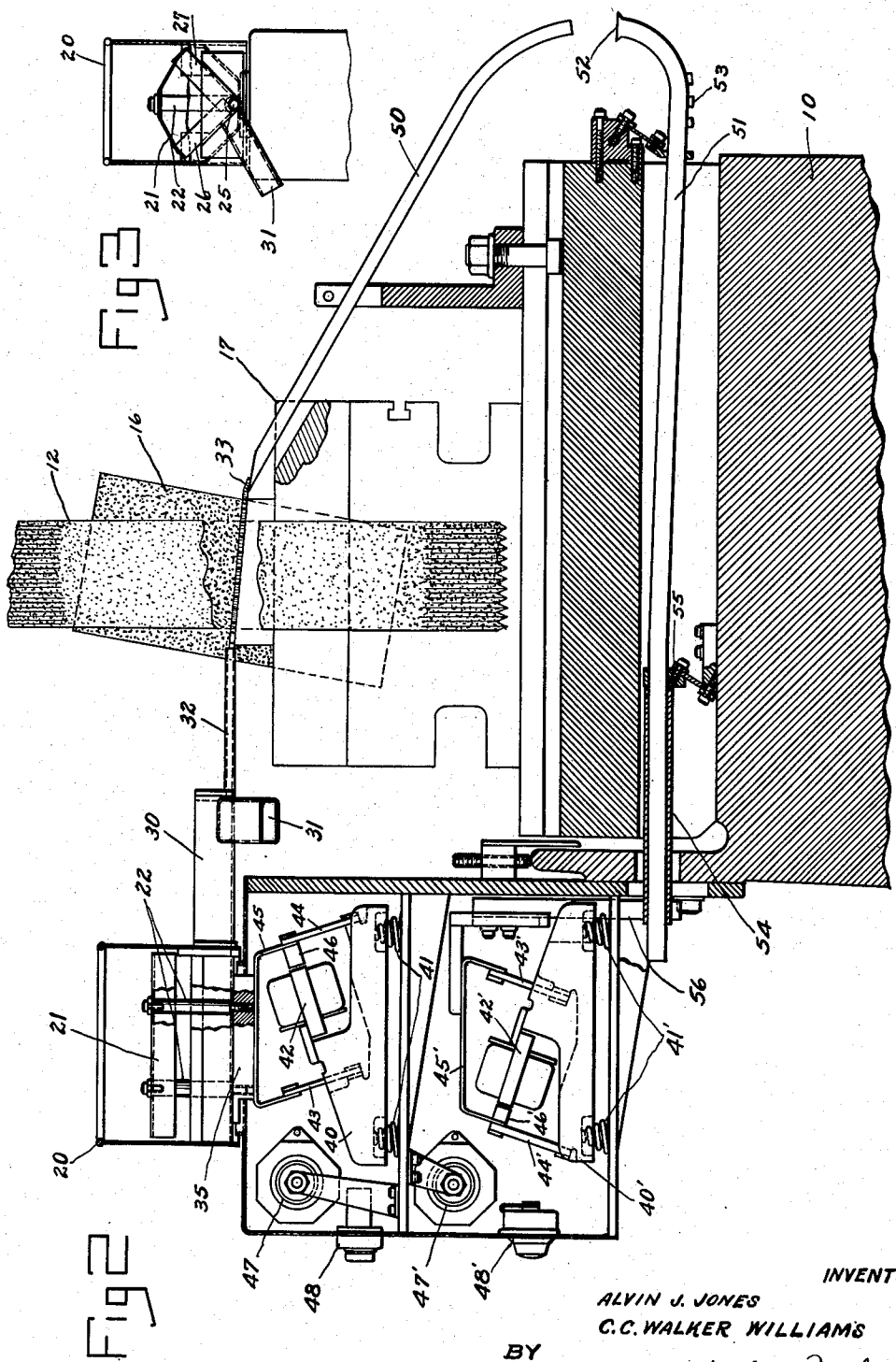


Fig 2

Fig 3

INVENTOR
ALVIN J. JONES
C. C. WALKER WILLIAMS
BY
Hugh M Rocks
ATTORNEY

June 7, 1949. A. J. JONES ET AL 2,472,707

WORK LOADING DEVICE FOR GRINDING MACHINES

Filed Sept. 20, 1945 3 Sheets-Sheet 3

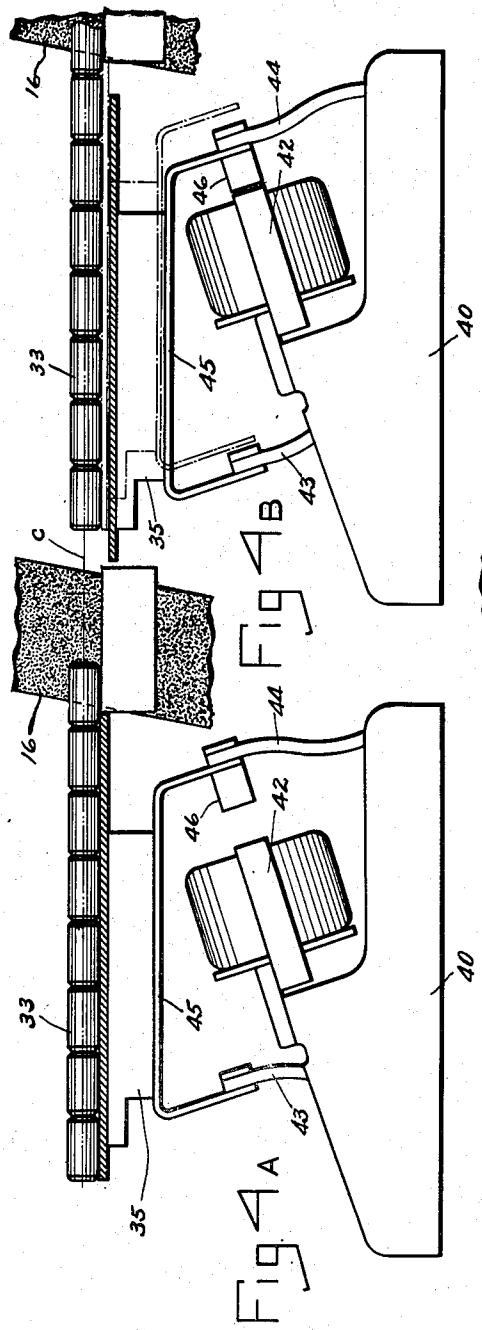


Fig. 4B

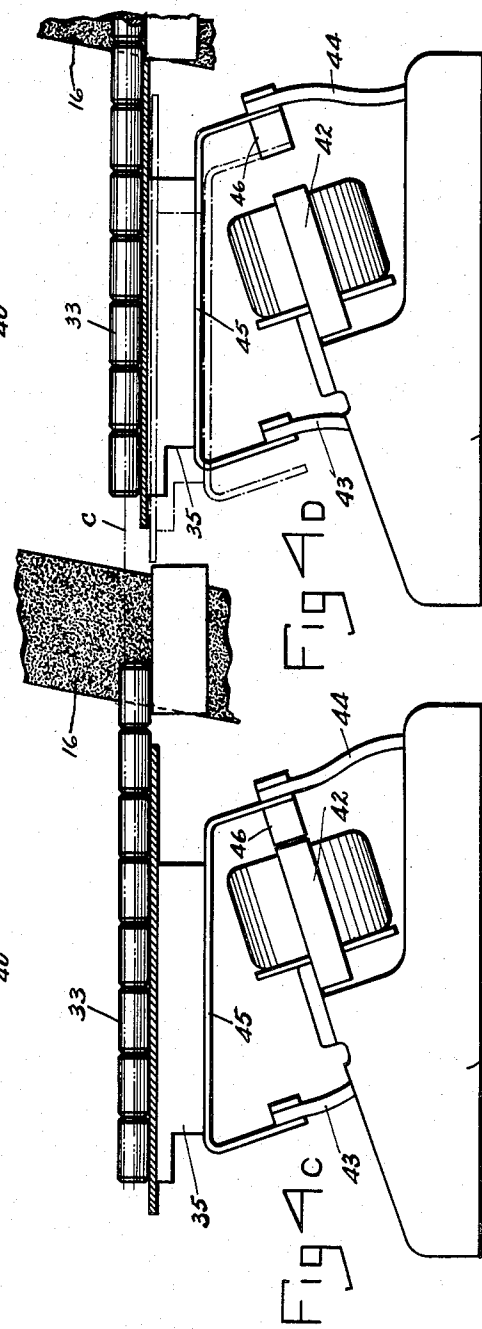


Fig. 4D

Fig. 4A

Fig. 4C

INVENTOR

ALVIN J. JONES

C. C. WALKER WILLIAMS

BY

Hugh M Rocker.

ATTORNEY

Patented June 7, 1949 2,472,707

UNITED STATES PATENT OFFICE

2,472,707

WORK LOADING DEVICE FOR GRINDING MACHINES

Alvin J. Jones and Charles Clement Walker Williams, Waynesboro, Pa., assignors to Landis Tool Company, Waynesboro, Pa.

Application September 20, 1945, Serial No. 617,540

3 Claims. (Cl. 51—103)

1

This invention relates to machine tools particularly to grinding machines of the centerless type and means for supplying work pieces thereto for a grinding operation.

This invention is particularly suited to supplying work pieces to a centerless grinder for a through feed operation although it may also be used to supply work pieces for a plunge cut operation.

