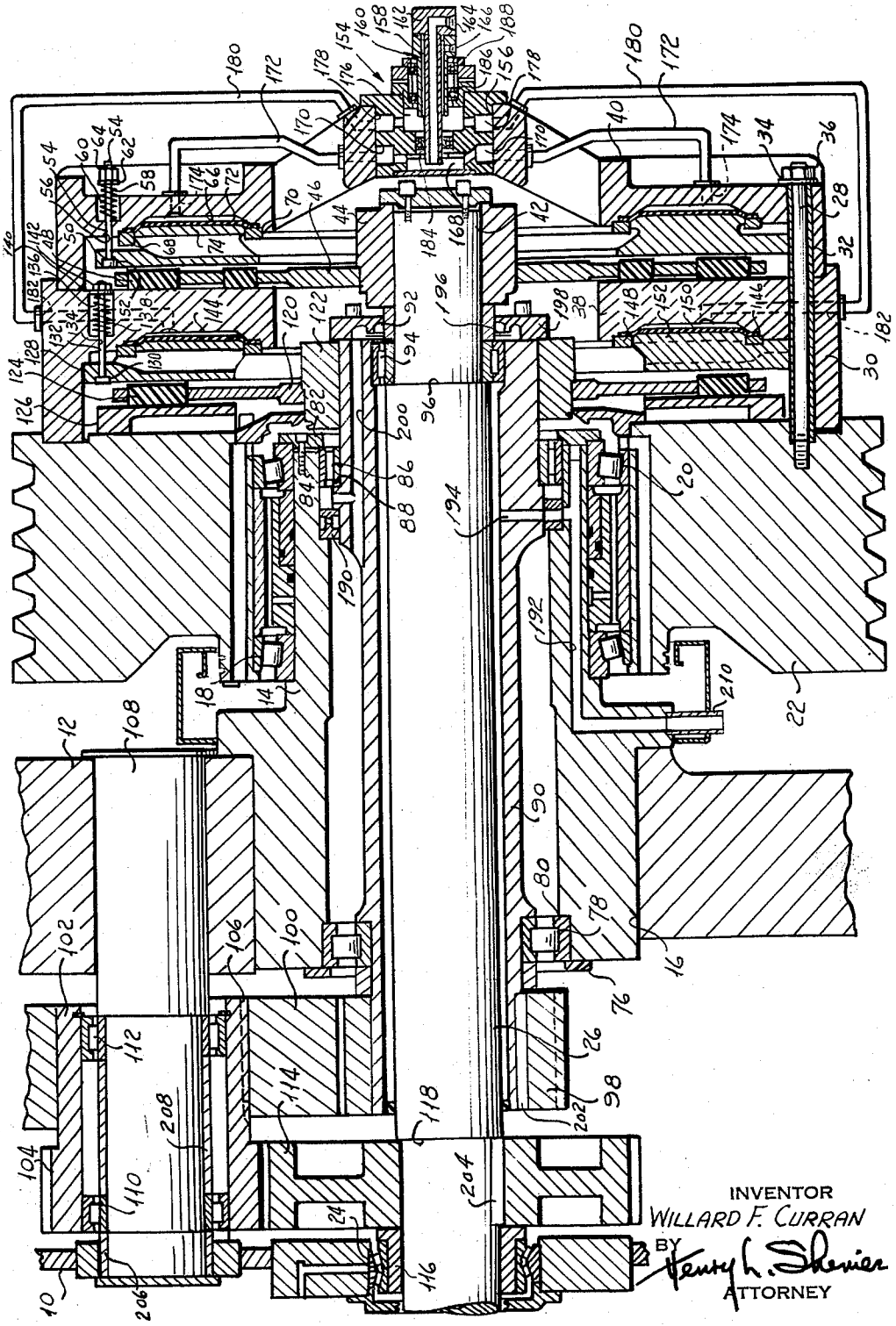
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DUAL SPEED CLUTCH ASSEMBLY

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DUAL SPEED CLUTCH ASSEMBLY

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My invention relates to a dual speed clutch assembly and more particularly to a dual speed clutch assembly which is simple to construct, certain in operation and inexpensive to manufacture.

