Jan. 17, 1928. 1,656,624

E. FINSEN

HYDRAULIC CHUCK

Filed April 20. 1926 2 Sheets-Sheet 1

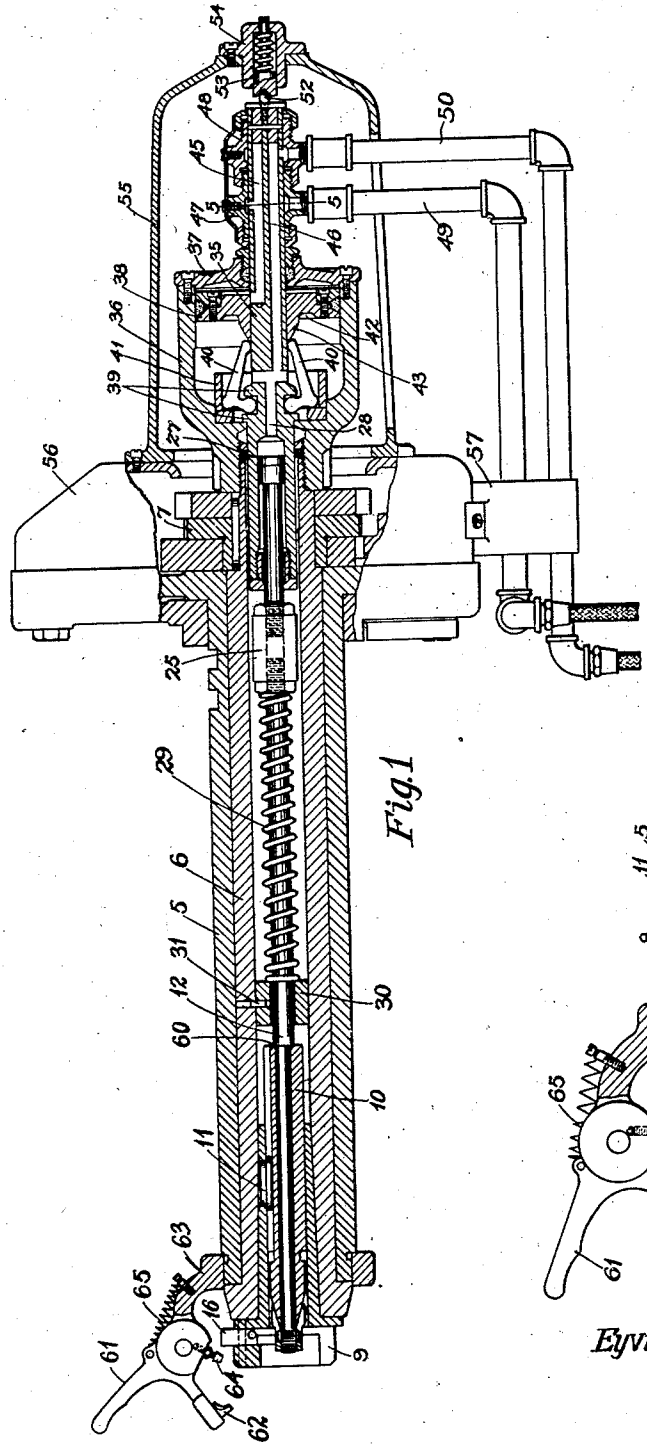


Fig. 1

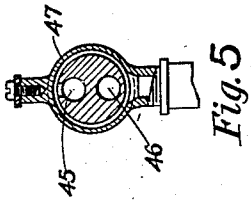


Fig. 5

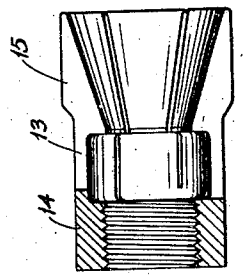


Fig. 4

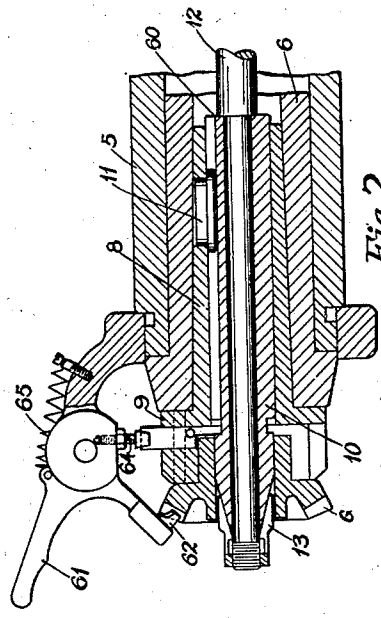


Fig. 2

