

April 10, 1956

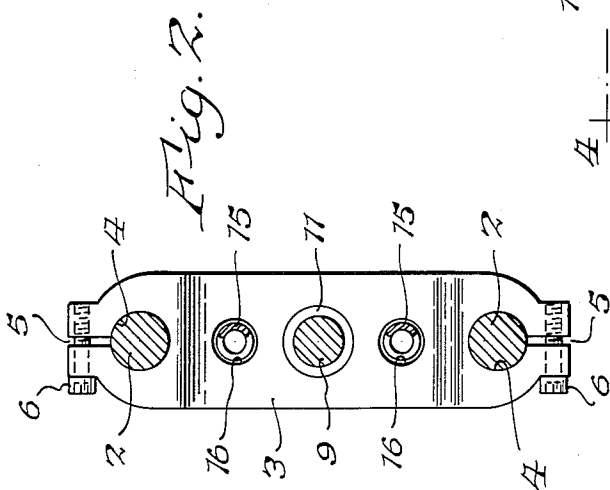
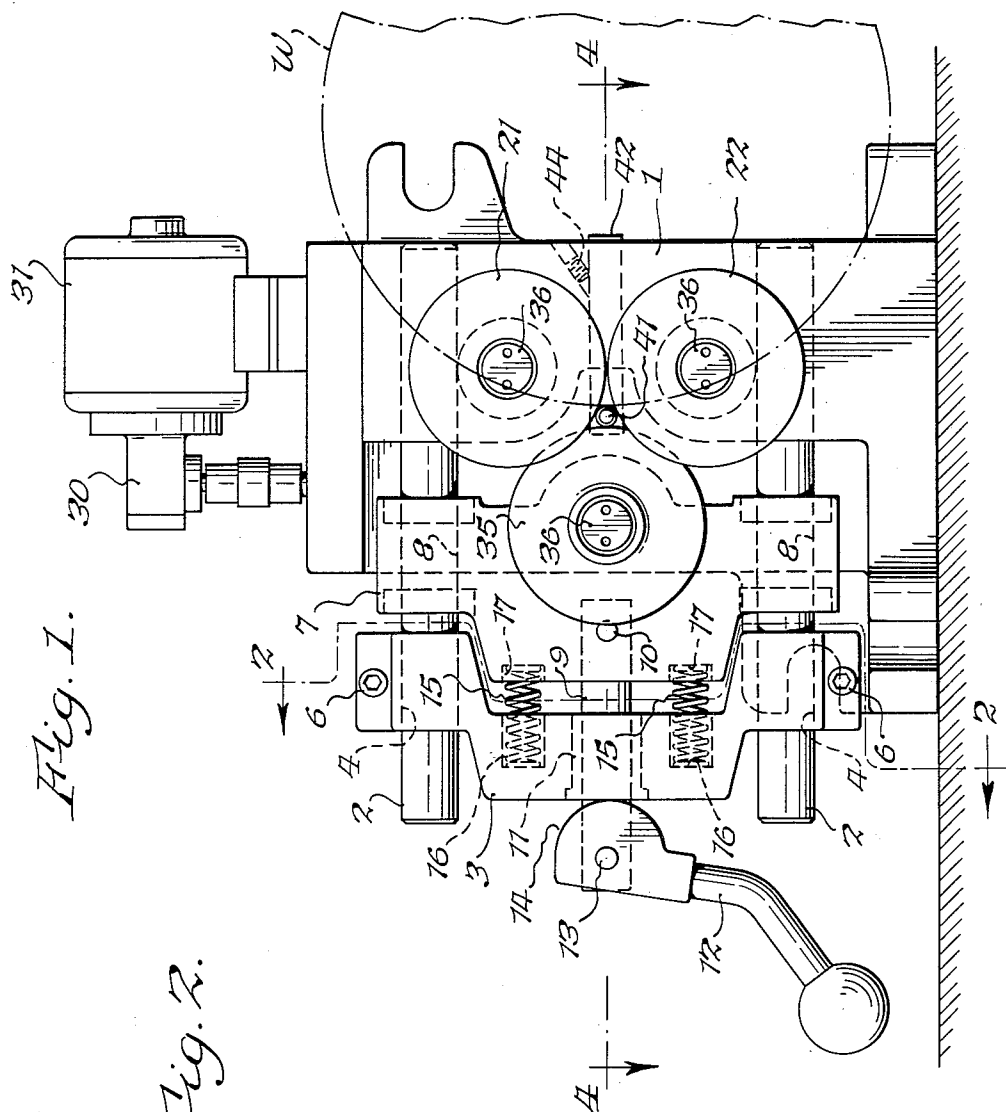
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2,741,074

MACHINE TOOLS

Filed July 14, 1954

3 Sheets-Sheet 1



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Fig. 4.