For the purpose of illustration the invention is disclosed as a work loading device in combination with a centerless grinding machine set up to produce headless screws from solid stock by the through feed method of centerless grinding. A similar machine is shown in detail in co-pending application Serial No. 543,780, filed July 7, 1944.

In supplying blank work pieces to a centerless grinder for the purpose of forming screw threads thereon it is desirable from the standpoint of production that they enter the grinding throat with successive pieces in contact with one another. At the same time it is just as desirable that the pieces are not forced through the grinding throat.

The rate of feed through the machine is determined by the combination of the angular speed and angle of tilt of the control wheel. This rate must be such that grinding ridges which form the thread neither act to retard the feed, which would be the case if the work was being forced unduly by axial pressure, nor to advance the feed, which would occur if the control wheel was not set at the proper angle.

It is therefore an object of my invention to provide means for supplying work pieces to a centerless grinder with a minimum application of force.

A further object is to substantially eliminate gravity as ordinarily used for motive power in such cases.

A further object is to provide means whereby the work blanks will be caused to move along a horizontal path or even up an incline in approaching the grinding throat.

A further object is to provide a hopper from which the work will flow without interruption.

A further object is to provide means for returning the finished work to the operator.

A further object is to provide a work feeding device of the vibrator type consisting of a hopper and a conveyor, said hopper and said conveyor being vibrated as a unit by a single vibrating means.

In the drawings Figure 1 is a perspective view

2

of a centerless grinder with a work feeding device mounted thereon.

Figure 2 is a sectional elevation showing two conveyor mechanisms on a centerless grinder, one for feeding the work to the grinding throat, the other for returning the ground piece to the operator.

Figure 3 is a partial end elevation of hopper shown in Figure 2.

Figure 4 is a series of drawings showing the method of operation of the feeding device.

Figure 4A shows the loader with the solenoid in deenergized position with the work piece at an elevation indicated by the centerline.

Figure 4B shows the loader position with the solenoid energized.

Figure 4C shows the loader with the solenoid still energized and the work piece in an advanced position on the work supporting member but at a lower elevation than in Figures 4A and 4B.