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HYDRAULIC CHUCK

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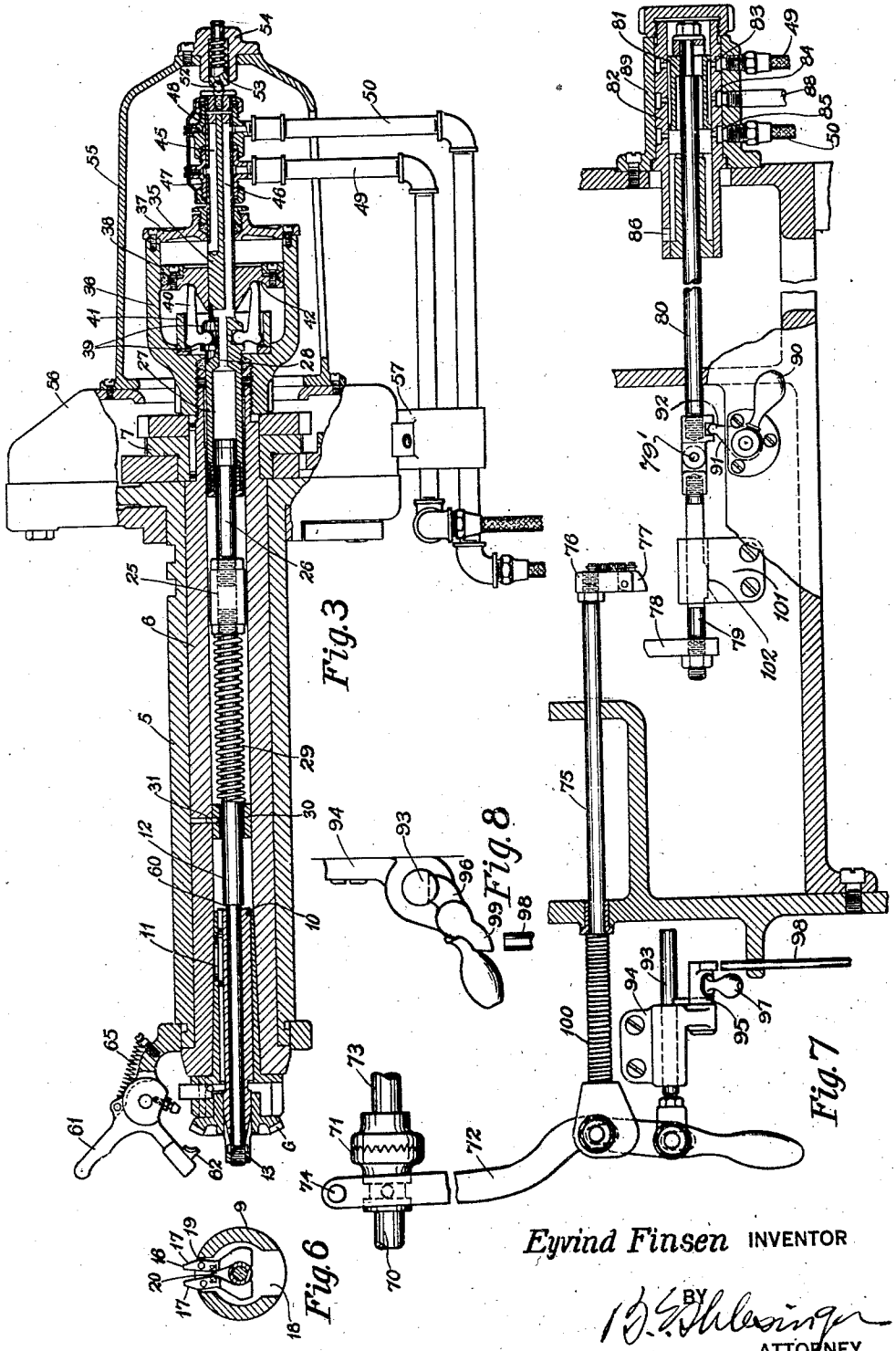


Fig. 3

Fig. 8

Fig. 7

Fig. 6

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Patented Jan. 17, 1928. 1,656,624

UNITED STATES PATENT OFFICE.