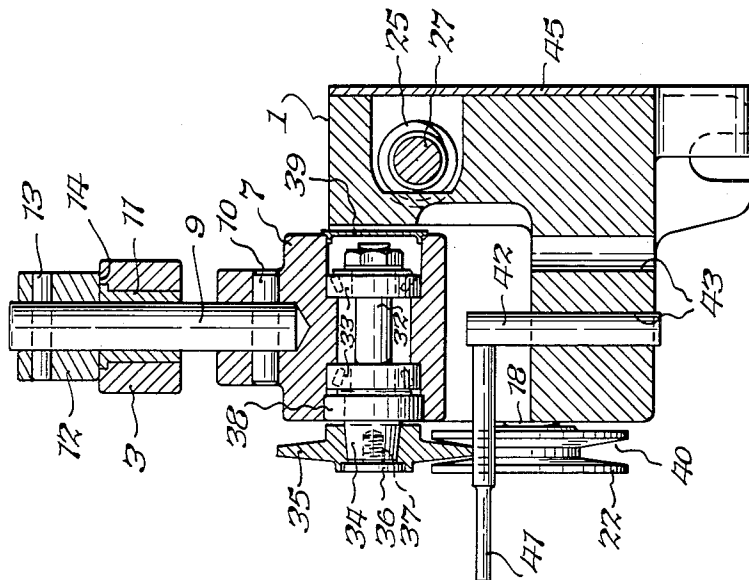
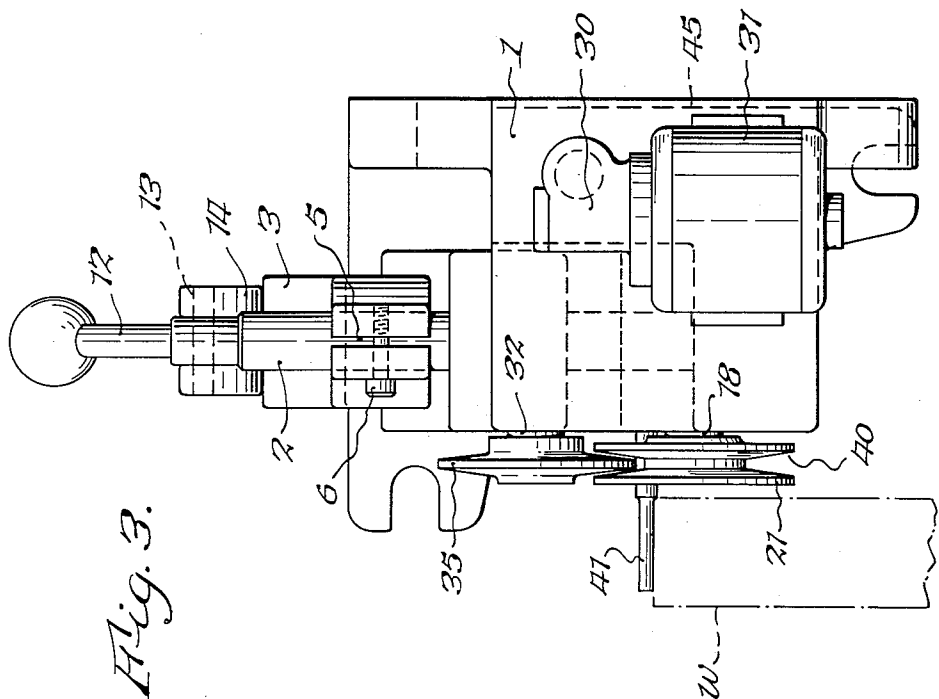


Fig. 3.



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Fig. 6.