In operation of power presses for performing drawing operations, the rate of travel of the press slide during the period of drawing is limited by the maximum rate at which the material being worked upon may be drawn. It will be appreciated that if the drawing slide speed is limited to this rate of travel over the entire cycle of operation of the press, the number of operations per unit time which can be performed on the press is limited. In order to increase the productive capacity of a press, it is desirable that the drawing slide approach the work at a relatively rapid speed, slow down to within the critical drawing speed during the actual drawing operation, and return to top dead center at the relatively high speed. Means are known in the prior art for accomplishing this operation of a press drawing slide. For example, the excitation of an eddy current clutch coupling the press flywheel to the drawing slide drive shaft may be varied to reduce the time of travel of the slide in approaching the work and in withdrawing from the work while performing the drawing operation at a speed within the critical drawing speed. This eddy current clutch speed control system, which is capable of a smooth and continuous speed control, is a relatively expensive method of achieving a two-speed control. Further, auxiliary and expensive equipment is necessary properly to control the excitation of the clutch to accomplish the desired result. These systems of the prior art are excessively complicated and costly in relation to the result achieved.

I have invented a dual speed clutch assembly for power presses which increases the productive capacity of a power press in performing drawing operations without exceeding the critical drawing speed during the actual drawing operation. My clutch assembly is a simple, pneumatically operated, mechanical construction. It is extremely certain in operation. It is inexpensive both to manufacture and to operate as compared with systems of the prior art.

One object of my invention is to provide a dual speed clutch assembly for power presses which increases the productive capacity of the press without exceeding the critical drawing speed of the material being worked on.

Another object of my invention is to provide a dual speed clutch assembly for power presses which has a simple construction.

A still further object of my invention is to provide a dual speed clutch assembly for power presses which is certain in operation.

Other and further objects of my invention will appear from the following description.

In general my invention contemplates the provision of a dual speed clutch assembly for a power press having a rigid frame and a drive shaft rotatably carried by the frame. A first quill mounted on the press frame rotatably supports the flywheel of the press. I rotatably

mount a second quill on the press frame and connect it to the drive shaft by a suitable gear train. A first clutch is adapted to couple the flywheel to the drive shaft to drive the shaft directly from the flywheel. I provide a second clutch for coupling the flywheel with the rotatable quill to drive the press shaft from the flywheel through the gear train. My assembly includes means for selectively rendering one or the other of the clutches operative.

In the accompanying drawing which forms part of the instant specification and which is to be read in conjunction therewith, the figure is a sectional view of my dual speed clutch assembly.

More particularly referring now to the drawing, the press with which my clutch assembly is used includes a pair of spaced rigid frame members 10 and 12. I fix a first quill 14 in an opening 16 in frame member 12 by any convenient means such as welding or the like. Respective bearings 18 and 20 rotatably support the press flywheel 22 on the quill 14. Means including a bearing 24 carried by the press frame member 10 rotatably support the press drive shaft 26 on the press. Any convenient means such as a plurality of threaded studs 28 screwed to the flywheel 22 secure a clutch cylinder-forming member 30 to flywheel 22 for rotation therewith. Member 30 is carried on cylindrical bushings or sleeves 32 retained on studs 28 by washers 34 and nuts 36 carried by the studs. I form member 30 with an annular clutch cylinder-forming plate 38. Studs 28 carry a second clutch cylinder-forming plate 40 so formed that its central portion is maintained in spaced relationship from plate 38. It will be appreciated that as flywheel 22 rotates, member 30 and spaced plates 38 and 40 also rotate.