EYVIND FINSEN, OF ROCHESTER, NEW YORK, ASSIGNOR TO GLEASON WORKS, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

HYDRAULIC CHUCK.

Application filed April 20, 1926. Serial No. 103,366.

The present invention relates to chucks.

The primary object of this invention is to provide a chuck which may be readily controlled and easily operated.

Further objects of the invention are to provide a chucking mechanism which will securely retain an object during work thereon, and which will automatically release the object after the various operations thereon have been completed.

A further purpose of the present invention is the provision of a chucking mechanism which may be controlled by fluid pressure, as it has been found that this medium permits of a simple centralized control and insures positive operation of the various parts at all times.

With the above and other objects in view, the present invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being specifically understood that this invention is not limited to the particular structure embodied in the accompanying drawing and specification but that the structure may be modified within the scope of the invention and the limits of the appended claims.

One embodiment of the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation, partly in section, of the blank support of a gear cutting machine, showing a chuck, constructed according to this invention, employed thereon and showing the chuck in inoperative position;

Figure 2 is a partial sectional view on a somewhat enlarged scale, showing the position of the chuck at the time of chucking a gear blank;

Figure 3 is a view similar to Figure 1 showing the gear blank completely chucked;

Figure 4 is a sectional view, showing the preferred type of clamp employed in securing the blank on its arbor;

Figure 5 is a section on the line 5—5 of Figure 1;

Figure 6 is a sectional view showing the clamping fingers employed to retain the arbor in operative position during operations upon the blank;

Figure 7 is a side elevational view, partly in section, showing somewhat diagrammatically one form of control device for controlling the operation of the chuck; and

Figure 8 is a detail of the mechanism shown in Figure 7.

The present invention has for its purpose, particularly, the provision of a chucking mechanism for machines operating upon gears or gear blanks and it is in connection with the blank supporting means of a gear cutting machine that the present invention is particularly disclosed. The specific purpose of the invention is to provide means which will prevent rotation or axial movement of the blank on its spindle or arbor during the operations thereon. The preferred embodiment includes mechanism, also, which automatically releases the blank after the completion of the required operations thereon so that a new blank may be chucked.

Referring to the drawings by numerals of reference, 5 indicates a support or housing which may be mounted in any suitable manner upon the frame or cradle of a gear cutting machine. Rotatably mounted in the housing 5 is a sleeve 6 with which is connected the indexing mechanism, indicated generally at 7, for indexing the blank. This indexing mechanism may be of any suitable character. That shown is that more particularly described in the copending application of James E. Gleason et al., Serial No. 715,390, filed May 23, 1924. Mounted in the sleeve 6 (Fig. 2) is a tubular member 8 which extends outwardly beyond the sleeve 6 and is provided with an outer enlarged head 9, one face of which seats against the outer face of the sleeve 6 and the other face of which forms a seat for the gear blank during cutting. Mounted for sliding movement within the member 8 is an arbor 10 which is slotted longitudinally to receive the key 11 secured to the member 8. This key prevents rotational movement of the arbor in the member 8 while permitting axial movement therein. Slidably mounted in the arbor is a rod 12 which serves to carry the clamping member employed to secure the blank to be cut upon the arbor. This clamping member may be of any usual or suitable character. It may be a horseshoe washer or any other suitable form of clamp-

ing device. The device shown in the drawings is an expansible bushing 13.