Figure 4D shows the loader with the solenoid de-energized and the loader moved upward and forward by the spring supports to an advanced position relative to the grinding wheel.

The centerless grinding machine which forms a part of our invention is substantially identical with that disclosed in application Serial No. 543,780, filed July 7, 1944. It consists briefly of a bed 10, a grinding wheel support 11 slidably mounted thereon for movement transversely of the wheel axis toward and from operative position. A grinding wheel 12 having a grinding surface formed to correspond to the shape of the work to be ground, in this case screw threads, is rotatably mounted on said base 11.

Also slidably mounted on said bed is a control wheel support 15 in which is rotatably mounted a control wheel 16. Said control wheel support is mounted for adjustment toward and from the grinding wheel. A work rest 17 is mounted on the bed between the operative surfaces of said wheels. The space bounded by the said wheel surfaces and the work rest is commonly known as the grinding throat.

The means for introducing work pieces into the grinding throat consists of a hopper 20 having a V-shaped bottom. A baffle is formed by an inverted V-shaped plate 21 spaced from the walls of the hopper by an amount to permit a controlled flow of work pieces therebetween to the bottom of the hopper. Said baffle is mounted on a pair of pins 22.

An opening 25 at one end of the hopper in line with the bottom of the V-shaped portion is made adjustable by means of two strips 26 and 27 mov-

able along the sides of the V and toward and from the bottom thereof. Thus the opening through which the work pieces must pass is adjustable for a variety of size so that for any size the work pieces must leave the hopper one at a time. The V-shaped bottom of the hopper is in effect extended in the form of a trough 30 having an opening 31 in the side and at the bottom thereof so that only a single piece may pass this point at one time. If there are two or more pieces moving together in a pile, all but one will drop through the opening to a suitable receptacle. From said trough, a tube 32 extends to a point just short of the edge of the grinding wheel.

The hopper, trough and tube form a single unit which is mounted by means of pins on a block 35 which in turn is attached to a vibrating device. Said vibrating device consists of a base member 40 resiliently supported on springs 41. An electro-magnet 42 is mounted on said base with its axis at an angle to the horizontal. A pair of flat springs 43 and 44 are mounted on said base approximately perpendicular to the axis of said magnet. Said springs are joined by a connecting member 45. An external armature 47 is attached to the spring 44 so that when magnet 42 is rapidly energized and de-energized the springs and connecting member are subject to a vibrating movement which occurs in a direction substantially parallel with the axis of said magnet.

The magnet 42 is powered by periodic direct current supplied through a rectifier 47 from a suitable source. The frequency of vibration is determined by the frequency of the source of alternating current used. The amplitude of vibration which determines the rate of feed of the work pieces is controlled by a rheostat 48.

While an electro-magnetic vibrator is shown, fluid or mechanical power could be used with satisfactory results.

The block 35 to which the conveyor unit is attached is mounted on the connecting member. Thus the conveyor unit is also vibrated in a direction parallel to the axis of the magnet. Vibration of the conveyor in this direction has the effect of causing work pieces 33 to move into the grinding throat when the trough and tube are horizontal and even if they are slightly inclined upwardly.

In order to return finish ground work pieces to the operator or to shift them to any other position a second conveyor is used. An inclined tubular member 50 receives the finished piece and discharges it at a lower level into a second tube 51 having an upwardly turned end portion 52 or other suitable means for receiving a work piece from the first tube 50. Tube 51 extends back under the work rest and through the front of the machine. Tube 51 is inclined slightly upwardly toward the front of the machine so that coolant does not return with the work. Said coolant is drained off through openings 53 in the bottom of tube 51. The front end of tube 51 is supported in a sleeve 54. One end of said sleeve is attached to the bed of the machine by a resilient connection 55. The other end is secured in a bracket 56. Said bracket is attached to the connecting member 45' of a second vibrator device located beneath the first mentioned vibrator and in a reverse position relative thereto. The first or upper vibratory conveyor causes work pieces to move from left to right in Figure 2. The second or lower conveyor causes work pieces to move from right to left.