The end 42 of drive shaft 26 remote from bearing 24 as viewed in the figure is provided with a hub 44. I fix a first clutch disk 46 on hub 44 by any convenient means such as welding or the like. Disk 46 carries a plurality of blocks 48 of frictional material adapted to be clamped between the plate 38 and the surface of a shiftable clutch plate 50. A plurality of bolts having their heads 52 disposed in recesses in the face of shiftable clutch plate 50 include shanks 54 passing through bores 56 in plate 40. Compression springs 58 extending between the bases of bores 60 in plate 40 and washers 62 held on shanks 54 by nuts 64 normally urge shiftable plate 50 to the right as viewed in the figure.

I form one face of plate 40 with an annular cylinder 66. A pair of rings 68 and 70 secure an annular flexible diaphragm 72 over cylinder 66. An annular piston 74 formed integrally with plate 50 cooperates with cylinder 66. When fluid under pressure is introduced, in a manner which will be explained in detail hereinafter, to cylinder 66, shiftable plate 50 is urged to the left as viewed in the figure against the action of springs 58 to clamp the friction blocks 48 of disk 46 between plate 50 and plate 38. In this condition of my clutch assembly, shaft 26 is directly coupled to flywheel 22 for rotation therewith.

A retaining ring 76, secured to quill 14 by any convenient means such as screws or the like, retains a bearing 78 in an annular recess 80 formed in the bore of the quill. A ring 82 fixed to quill 14 by screws 84 holds a bearing 86 against a shoulder 88 formed on a second quill 90. Bearings 78 and 86 permit relative rotation between stationary quill 14 and rotatable quill 90. It will be seen that shaft 26 extends through the bore of quill 90. A collar or the like 92 on shaft 26 holds a bearing 94 against a shoulder 96 formed on shaft 26. Bearing 94 assists in supporting shaft 26 and permits relative rotation between the shaft and quill 90. The end of quill 90 remote from bearing 94 supports for rotation

therewith by means of a key 202 a pinion 98 which engages a gear 100 fixed on the hub 102 of a second pinion 104 by means of a key or the like 106. A stationary shaft 108 extending between frame members 10 and 12 carries bearings 110 and 112 which rotatably mount pinion 104 and its hub 102. A sleeve 206 and a spacer 208 hold bearings 110 and 112 in position on shaft 108. Pinion 104 engages a gear 114 fixed on shaft 26 for rotation with it by a key 204. A collar 116 fixed on shaft 26 by any convenient means holds gear 114 against a shoulder 118 formed on the shaft. It will be appreciated that as quill 90 rotates, it drives the gear train including pinion 98, gear 100, pinion 104, and gear 114 to drive shaft 26. It will be readily appreciated that this gear train provides a speed reduction from quill 90 which is being driven at the speed of the flywheel to shaft 26.

In order to drive quill 90 at flywheel speed, I mount a second clutch disk 120 on a hub 122 carried by quill 90 for rotation with it. Disk 120 carries friction blocks 124 adapted to be clamped between a clutch member 126 formed on flywheel 22 and a shiftable clutch plate 128. Bolts having heads 130 disposed in recesses in the face of shiftable plate 128 include shanks 132 which pass through bores 134 in plate 38. Compression springs 136 extending between the bases of recesses 138 formed in plate 38 and washers 140 positioned on shanks 132 by nuts 142 normally urge plate 128 to the right as viewed in the figure to move plate 128 away from disk 120. I form plate 38 with an annular cylinder 144. Respective rings 146 and 148 retain a flexible diaphragm 150 over cylinder 144. I form plate 128 with a piston 152 which cooperates with cylinder 144. When fluid under pressure is admitted to the cylinder 144, piston 152 is urged to the left as viewed in the figure to clamp blocks 124 between plate 128 and clutch member 126.

I provide means for applying fluid under pressure to the interior of cylinder 66 and to the interior of cylinder 144. This means includes a double swivel valve indicated generally by the reference character 154 carried in a bore 156 in the center of the plate 40. Valve 154 includes a pair of concentric tubes 158 and 160 held in spaced relationship by a fitting 162 having respective openings 164 and 166 leading into the bores of the tubes 158 and 160. Tube 158 communicates with an area 168 which is connected by passages 170 to respective fluid feed lines 172. Appropriate fittings connect the tubes or pipes 172 to passages 174 leading to the interior of cylinder 66. It will be seen that fluid under pressure fed to opening 164 travels through the bore of pipe 158, through passages 170, through pipes 172 and through passages 174 to cylinder 66 to urge piston 74 to the left as viewed in the figure to clamp blocks 48 of disk 46 between plates 50 and 38. In this condition of my clutch assembly, the flywheel 22 drives shaft 26 directly.