This bushing 13 is of the same character as that described in the copending application of Schuyler H. Earl, Serial No. 723,287, filed June 30, 1924. This bushing 13 includes a collar 14 (Fig. 4) which is screw threaded upon the outer end of the rod 12, and a plurality of fingers 15 formed by splitting the bushing longitudinally. The arbor 10 is formed with a tapering outer end with which the fingers of the bushing engage when the bushing is moved axially inwardly. Engagement of arbor and bushing expands the bushing, thus clamping the gear blank, or other object being chucked, upon the arbor. Preferably the bushing, as in the application above mentioned, is so constructed that its diameter when collapsed is less than the diameter of the bore of the gear or other object to be mounted upon the arbor, so that when the bushing is collapsed the gear or other object may be removed from or placed on the arbor without first disconnecting the bushing from the rod 12.

To expand this bushing, the rod 12 must be moved axially inwardly of the sleeve 6 so that the inner faces of the fingers 15 of the bushing engage the tapered outer portion of the arbor 10. During this inward axial movement the arbor must be held stationary so that the fingers may be expanded. For holding the arbor stationary a friction clamp 16 is provided. This clamp consists of a pair of finger members 17 (Figure 6) which are pivotally mounted in a slot 18 provided in the head 9 of the tubular member 8. These members 17 are mounted with their longer arms lying below the pivots 19 so that when the shorter arms are forced apart the longer arms will clamp the arbor 10. This friction clamp 16 is adapted to grip the arbor behind a shoulder provided thereon, thus retaining the arbor against rearward movement in the sleeve. A coil spring 20 interposed between the fingers 17 below the pivots 19 serves to move the fingers from clamping position.

The means for moving the rod 12 in the arbor 10 for the purpose of clamping and releasing an object, will now be described. Secured to the inner end of the rod 12, as by means of a turnbuckle 25, is a piston 26 which is adapted to reciprocate in a cylinder 27 which is itself reciprocable in the sleeve 6. The cylinder 27 is formed with a duct or port 28 through which a fluid under compression may be admitted to one side of the piston 26 so as to force the piston forward in the cylinder 27. A coil spring 29 mounted upon the rod 12 serves to actuate the rod in a rearward direction in the sleeve. This spring 29 is mounted on the rod 12 between the turnbuckle 25 and a nut 30 mounted coaxially of the rod. The nut 30 is secured in the sleeve 6 against axial movement by means of a pin 31.

The cylinder 27 itself is provided with an extension 35 which extends into a second cylinder 26 which is screw threaded upon or otherwise secured to the outer end of the sleeve 6. The extension 35 extends through the cover 37 of the cylinder 36 and is bored as will be described hereafter for fluid pressure ducts. Reciprocable in the cylinder 36 is a piston 38 which slides on the extension 35 of the cylinder 27. The extension 35 is formed with two ring-like projections 39 which serve as sockets for the inner ends of a set of toggle members or bell crank levers 40. These toggles or bell crank levers are fulcrumed in the angles formed between the side wall and the base of a cup 41 which is rigidly secured in the cylinder 36. The piston 38 is provided with a groove 42 which serves as a socket for the inner ends of the bell crank or toggle members 40. The piston 38 is also provided with a tapered nose 43 which assists in moving the bell cranks from the position shown in Figure 1 to the position shown in Figure 3. The extension 35 is bored as indicated at 45 and 46 to form passageways through which the fluid employed in moving the pistons may be admitted to the cylinders. The passageway 45 conveys the fluid to the outer side of the piston 38, while the passageway 46 conveys the fluid to the inner side of this piston and also communicates with the duct or port 28 of the cylinder 27 to convey fluid into the cylinder 27.

The fluid employed in a chuck constructed according to this invention may be of any suitable character. I preferably use oil. This fluid may be carried to the passageways 45 and 46 in any suitable manner and from any suitable source. As shown, the fluid enters the passageways through T-joints 47 and 48 which are secured to each other and to pipes 49 and 50 respectively which may communicate with a pump or with a fluid pressure line.