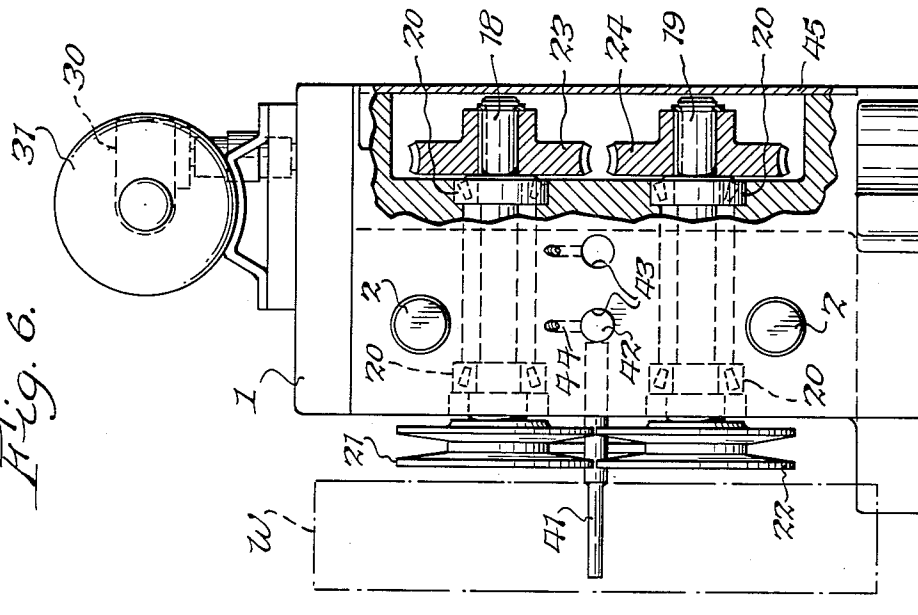
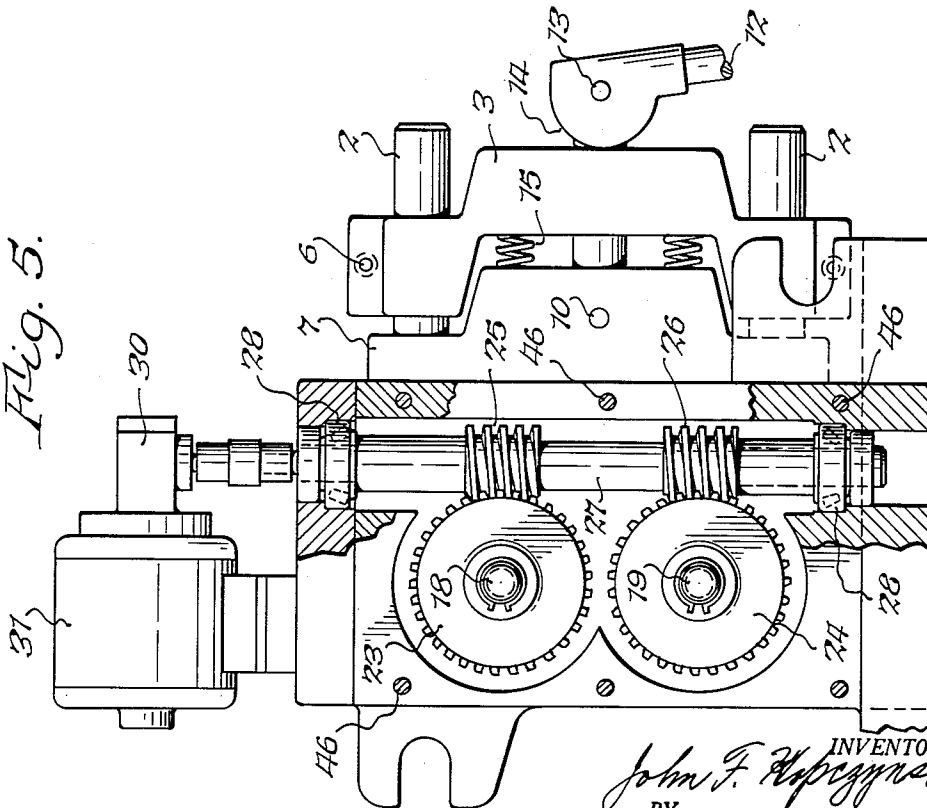


Fig. 5.