The bore of tube 160 leads into an area 176 connected by passages 178 to fluid feed pipes 180. Suitable fittings connect pipes 180 to bores 182 in plate 38 which bores communicate with the interior of cylinder 144. Fluid under pressure admitted through opening 166 passes into the area 176, through passages 178, through pipes 180 and through bores 182 to the interior of cylinder 144 to urge piston 152 to the left as viewed in the figure to clamp blocks 124 between plate 128 and clutch member 126. In this condition of my assembly, flywheel 22 drives quill 90 to drive shaft 26 at reduced speed through the gear train including pinion 98, gear 100, pinion 104 and gear 114.

Bearings 184, 186, 188 permit relative rotation between the tubes 158 and 160 carried by fitting 162 and the remainder of the swivel valve 154 carried by plate 40 for rotation with it. It will be appreciated that at no time should both clutch disk 120 and clutch disk 46 be engaged with flywheel 22. To prevent this operation, a control valve of any suitable type known to the art (not shown) connects only one of the openings 164 or 166 to a source of fluid under pressure (not shown) at a time while connecting the other of the openings to an area of reduced pressure or to the atmosphere. In this manner, simultaneous operation of both clutches of my assembly is prevented. This control valve may be operated by hand or by a cam driven from the driving gear train of the press, as is understood by those skilled in the art.

I provide my assembly with a stationary oil introducing ring 190 disposed between rotatable quill 90 and stationary quill 14. A pipe 210 connected to a source (not shown) of lubricating oil introduces oil into a passage 192 in stationary quill 14. Passage 192 conducts oil to ring 190. A transverse passage 194 in the wall of rotatable quill 90 conducts oil to the space between shaft 26 and rotatable quill 90. Oil in this space between shaft 26 and rotatable quill 90 flows through bearing 94 and is thrown outwardly by a flinger ring 196. A ring 198 collects the oil, which flows through a return duct 200 in rotatable quill 90, which duct 200 has branches which supply lubricating oil to bearings 78 and 86.

In operation of my dual speed clutch assembly, during the period of time when the press draw slide moves toward the work but before the slide die engages the work, opening 164 is connected to a source of fluid under pressure and opening 166 is connected to the atmosphere or to an area of reduced pressure. Owing to the fact that no fluid under pressure is being introduced into cylinder 144 through opening 166, springs 136 urge plate 128 to the right as viewed in the figure out of engagement with the blocks 124 carried by disk 120. At this time the rotatable quill 90 will not be clutched to flywheel 22. Fuild under pressure entering opening 164 passes through tube 158 into the area 168 through passages 170 through pipes 172 and through passages 174 into the interior of cylinder 66. This fluid under pressure moves piston 74 to the left as viewed in the figure against the action of springs 58 to clamp blocks 48 between plate 50 and plate 38 to clutch shaft 26 directly to flywheel 22. This is the condition of my clutch assembly corresponding to the faster of the two drive speeds provided. It will be seen that when flywheel 22 drives shaft 26 directly, the shaft drives quill 90 through the gear train including gears 114, 104, 100, and 98. Since no fluid under pressure is fed to opening 166, clutch disk 120 is free to permit this rotation of quill 90.