The outer end of the extension 35 of the cylinder 27 seats against a ball 52 mounted in a socket formed in the outer end of a spring-pressed plunger 53 which is reciprocably mounted in a socket 54 which is formed in or secured to the guard 55 which surrounds the cylinder 36 and its cooperating parts and is secured to the index mechanism housing 56. A bracket 57 secured to the index housing 56 serves as a support for the fluid conducting pipes 49 and 50.

The operation of the mechanism so far described is as follows: Assuming the parts in the position shown in Figure 1, when it is desired to secure a gear blank G upon the machine, this blank is positioned so that its bore is in line with the arbor 10. Then the valve or other means controlling the admis-

sion of fluid pressure to the cylinders is turned so that the fluid employed flows through the pipe 50 into the passageway 46 which communicates with the duct or port 28 of the cylinder 27. The fluid acting upon the outer end of the piston 26 forces this piston forward in the cylinder 27 against the resistance of the spring 29. The forward movement of the piston causes a forward movement of the rod 12. This rod 12 is provided with a reduced outer portion forming a shoulder 60 which engages the inner end of the arbor 10 and carries the arbor forward also. At the same time the operator pulls down the handle 61 of the stock dividing gauge 62 which is pivotally mounted on an arm 63 secured to the housing 5. Secured to this stock dividing gauge is a screw 64 which is provided with a tapered head which serves, when the stock dividing gauge has been moved to the position shown in Figure 2, to move the fingers 17 into clamping position where they will engage the arbor 10 behind its shoulder. This stock dividing gauge may be of any usual structure or type ordinarily employed on gear finishing machines for correctly positioning the blank before starting operation upon it. When the arbor has moved the required distance into the bore of the gear blank G, the valve controlling the admission of the fluid to the cylinders is moved so that the fluid will flow through the pipe 49 and into the passageway 45. At the same time the fluid may flow out of the cylinder 27 and passageway 46 into the pipe 50. The fluid flowing into the passageway 45 forces the piston 38 from the position shown in Figure 1 to the position shown in Figure 3, during which time the toggle or bell crank members 40 force the cylinder 27 rearwardly in the sleeve 6 and with the cylinder, the piston 26 and the rod 12. As the rod 12 moves rearwardly the shoulder of the arbor is seated firmly against the fingers 17 thus securely holding these members in clamping position. The handle of the stock dividing gauge may then be released and the gauge will be swung out of the way by the spring 65. Further rearward movement of the rod 12 expands the bushing 13 and securely clamps the gear blank G upon the arbor against rotational and axial movement. This position is shown in Figure 3 which is the position of the mechanism during operation upon the gear or blank G. After the required number of operations have been performed upon the blank, the same may be released so as to permit operation upon another blank. For this purpose, the valve controlling the flow of fluid to the various cylinders is again moved so that the fluid flows through the pipe 50 and out of the pipe 49. The fluid flowing through the pipe 50 passes through the passageway 46 and duct 28, thus forcing the piston 38 rearwardly in its cylinder 36 to release the toggles 40 and forcing the piston 26 forwardly in its cylinder 27. The forward movement of the piston 26 is aided by the spring pressed plunger 53 which expands upon release of the toggles 40. The forward movement of the piston 26 causes a forward movement of the rod 12. This forward movement of the rod 12 brings the shoulder 60 of this rod into engagement with the rear end of the arbor 10 forcing the arbor forward and releasing the fingers 17 from clamping position. This forward movement of the rod also collapses the bushing 13. The valve is now moved so that fluid flows through the pipe 49 and out of the pipe 50. This causes the piston 38 again to move forwardly in its cylinder 36, thereby to draw the cylinder 27 rearwardly in the sleeve. The rearward movement of the cylinder 27 carries with it the rod 12. The bushing 13 will engage the arbor 10 during this rearward movement and carry the arbor rearwardly also. The bushing 13 does not expand at this time because the clamping fingers 17 have been released and there is nothing else to hold the arbor stationary. The rearward movement of the rod 12 is aided and accelerated by the spring 29 which expands when the fluid flows out of the cylinder 27, so that the whole rearward movement of rod and arbor takes place in a very short time. The rearward movement continues until the rod and arbor have been withdrawn completely from the bore of the gear G so that the gear drops off and may slide down a chute provided for the purpose in the machine.