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MACHINE TOOLS

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11 Claims. (Cl. 51—134.5)

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This invention relates to machine tools, and particularly to those which are used to center, hold and rotate an object which is to be operated upon, or which itself is a tool that is to be rotated at a high speed and used to operate upon some other object.

An object of the invention is to provide an improved and simple device for centering and rotating an object; with which the object may be quickly and easily removed from held position or a new object inserted in operative position where it is centered and held for rotation; which will be exceptionally simple and compact in construction; which will center, hold and rotate an object of very small diameter at high speed with a minimum of frictional resistance; which adjusts automatically to receive and hold objects of different diameters to be centered and rotated; with which a uniform and continuous holding pressure may be exerted on the held object, and which requires only simple operations in its use.

Other objects and advantages will be apparent from the following description of one embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the illustrated embodiment of the invention:

Fig. 1 is a face elevation of a device constructed in accordance with this invention.

Fig. 2 is a sectional elevation through a portion of the same, the section being taken approximately along the line 2—2 of Fig. 1.

Fig. 3 is a plan of the device shown in Fig. 1;

Fig. 4 is a sectional plan of a portion of the same, the section being taken approximately along the line 4—4 of Fig. 1;

Fig. 5 is a face elevation opposite from that of Fig. 1, with parts broken away to show interior details of construction;

Fig. 6 is a side elevation of the same as viewed from the right in Fig. 1.

In the illustrated embodiment of the invention, the mechanism is carried by a frame 1 which has a main casting or support with posts 2 extending sidewise therefrom in parallel but spaced apart relation and one vertically above the other. A bridge member 3 has passages 4 in its ends through which the posts 2 extend, so that the bridge member 3 can slide along the posts to different extents. The member 3 has its ends that are beyond the passages slit, as at 5, and opposite sides of each slit end are connected by a clamping screw 6 whose shank passes loosely through the bridge member at one side of the slit 5 and is threaded into the part at the opposite side of the slit. By tightening the screws 6, the member 3 may be clamped in any position into which it has been adjusted along the posts 2.

Also confined on the posts 2 is a member 7 which has passages 8 at its ends through which the posts 2 pass with a sliding fit. This member 7 thus slides freely on posts 2 and it has a rod 9 fixed in a recess thereof by a pin 10, the rod extending through a bearing bushing 11 in the bridge member 3. The outer end of rod 9 has

an operating arm 12 pivoted thereto by a pin 13. This arm 12, adjacent the pivot pin 13, has an arcuate cam surface 14 which may be a circular arc with its center of curvature eccentric to the pin 13. When the arm is rotated to extend straight out in a direction generally parallel to rod 9, the surface 14 where it is nearest to pin 13 will be in engagement with the outer face of the bridge member 3, and rod 9 can move to the right in Fig. 1 to its maximum extent. This pushes member 7 nearest to the body of the frame.

When the handle 12 is rotated into the position shown in Fig. 1, the portion of the cam surface 14 which is farther from the pin 13 will engage with the outer face of the member 3, and acting as a cam, will pull the rod 9 outwardly and pull with it the member 7. A plurality of springs 15 are disposed in recesses 16 on the inner face of the bridge member 3 and are under compression between the member 3 and the member 7. The outer face of the member 7 may have recesses 17 in which the abutting ends of springs 15 may be received. The springs 15 resiliently and yieldingly urge the member 7 toward the fixed ends of the posts 2, which is to the right in Fig. 1. Operation of the handle 12 into the position shown in Fig. 1 serves to pull the member 7 to the left in Fig. 1 and further compress the springs 15. When handle 12 is operated upwardly in Fig. 1 into a straight-out position, it releases member 7, and the springs 15 urge it to the right in Fig. 1.

