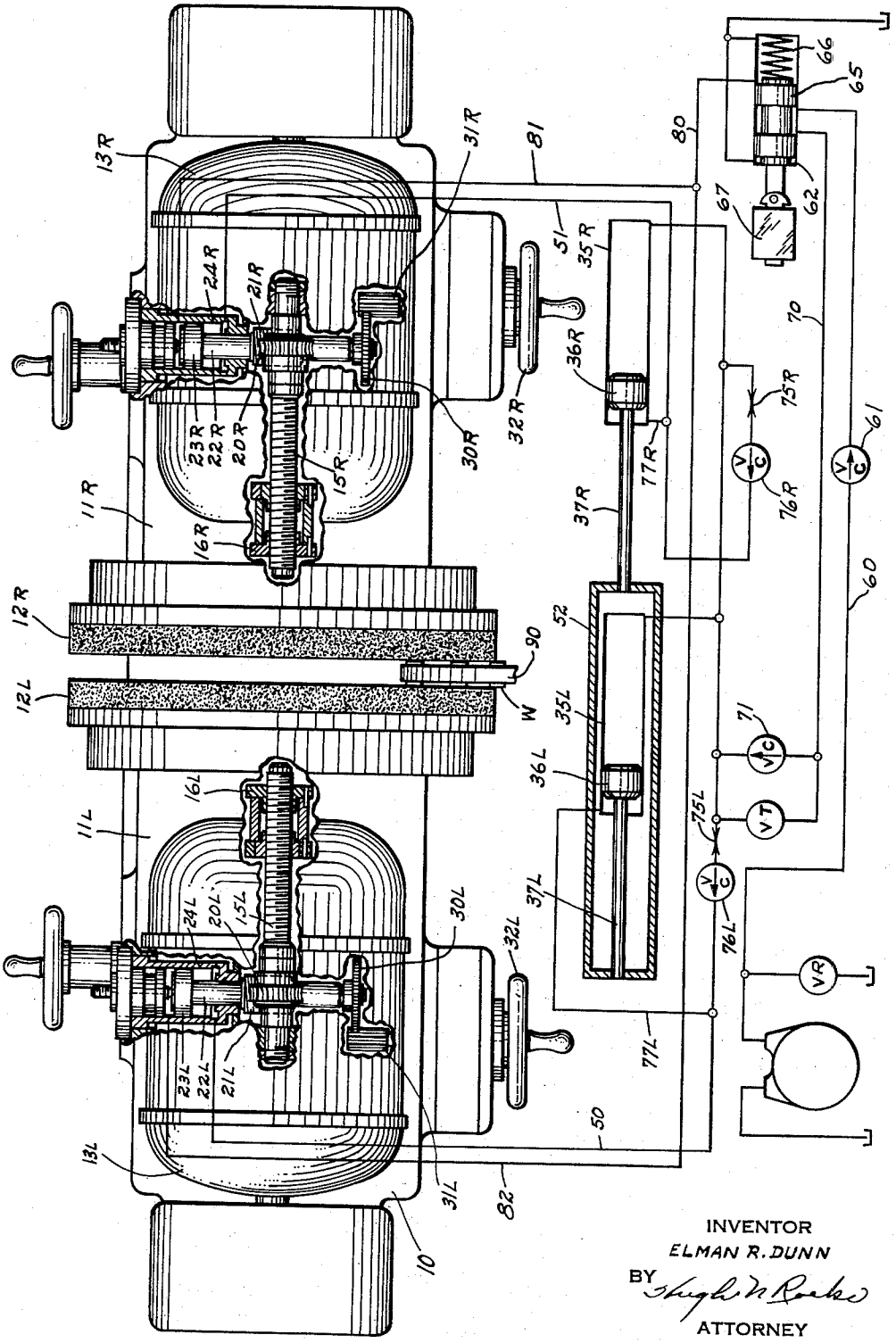
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OPPOSED DISC GRINDER WITH CO-ORDINATING FEED CONTROL

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OPPOSED DISC GRINDER WITH CO-ORDINATING FEED CONTROL

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This invention relates to horizontal double spindle disc grinders for grinding parallel surfaces on a workpiece.