Just before the die carried by the press drawing slide engages the work, opening 164 is connected to the atmosphere or to an area of reduced pressure and opening 166 is connected to a source of fluid under pressure. Since no fluid is admitted to cylinder 66 through opening 164, springs 58 urge plate 50 to the right as viewed in the drawing away from disk 46 to permit the disk to rotate with respect to the flywheel 22. Fluid under pressure entering the opening 166 passes through the bore of tube 160 into the area 176 through passages 178 through pipes 180 and through passages 182 to the interior of cylinder 144. The fluid in cylinder 144 urges piston 152 to the left as viewed in the drawing against the action of springs 136 to clamp blocks 124 carried by disk 120 between member 126 carried by flywheel 22 and plate 128. When disk 120 is thus clutched to the flywheel 22, quill 90 is driven from the flywheel to drive shaft 26 through the speed reducing gear train including pinion 98, pinion 104, and gear 114. In this condition of my clutch assembly the press drawing slide operates on the work at a speed below the critical drawing speed for the material being worked on. When the drawing operation is complete, opening 166 is connected to the atmosphere or to an area of reduced pressure and opening 164 is connected to a source of fluid under pressure. Flywheel 22 then drives shaft 26 directly at the higher speed provided by my assembly for the remainder of the cycle of press operation.

It will be seen that I have accomplished the objects of

my invention. I have provided a dual speed clutch assembly for reducing the approach and withdrawal times of the press drawing slide while not exceeding the critical drawing speed during the period of time when the slide acts on the work. My assembly is a simple mechanical construction. It is inexpensive both to construct and to operate. It is certain in operation.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. A power press drive system including in combination a frame, a continuously rotating flywheel, a stationary quill carried by the press frame, means rotatably mounting said flywheel on said stationary quill, a drive shaft, means rotatably mounting said drive shaft on the frame, a rotatable quill, means rotatably mounting said rotatable quill within said stationary quill, said mounting means being such that said rotatable quill is supported by said stationary quill, a gear train operatively connecting said rotatable quill and said shaft, and means for alternately clutching said flywheel to said shaft and to said rotatable quill.

2. A power press drive system including in combination a frame, a continuously rotating flywheel, a stationary quill carried by the press frame, means rotatably mounting said flywheel on said stationary quill, a drive shaft, means rotatably mounting said drive shaft on said frame, a rotatable quill, means rotatably mounting said rotatable quill on said frame, a gear train operatively connecting said rotatable quill and said shaft and means for alternately clutching said flywheel to said shaft and to said rotatable quill.

3. A power press as in claim 2 in which said drive shaft extends through said rotatable quill.

4. A power press drive system as in claim 2 in which said gear train provides a gear reduction.

5. A power press drive system as in claim 2 in which said clutching means comprises a clutch housing and means for mounting said clutch housing on said flywheel for movement therewith.

6. A power press drive system as in claim 2 in which said clutching means comprises a clutch disk, means mounting said clutch disk on said shaft for rotation therewith, a clutch plate carried by said flywheel for rotation therewith, a shiftable clutch plate, means forming a cylinder adapted to receive fluid under pressure, said shiftable clutch plate being formed with a piston adapted to cooperate with said cylinder, means normally urging said shiftable clutch plate out of engagement with said disk and means for admitting fluid under pressure to said cylinder to urge said shiftable clutch plate into engagement with said disk to clamp the disk between the shiftable clutch plate and said plate carried by the flywheel.

7. A power press drive system as in claim 2 in which said second clutch comprises a clutch disk, means mounting said clutch disk on said quill for rotation therewith, a clutch plate carried by said flywheel for rotation therewith a shiftable clutch plate, means forming a cylinder adapted to receive fluid under pressure, said shiftable clutch plate being formed with a piston adapted to cooperate with said cylinder, means normally urging said shiftable clutch plate out of engagement with said disk and means for admitting fluid under pressure to said cylinder to urge said shiftable clutch plate into engagement with said disk to clamp the disk between the shiftable clutch plate and the plate carried by the flywheel.

References Cited in the file of this patent

UNITED STATES PATENTS

1,523,648	Jackson	Jan. 20, 1925
1,855,882	Hoelscher et al.	Apr. 26, 1932
1,994,631	Banker	Mar. 19, 1935
2,591,342	Dodge	Apr. 1, 1952