The body of the frame 1 and the member 7 may be considered as two parts that may be selectively caused to relatively approach and separate upon operation of the handle 12, with the aid of springs 15. On the body of frame 1 (or the support), I mount two shafts 18 and 19 (Figs. 5 and 6), for rotation about their own axes by means of roller bearings 20. These shafts 18 and 19 are horizontal and at corresponding ends they carry wheels or discs 21 and 22 removably fixed thereon respectively. On their opposite ends worm wheels 23 and 24 respectively are fixed to rotate with the shafts. The discs 21 and 22 are in side by side alignment vertically, as shown in Fig. 1. The worm wheels 23 and 24 mesh respectively with worm screws 25 and 26 (Fig. 5) that are fixed on an upright shaft 27. Shaft 27 is rotatably mounted in the frame or support 1 by roller bearings 28 and to a speed reduction gear device 30 that in turn is operated by a motor 31. This motor is mounted on the upper end of the frame 1.

The member 7 (Figs. 1 and 4) rotatably mounts a shaft 32 by roller bearings 33, and this shaft extends endwise at one end beyond the member 7 at the end where the discs 21 and 22 are located. This extended end is provided with a tapered periphery 34 (Fig. 4) and a disc 35 with a correspondingly tapered passage at its axis fits over the tapered surface 34. It is held removably thereon by the head 36 of a screw 37 that is threaded into the end of shaft 32. A lubricant seal 38 is provided on the shaft 32 between the disc 35 and the adjacent bearing 33. A cover plate 39 fits and closes the other end of the recess in member 7 in which shaft 32 is disposed. The disc 35 is in side by side alignment with the discs 21 and 22, and the three discs 21, 22 and 35 also have a triangular arrangement and may also be referred to as wheels. The periphery of the disc 35 is formed to telescope somewhat with the peripheries of each of the discs or wheels 21 and 22, as shown in Figs. 1, 3, 4 and 6, so that the wheels 35 may move more closely toward the wheels 21 and 22 than if there were no telescoping. This effect is obtained in the illustrated example by providing each of the wheels 21 and 22 with an endless, outwardly opening, circumferential groove 40 which groove is aligned side by side with that of the other wheel. The wheel 35 is of a width or thickness at its periphery that is less than

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the width of the grooves 40 of wheels 21 and 22, so that it can enter both grooves 40 when the member 7 is moved to the right in Fig. 1, to decrease the triangular space between the wheel peripheries. The grooves 40 may decrease in width with the depth, as shown in Figs. 3 and 4, and the wheel 35 may taper or decrease in thickness toward its periphery to approximately match the taper in grooves 40. The discs or wheels 21 and 22 may be detachably mounted on the ends of shafts 18 and 19 in the same manner as explained for the securing of disc or wheel 35 to its shaft 32.

An object 41 to be centered, held and rotated about its longitudinal axis may be an object to be operated upon, such as a metal punch, or it may be the shank of a small diameter tool or grinding wheel which is to be rotated at a high speed. This object, regardless of the diameter within the limits of this device, will always be centered, held and rotated with the three wheels or discs. To insert an object 41, the handle 12 is rotated downwardly in Fig. 1, into the position shown in Fig. 1, so that its cam surface 14 will act against the outer face of bridge 3 and pull rod 9 outwardly. This pulls member 7 to the left in Fig. 1 and wheel or disc 35 moves with it away from the other wheels 21 and 22. The object 41 is then free and may be removed and replaced by another object. The handle 12 is then moved upwardly to a straight-out or generally horizontal position, which releases rod 9. Springs 15 then move member 3 toward the wheels 21 and 22 until wheel 35 engages the new object 41 and presses it against the peripheries of wheels 21 and 22. This causes the new object 41 to be resiliently held between the three wheels, centered thereby, and rotated about its endwise axis. It thus automatically accommodates itself to centering and holding objects of quite a wide range of different diameters.

In order to hold the object 41 from unintentional endwise movement as it rotates, the shaft 32 of wheel 35 is cocked or disposed at a slight angle to the position it would occupy if its axis of rotation were parallel to the axes of rotation of the wheels 21 and 22. The axes of rotation of wheels 21 and 22 are parallel to each other. The angle that the axis of rotation of wheel 35 makes with a parallel to the axes of rotation of wheels 21 and 22 is very small and is at that side of its parallel position which causes the periphery of wheel 35 to urge the object 41 inwardly. A stop pin 42 (Figs. 4 and 6), which may be removably secured in any of a plurality of holes 43 in a row, is in the path of such endwise movement of the object 41 and stops it, since the force urging the object 41 endwise is not positive but yielding. One of the set screws 44 (Fig. 6) in the frame engages with the pin 42 and holds it against accidental or unintentional removal.