The manner in which the vibrator moves the work pieces is disclosed in Figures 4*a* and 4*b*.

In Figure 4*a* the parts are shown in normal position with the magnet 42 deenergized. The centerline of the work is indicated by the letter C.

In Figure 4*b*, magnet 42 has been energized and the work supporting portion of the vibrator has moved to the solid line position against the resistance of flat springs 43 and 44. This movement takes place so rapidly that in effect the work pieces are left hanging in space. However, due to the force of gravity, they do drop to the work supporting member as shown in Figure 4*a*, while the magnet is energized. The work pieces drop vertically to the centerline C, and since the movement of the supporting member is downward and to the rear, the work pieces land in a slightly advanced position on said support as shown in Figure 4c.

In Figure 4*d* the magnet is deenergized and the work supporting member together with the parts are returned to normal position by means of flat springs 43 and 44. Since the work pieces have assumed an advance position on the support as described above, then when the support is returned to normal position the work pieces will likewise be moved to an advanced position relative to the grinding throat. Said throat is represented in Figures 4*a* and 4*d* by the control wheel 16. It will be noted in the drawing that in Figures 4*a*, 4*b* and 4*c* the relative position of the work and wheel does not change. In Figure 4*d* however the work piece which was only partly within the throat in the first three views is now entirely therein.

We claim:

1. In a centerless grinding machine opposed grinding and control wheels, means for supporting work to be ground between said wheels, said elements being arranged to provide a grinding throat, said control wheed being tilted to feed the work axially past the grinding wheel, means to feed unground work pieces to said work supporting means at substantially the same rate including a conveyor member and a vibrating device for actuating same, a hopper for supplying a succession of work pieces to said conveyor, said hopper consisting of a container, a baffle plate in said container, the edge of said plate being spaced from the sides of said container to permit a controlled flow of said work pieces to the bottom of said container said conveyor extending from said hopper to said grinding throat.

2. In a centerless grinding machine, a grinding wheel, a work rest and a control wheel forming a grinding throat, said control wheel being tilted relative to the grinding wheel so as to feed work pieces through said grinding throat at a predetermined rate, means to supply work pieces to said grinding throat at substantially the same rate including a vibratory conveyor substantially level with said grinding throat and vibrating means for actuating said conveyor, a hopper having a baffle plate therein for supplying work pieces to said conveyor at a controlled rate, said hopper and said conveyor being vibrated as a unit.

3. A centerless grinding machine including a control wheel, a work rest and a grinding wheel, said control wheel being tilted relative to said grinding wheel, whereby to feed the work piece axially at the proper rate, means for supplying work pieces to the machine along a horizontal path at a rate no faster than said axial feed movement including a vibratory conveyor supported in operative relation to said work support,

a vibrator for said conveyor, a hopper for supplying work blanks to said conveyor at a controlled rate, said conveyor having a lateral opening therein, at which point said conveyor can support only one work piece at a time, all blanks in excess of one passing through said opening, whereby a succession of single blanks moves toward grinding position.

ALVIN J. JONES.
C. C. WALKER WILLIAMS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,837,821	Holmes	Dec. 22, 1931
1,848,676	Swanson	Mar. 8, 1932
1,850,373	Booth	Mar. 22, 1932
2,116,031	Lindner	May 3, 1938
2,187,717	Weyandt	Jan. 23, 1940
2,260,843	Strong	Oct. 28, 1941
2,305,943	Weyandt	Dec. 22, 1942
2,377,982	Theler et al.	June 12, 1945

OTHER REFERENCES

"Centerless Thread Grinding," Landis Tool Co., published in April 1915 issue of Screw Machine Engineering.