It is desirable that the feeding movement of abrasive discs be synchronized so that one does not advance at a rate faster or slower than the other. Such synchronization is usually provided by various mechanical arrangements whereby the power to effect the feeding movement is applied equally to both disc supporting members. All of these are relatively expensive because of the machine work involved.

It is, therefore, an object of this invention to provide means for synchronizing the feed mechanism of a double disc grinder.

Another object is to provide a pair of displacement cylinders having the piston in each of said cylinders joined together.

Another object is to provide hydraulic means for effecting such synchronization.

The drawing is a plan view of a double disc grinder with the disc supporting heads broken away to show the feed mechanism, and a hydraulic circuit having means for synchronizing the operation of said feed mechanism.

Numeral 10 indicates the bed of a double disc grinder. Numerals 11L and 11R indicate spindle housings for rotatably supporting abrasive discs 12L and 12R. Abrasive discs 12L and 12R are driven through suitable connections by motors 13L and 13R.

The means for moving abrasive discs 12L and 12R toward and from one another consists of feed screws 15L and 15R mounted in bed 10 and in operative engagement with feed nuts 16L and 16R mounted in spindle housings 11L and 11R respectively.

Since both feed mechanisms are identical, the structural details of only one will be described.

Feed screw 15L has a worm wheel 20L in mesh with worm gear 21L on piston rod 22L. Piston rod 22L is attached to piston 23L in cylinder 24L in bed 10. The other end of piston rod 22L has a gear 30L in engagement with pinion 31L connected to hand wheel 32L.

The rod end of cylinder 24L is connected through line 50 to the rod end of displacement cylinder 35L in which is slidably mounted a piston 36L having a piston rod 37L.

The rod end of cylinder 24R is connected through line 51 of the rod end of displacement cylinder 35R. Piston 36R in cylinder 35R has a piston rod 37R which is connected by means of yoke 52 to the piston rod 37L so that movement of one piston causes the movement of the other.

Fluid under pressure is supplied by pump P through line 60 and check valve 61 to reversing valve body 62. Check valve 61 serves to prevent draining of fluid from the hydraulic system when pump P is not running.

In the reversing valve body 62, there is a valve member 65 held in its left hand position by spring 66. Solenoid 67, when energized, shifts valve 65 to the right against spring 66.

In the left hand position, fluid under pressure from pump P is directed by valve 65 through line 70 and check valve 71 to the head ends of displacement cylinders 35L and 35R to shift pistons 36L and 36R to the left or starting position. A part of the fluid is also directed through restrictions 75L and 75R and check valves 76L and 76R. After passing through check valves 76L and 76R, said

fluid is directed through line 77L to the rod end of displacement cylinder 35L and through line 77R to the rod end of displacement cylinder 35R.

Solenoid 67 may be energized by any suitable control means to shift valve 65 to the right and direct fluid under pressure from line 60 through line 80 and lines 81 and 82 to the head ends of cylinders 24L and 24R. Pistons 23L and 23R move downwardly and rotate feed screws 15L and 15R in order to advance abrasive discs 12L and 12R to grind workpieces W in work carrier 90.

Exhaust fluid from the rod ends of cylinders 24L and 24R passes through lines 50 and 51 to the rod ends of displacement cylinders 35L and 35R.

Since pistons 36L and 36R are connected together, movement of one must take place at the same rate as movement of the other. Therefore, fluid must be discharged from cylinder 24L at the same rate as from cylinder 24R. The discharge from cylinders 24L and 24R serves to move pistons 36L and 36R at the same rate. Thus, the feeding movement of support members 11L and 11R must occur in synchronism. Any tendency of one of the supporting members 11L and 11R to move more slowly than the other will result in a drop in pressure in the rod end of cylinder 24L for example, because the corresponding displacement piston 36L will continue to move along with displacement piston 36R for cylinder 24R. This drop in pressure will produce an increased pressure difference between the head end of cylinder 24L and the rod end of said cylinder. Such pressure difference has the effect of applying a greater force in the head end of cylinder 24L which will overcome the resistance to movement of spindle housing 11L.