A plate 45 (Fig. 6) closes the space in the frame 1 in which the wheels 21 and 22 and shaft 27 are disposed, and is confined to frame 1 by screws 46 (Fig. 5). When the object 41 is a punch whose shank or punching end is to be ground, a grinding wheel W, shown by dot and dash lines in Figs. 1, 3 and 6, may be mounted to rotate on its own axis in any suitable manner, where it may engage with the object 41, as shown in Fig. 1.

It will be noted that the linear speed of the peripheries of wheels 35, 21 and 22 is quite rapid as compared to the linear speed of the bearing surfaces of their mounting shafts, and these wheel peripheries in turn rotate the much smaller object 41 at a very high speed. Thus, one obtains a high speed of rotation of object 41 without a correspondingly high speed of the bearings for the shafts of wheels 35, 21 and 22. This avoids excessive bearing heat in the bearings that rotatably mount the object 41 for rotation.

It is believed that the operation of this device will be understood from the foregoing description. It will be understood that various changes in the details, materials and arrangements of parts which have been herein described and illustrated in order to explain the nature of

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the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. A machine tool comprising a frame, a pair of axles disposed side by side in parallel, but spaced apart relation and rotatably mounted in said frame, a wheel fixed on an end of each axle, with the two wheels in side by side alinement, each wheel having a grooved periphery with the grooves in approximate alinement with each other in a direction crosswise of their axles, a member mounted on said frame for movement bodily toward and from said axles in a direction crosswise of their axes, a third wheel rotatably carried by said member with its axis of rotation generally parallel to the axes of said axles, said third wheel having its periphery cylindrical and of a substantial width less than the width of and aligned with the grooves in said two wheels so as to be able to enter said grooves when the third wheel is moved toward the said two wheels and center and hold between the wheels an object to be operated upon, springs urging said member yieldingly towards said axles and means also mounted on said frame for selectively moving said member bodily back from said two wheels against the action of said springs, or releasing it so as to cause said third wheel to grip, center and hold between its periphery and the peripheries of the other wheels said object to be operated upon, and to rotate said object when at least one of said wheels is rotated, and means connected to at least one of said wheels for causing its rotation and through it rotation of said object held centered between said wheels.

2. A machine tool comprising a frame, a pair of shafts disposed side by side in parallel, but spaced apart relation and rotatably mounted in said frame, a wheel fixed on an end of each shaft, with the two wheels in side by side alinement, each wheel having a grooved periphery with the grooves in approximate alinement with each other in a direction crosswise of their shafts, guides provided on said frame and extending in a direction crosswise of said shafts at one side thereof, a member confined to said guides for bodily sliding movement thereon toward and from said shafts, a third wheel rotatably carried by said member with its axis of rotation generally parallel to the axis of said shafts, said third wheel having its periphery cylindrical and of a substantial width less than the width of, and aligned with the grooves in said two wheels so as to be able to enter said grooves when the third wheel is moved toward the said two wheels and center and hold between the wheels an object to be operated upon, spring means for resiliently urging said member toward said two wheels and a cam device fixed on said guides on said frame for selectively moving said member bodily back away from said two wheels, whereby when said cam device releases said member, said spring means will cause said third wheel to grip, center and hold between its periphery and the peripheries of the other wheels said object to be operated upon, and to rotate said object when at least one of said wheels is rotated, and means connected to at least one of said wheels for causing its rotation and through it rotation of said object held and centered between said wheels.

3. A machine tool comprising a frame, a pair of shafts disposed side by side in parallel, but spaced apart relation and rotatably mounted in said frame, a wheel fixed on an end of each shaft, with the two wheels in side by side alinement, each wheel having a grooved periphery with the grooves in approximate alinement with each other in a direction crosswise of their shafts, guides provided on said frame and extending in a direction crosswise of said shafts at one side thereof, a member confined to said guides for bodily movement thereon toward and from said shafts, a third wheel rotatably carried by said member with its axis of rotation generally parallel to the axes of said shafts, said third wheel having its periphery cylindrical and of a substantial width

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less than the width of the grooves in said two wheels so as to be able to enter said grooves when the third wheel is moved toward the said two wheels and center and hold between the wheels an object to be operated upon, a cam coupled to said member and operable against said frame to operate said member away from said shafts and to release it, and means acting between said frame and member for resiliently urging the member toward said shafts so as to cause any object to be operated upon which is disposed between the peripheries of said three wheels to be engaged, centered and releasably held by the wheels, and also rotated about its center axis when at least one of the wheels is rotated and the others are free to rotate, and means coupled to at least one of said wheels for imparting rotary movement thereto.