The valve controlling the flow of fluid may be hand operated. Preferably, however, means are provided for controlling certain movements of this valve automatically. A preferred form of control device is illustrated somewhat diagrammatically in Figures 7 and 8. 70 indicates the main drive shaft of the machine. 71 is a clutch controlled by the clutch lever 72 for transmitting the rotation of this main drive shaft to the shaft 73. The clutch lever 72 is pivotally mounted at 74 upon any suitable part of the machine. Pivotally connected with this clutch lever 72 is a rod 75 which is slidable in suitable bearings provided in the frame of the machine. This rod 75 carries at its inner end a depending lug 76 upon which is pivotally mounted a finger 77 which, as will be hereafter described, is adapted to be moved into engagement with a lug 78 secured to a rod 79. The rod 79 is slidably mounted in a bracket 101 which is secured to the frame of the machine. This rod has a portion 102 which is of enlarged diameter and the bore of the bracket 101 is of a dimension suitable to receive this enlarged

portion. During the operation of the machine the portion 102 seats in the bore of the bracket 101. This rod 79 is pivotally connected as at 79′ with a rod 80 to which is secured the slide valve 81 which controls the operation of the chuck. This slide valve 81 slides in a sleeve 82 which is provided with ports or openings 83, 84, and 85 communicating, respectively, with the pipes 49, 88, and 50. The pipe 88 serves to conduct the fluid from its reservoir in the machine or from the pump which pumps the fluid from this reservoir into the valve cylinder 89 whence it is distributed by the valve 81, the sleeve 82, and the pipes 49 and 50 to the cylinders 36 and 27. The fluid is exhausted from the valve cylinder by the port 86. A pipe may be connected with this port 86 leading back to the reservoir or pump or this port may be merely an opening in the valve cylinder and the fluid may flow back by gravity to the reservoir or pump.

In the position of the valve 81, shown in Figure 7 the fluid flows from the intake pipe 88 through the ports 83 and 84 into the pipe 49. At the same time it exhausts from the pipe 50 through the openings 85 and 86. The valve 81 may be moved to this position by hand by means of the hand lever 90 which is pivotally mounted upon the frame of the machine and which is provided with an arm 91 which actuates the rod 80 through the finger and socket connection 92.

When the hand lever is in the position shown in Figure 7, the blank may be clamped upon the arbor as shown in Figure 3. The machine is then started up by throwing the clutch lever 72 into engaged position. Pivotally connected to this clutch lever is a rod 93 which is slidable in a bracket 94 which is secured to the frame of the machine. Pivotally mounted on this bracket 94 is an arm 95 carrying a keeper 96 which is adapted to be moved by the handle 97 to engage the keeper in a kerf or slot formed in the rod 93. When the keeper is engaged in the slot the clutch lever 72 cannot be thrown. Slidably mounted in suitable brackets provided therefor on the frame is a rod 98. This rod is adapted to be advanced vertically with each minor operation of the machine. For instance, after each indexing operation or after each relative withdrawal of tool and blank for indexing, this rod is advanced a small amount vertically. The advance is such that when the operations upon the blank have been completed the rod will contact with the nose 99 of the arm 95 and rock this arm in its socket, thus withdrawing the keeper 96 from the slot in the rod 93. Release of the rod 93 permits the spring 100 which is mounted on the rod 75 to throw the clutch lever 72 into disengaged position, thus stopping the operation of the machine. The movement of the rod 75 under impulse of the spring brings the finger 77 into engagement with the lug 78 and shifts the rod 79 to the left from the position shown in Figure 7. The movement of the rod 79 to the left shifts the valve 81 to the left causing the fluid to flow from the intake pipe 88 through the pipe 50, thus releasing the arbor 10 and collapsing the bushing 13, as has been described above, to unclamp the gear G. As the rod 79 moves to the left, the enlarged portion 102 of the rod moves out of the bore of the bracket 101 and the lug 78 accordingly drops down out of contact with the finger 77, the rod 79 pivoting about the pivot 79′. If desired the bore of the bracket 101 may be provided with a tapering bottom adjacent its left end thereby easing the rod 79 into its lowered position. After the lug 78 has dropped away, the finger 77 continues to move to the left until the spring 100 has expanded to its limit. The rod 80 may now be moved to the right by means of hand lever 90 to shift the valve 81 to the right to permit entire withdrawal of the arbor 10 and rod 12 from the now completed gear. When a new blank is to be cut and has been positioned in the manner already described, the machine may be again started up by throwing the clutch lever 72 to the right. The pivotal mounting of the finger 77 permits of this last described movement of the lever 72 and the rod 75 connected thereto, since the finger 77 will ride over the lug 78 when the rod 75 is moved to the right.