I claim:

1. In a double discs grinder, a pair of disc supporting members, means for feeding said discs toward each other for grinding parallel sides of a workpiece comprising a piston and cylinder for each of said disc supporting members, means for synchronizing the movement of said disc supporting members comprising means to maintain an equal rate of exhaust from both of said cylinders during said feeding movement, said means comprising a pair of displacement cylinders, a piston in each of said displacement cylinders, a yoke for connecting said displacement pistons so that they move in unison, a conduit connecting the rod ends of each of said disc positioning cylinders with the corresponding rod and of one of said displacement cylinders.

2. In a double disc grinder, a pair of disc supporting members, means for feeding said discs toward each other for grinding parallel sides of a workpiece comprising a piston and cylinder for each of said disc supporting members, means for synchronizing the movement of said disc supporting members comprising means to maintain an equal rate of exhaust from both of said cylinders during said feeding movement, said means comprising a pair of displacement cylinders, a piston in each of said displacement cylinders, a yoke for connecting said displacement pistons so that they they move in unison, a conduit connecting the rod ends of each of said discs positioning cylinders with the corresponding rod end of one of said displacement cylinders, and means to control the discharge of fluid from the other ends of said displacement cylinders.

3. In a double disc grinder, a pair of disc supporting members, means for feeding said discs toward each other for grinding parallel sides of a workpiece comprising a piston and cylinder for each of said disc supporting members, the rod ends of said cylinders being connected to exhaust when said discs are moving toward grinding position, means to maintain an equal rate of exhaust from both of said cylinders comprising a pair of displacement cylinders, a piston in each of said displacement cylinders, a yoke for connecting said displacement

pistons so that they move in unison, conduits connecting the rod ends of each of said disc positioning cylinders with the rod ends of the corresponding displacement cylinders, a common discharge line from the head ends of said displacement cylinders, and an adjustable restriction in said discharge line.

4. In a double disc grinder, a pair of disc supporting members, means for feeding said discs toward each other for grinding parallel sides of a workpiece comprising a piston and cylinder for each of said disc supporting members, the rod ends of said cylinders being connected to exhaust when said discs are moving toward grinding position, a pair of displacement cylinders, a piston in each of said displacement cylinders, a yoke for connecting said displacement pistons so that movement of one causes movement of the other, a conduit from the rod ends of each of said disc positioning cylinders to the rod ends of said corresponding displacement cylinders, a conduit connecting the head ends of said displacement cylinders, a common discharge line from said conduit, and an adjustable restriction in said discharge line whereby the rate of movement of said disc positioning pistons is controlled simultaneously by the discharge of fluid from said displacement cylinders.

5. In a double disc grinder, a pair of disc supporting members, means for feeding said discs toward each other for grinding parallel sides of a workpiece comprising a piston and cylinder for each of said disc supporting members, the rod ends of said cylinders being connected to exhaust when said discs are moving toward grinding

position, means to synchronize the movement of said disc supporting members so that one will not reach work engaging position before the other, comprising a pair of displacement cylinders, a piston in each of said displacement cylinders, a yoke for connecting said displacement pistons so that movement of one causes movement of the other, a conduit from the rod ends of each of said disc positioning cylinders to the rod ends of said corresponding displacement cylinders whereby a tendency of one of said disc supporting members to lag behind the other results in a drop in exhaust pressure in the rod end of said lagging disc positioning cylinder and also in the corresponding displacement cylinder, the movement of said other displacement piston causing said first displacement piston to move also, whereby an additional drop in exhaust pressure is effected, the pressure drop between the head end of said lagging disc positioning cylinder and the rod end of said disc positioning cylinder being increased due to the drop in exhaust pressure so that additional force is provided to overcome the tendency of one disc supporting member to lag behind the other.

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