4. A machine tool comprising a frame, a pair of shafts disposed side by side in parallel, but spaced apart relation and rotatably mounted in said frame, a wheel fixed on an end of each shaft, with the two wheels in side by side alinement, each wheel having a grooved periphery with the grooves in approximate alinement with each other in a direction crosswise of their shafts, a member mounted on said frame for movement bodily toward and from said shafts in a direction crosswise of their axes, a third wheel rotatably carried by said member with its axis of rotation generally parallel to the axes of said shafts, said third wheel having its periphery cylindrical and of a substantial width less than the width of the grooves in said two wheels so as to be able to enter said grooves when the third wheel is moved toward said two wheels and center and hold between the wheels an object to be operated upon, means also mounted on said frame for yieldingly urging said member bodily toward said two wheels so as to cause said third wheel to grip, center and hold between its periphery and the peripheries of the other wheels said object to be operated upon, said object being rotatable about its center axis as it is mounted and centered between said wheels, and means also on said frame for retracting said member against the action of said urging means, to withdraw said third wheel away from said pair of shafts and release an object held between the three wheels.

5. A machine tool comprising a support, a pair of wheels disposed in side by side alinement and each having a peripheral groove, with said grooves in alinement with each other, a third wheel disposed in triangular relation to said two wheels and having a cylindrical periphery of a substantial width but less than the widths of said grooves and alined with said grooves so as to be able to enter said grooves when there is relative approach between said third wheel and the other wheels, means on said support for rotatably supporting said wheels for rotation about approximately parallel axes and guiding one of them in relative sidewise approach and separation, from the other two of said wheels in said triangular relation so as to be able to receive between the wheels, center and hold an object to be operated upon, of very small crosswise diameter, for rotation about its longitudinal axis, means on said frame for positively causing said relative separation of one of said wheels from two of said wheels to release an object that has been confined between said wheels or to permit placing of an object to be operated upon in a position to be engaged, centered and held between the wheel peripheries, and means on said frame and operable when free to function, by inaction of said positively causing means to urge said relative sidewise approach of said wheels and engage, center and resiliently hold said object for its rotation about its longitudinal axis.

6. A machine tool comprising a support, three wheels disposed in side by side alinement, and also in a triangular relation, two of said wheels having peripheral grooves, the other of said wheels having a cylindrical periphery of substantial width but less than the widths of said grooves so as to be able to enter them upon relative movement between one wheel and the others to shorten

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at least two sides of the triangle between the axes of said wheels, means on said support for rotatably mounting all of said wheels for rotation on their axes, said mounting means guiding two of said wheels and the other of said wheels in relative sidewise approach and separation, and operable during relative approach to engage, center and hold for rotation with the wheels, an object to be operated upon, which may be of very small diameter in the part where it is engaged as the periphery of one wheel enters the grooves of the other two wheels but said two wheels being sufficiently close to prevent passage of said object between them, positively operating means on said support for causing said relative sidewise separation of said wheels, and resilient means also on said support for causing, when free to act by release from said positively operating means, said relative approach of said wheels so as to accommodate objects of different sizes between the wheels and to releasably and resiliently hold any object between said wheels.

7. A machine tool comprising a support having two relatively movable parts which approach and separate, three wheels disposed in side by side alinement and also in a triangular relation, two of said wheels being mounted on one of said parts, for rotation about their individual axes and having peripheral grooves alined with each other, and the third wheel being mounted for rotation about its axis on the other of said parts, and all of the axes of rotation of said wheels being crosswise of the direction of approach and separation of said parts, selectively operable means for positively separating said parts, means normally overcome by said selectively operable means but free to act when released therefrom, for resiliently urging said parts toward each other to cause relative approach of said third wheel to said two wheels, the periphery of the third wheel being cylindrical and of substantial width but narrow enough to telescope somewhat into the grooves of the other two wheels during approach of said parts and enable a very close approach of said wheels, whereby the wheels may engage and hold an object of very small diameter.