In the mechanism described, the movements of the valve 81 necessary to the various operations of the chuck are controlled by the hand lever 90, with the exception of the releasing operation which is automatically controlled by the stopping mechanism described. The control for the valve is, however, subject to modification without departing from the spirit of this invention.

Having thus described my invention, what I claim is:

1. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, said means being releasable by forward movement of the arbor, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted on the arbor, means on said member adapted on forward movement of said member to engage said arbor and means for moving said member in opposite directions.

2. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, said means being releasable on forward movement of the arbor, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in the arbor, means on said member adapted on forward movement of said member to engage said

arbor, fluid pressure operated means for moving said member in one direction and means for moving said member in the opposite direction.

3. In a chuck, a sleeve, an arbor slidably mounted in said sleeve, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, fluid pressure operated means for moving said member in opposite directions, means whereby the movement of said member is transmitted to said arbor and means adapted to be engaged with said arbor to prevent rearward movement of the arbor in the sleeve and permit relative movement between said member and arbor.

4. In a chuck, a sleeve, an arbor slidably mounted in said sleeve, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, means whereby movement of said member is transmitted to said arbor, means adapted to be engaged with said arbor to prevent rearward movement of the same and permit relative movement between said member and said arbor, and fluid pressure operated means for moving said member rearwardly relative to said arbor.

5. In a chuck, a sleeve, an arbor slidably mounted in said sleeve, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, means whereby movement of said member is transmitted to said arbor, fluid pressure operated means for moving said member in opposite directions, means adapted to be engaged with said arbor to prevent rearward movement of the arbor in the sleeve and means for moving said member rearwardly in said arbor when said last named means is in engaging position.

6. In a machine for producing gears, an arbor, means for clamping a gear blank upon said arbor, fluid pressure operated means for moving said clamping means to and from clamping position, a valve for controlling the application of fluid pressure, means for moving said valve to cause the release of said clamping means and means adapted to be advanced step by step with each minor operation of the machine to a position where after completion of a predetermined number of operations of said machine it will actuate the valve controlling means.

7. In a machine for producing gears, an arbor, means for moving the arbor into and withdrawing it from the bore of a gear blank, means for clamping the blank upon said arbor, fluid pressure operated means for moving said clamping means to and from clamping position, a valve for controlling the movement of said clamping means, and means adapted to be actuated after a predetermined number of operations of the machine to move said valve to release said clamping means.

8. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, said means being releasable by forward movement of said arbor, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, spaced means carried by said member adapted to engage said arbor on movement of said member in either direction, a piston connected to said member, a cylinder in which said piston slides, fluid pressure operated means for actuating said piston in one direction, means for actuating said piston in the opposite direction, and means for moving said cylinder bodily in opposite directions.

9. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, said means being releasable on forward movement of said arbor, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, a piston to which said member is connected, a cylinder, in which said piston is reciprocable, reciprocably mounted in said sleeve, said cylinder being provided with a port for admitting fluid pressure to one side of said piston, means for actuating the piston in the opposite direction, a second cylinder secured to said sleeve, a piston reciprocable in said second cylinder, means for directing fluid pressure to opposite sides of said last named piston, means adapted on movement of said last named piston in one direction to move the first cylinder rearwardly in said sleeve and spaced means on said slidable member adapted to engage said arbor on movement of said member in either direction.

10. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, said means being releasable on forward movement of said arbor, a rod slidable in said arbor, spaced means carried by said rod adapted to engage said arbor on movement of said rod in either direction, a piston connected to said rod, a cylinder in which said piston reciprocates, fluid pressure operated means for actuating said piston in one direction, means for actuating the piston in the opposite direction, a second cylinder secured to said sleeve, an extension on said first cylinder, a piston slidable in said second cylinder and on the extension of the first cylinder, said extension being bored to form ducts for conducting fluid pressure to opposite sides of said second piston, one of said ducts communicating with the first cylinder to admit fluid pressure to one side of the piston movable therein, means adapted

to be engaged with the extension of the first cylinder, on movement of the second piston in its cylinder, to move the first cylinder in the sleeve, and means for actuating said first cylinder in the opposite direction.

11. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, spaced means carried by said member adapted to engage said arbor on movement of said member in either direction, a piston connected to said member, a cylinder in which said piston slides, fluid pressure operated means for actuating said piston in one direction, means for actuating said piston in the opposite direction, and means for moving said cylinder bodily in opposite directions.

12. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, a member, adapted to carry a clamp for clamping an object on said arbor, slidably mounted in said arbor, a piston to which said member is connected, a cylinder, in which said piston is reciprocable, reciprocably mounted in said sleeve, said cylinder being provided with a port for admitting fluid pressure to one side of said piston, means for actuating the piston in the opposite direction, a second cylinder secured to said sleeve, a piston reciprocable in said second cylinder, means for directing fluid pressure to opposite sides of said last named piston, means adapted on movement of said last named piston in one direction to move the first cylinder rearwardly in said sleeve and spaced means on said slidable member adapted to engage said arbor on movement of said member in either direction.

13. In a chuck, a sleeve, an arbor slidable in said sleeve, means for clamping the arbor against rearward movement in said sleeve, a rod slidable in said arbor, spaced means carried by said rod adapted to engage said arbor on movement of said rod in either direction, a piston connected to said rod, a cylinder in which said piston reciprocates, fluid pressure operated means for actuating said piston in one direction, means for actuating the piston in the opposite direction, a second cylinder secured to said sleeve, an extension on said first cylinder, a piston slidable in said second cylinder and on the extension of the first cylinder, said extension being bored to form ducts for conducting fluid pressure to opposite sides of said second piston, one of said ducts communicating with the first cylinder to admit fluid pressure to one side of the piston movable therein, means adapted to be engaged with the extension of the first cylinder, on movement of the second piston in its cylinder, to move the first cylinder in the sleeve, and means for actuating said first cylinder in the opposite direction.

14. In a chuck, a sleeve, a cylinder secured to said sleeve, a member reciprocable in said cylinder, a piston mounted in said cylinder and slidable on said member, means adapted on movement of the piston in one direction to move said member in the opposite direction, an arbor adapted to extend into the bore of the object to be chucked slidably mounted in said sleeve, a rod slidably connected with said reciprocable member and reciprocable in the bore of said arbor, means carried by said sleeve for holding said arbor against rearward movement in said sleeve, means carried by said rod adapted to clamp an object on said arbor on rearward movement of the rod, means on said rod adapted to engage said arbor to move the latter rearwardly in said sleeve on release of said arbor holding means and means on said rod adapted to release said arbor holding means on forward movement of said rod.

15. In a chuck, a sleeve, a cylinder secured to said sleeve, a member reciprocable in said cylinder, a piston mounted in said cylinder and slidable on said member, means for selectively applying fluid pressure to the opposite ends of said piston, means adapted to be actuated by movement of said piston in one direction to move said member in said cylinder, a second cylinder secured to said member, a piston slidable in said second cylinder, means for applying fluid pressure to one end of said piston to actuate the piston in one direction and means for actuating the piston in the opposite direction, an arbor adapted to extend into the bore of the object to be chucked, slidably mounted in said sleeve, a rod secured to said second piston reciprocable in the bore of said arbor, means carried by said rod for clamping the object on said arbor, means for holding the arbor against rearward movement in said sleeve, means on said rod adapted to engage the arbor to move the same rearwardly in the sleeve on release of the last named means, and means carried by said rod adapted to release the arbor holding means on forward movement of said rod.

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