8. A machine tool comprising a support having two relatively movable parts which approach and separate, three wheels disposed in side by side alinement and also in a triangular relation, two of said wheels being mounted on one of said parts for rotation about their individual axes and having peripheral grooves alined with each other, and the third wheel being mounted for rotation about its axis on the other of said parts, and all of the axes of rotation of said wheels being crosswise of the direction of approach and separation of said parts, cam means on said support and operable for positively separating said parts, spring means for resiliently urging them toward each other to cause relative approach of said third wheel to said two wheels, the periphery of the third wheel being alined with said grooves, cylindrical and of substantial width but narrow enough to telescope somewhat into the grooves of the other two wheels during approach of said parts and enable a very close approach of said wheels, whereby the wheels may engage and hold between them an object of very small diameter, and means for rotating at least one of said wheels to cause rotation of said object when it is confined between said wheels.

9. A machine tool comprising a support having two parallel posts extending therefrom in the same direction, a member slidable on said posts and supported thereby, a bridge fixed to the outer ends of said posts, a pair of wheels disposed side by side on said support and rotatably mounted thereby, a third wheel rotatably supported on said member in side by side alinement with said pair of wheels and forming a triangle of wheels therewith, spring means acting between said bridge and member for yieldingly and resiliently urging said third wheel toward said pair of wheels to decrease the approximately triangular space between them, and means on said bridge for positively retracting said member in

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a direction away from said pair of wheels but operable selectively to release said member for movement by said springs, whereby an object of small diameter may be rotatably confined between the peripheries of said wheels of said triangle but released upon operation of said positive means on said bridge.

10. A machine tool comprising a support part having a base with spaced, parallel posts extending therefrom in the same direction, and a bridge fixed on the outer ends of said posts, a member part slidable along and supported by said posts between said bridge and said base, a pair of wheels disposed in side by side alinement and rotatably carried on parallel axes by one of said parts, a third wheel in side by side alinement with the wheels of said pair and rotatably carried by the other of said parts, the three wheels forming a triangle of wheels that can receive between them and rotatably mount a selected object of relatively small diameter, spring means acting between said bridge and said member part and urging the latter yieldingly and resiliently toward the base, and means on said bridge for positively moving said member part toward it and away from said base to enlarge said triangle of wheels when an object is to be removed from or placed between said wheels, but operable to release said member part for movement by said spring means.

11. A machine tool comprising a support part having a base with spaced, parallel posts extending therefrom in the same direction, and a bridge fixed on the outer ends of said posts, a member part slidable along and supported by said posts between said bridge and said base, a pair of wheels disposed in side by side alinement and rotatably carried on parallel axes by one of said

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parts, a third wheel in side by side alinement with the wheels of said pair and rotatably carried by the other of said parts, the three wheels forming a triangle of wheels that can receive between them and rotatably mount a selected object of relatively small diameter, each of two of said wheels having a peripherally extending groove of substantial width, and the other wheel having a cylindrical periphery of substantial width but capable of entering the grooves of the other two wheels, the grooves of said wheels being alined side by side with each other and with the cylindrical periphery of the other wheel, spring means acting between said bridge and said member part and urging the latter yieldingly and resiliently toward the base, and means on said bridge for positively moving said member part toward it and away from said base to enlarge said triangle of wheels when an object is to be removed from or placed between said wheels, but operable to release said member part for movement by said spring means.

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References Cited in the file of this patent

UNITED STATES PATENTS

427,288	Alderdice	May 6, 1890
688,437	Robinson	Dec. 10, 1901
1,493,836	Wurster	May 13, 1924
2,000,586	Foerster et al.	May 7, 1935
2,025,881	McGhee et al.	Dec. 31, 1935
2,039,223	Hutchinson	Apr. 28, 1936
2,060,785	Binns et al.	Nov. 17, 1936
2,351,881	Schottland	June 20, 1944
2,411,972	Melin	Dec. 3, 1946
2,544,318	Horberg	Mar. 6, 1951
2,701,433	Kopczynski	Feb. 8, 1955

30