April 9, 1935. A. F. J. WRIGHT 1,997,353

AUTOMATIC SCREW MAKING MACHINE AND THE LIKE

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Fig. 1.

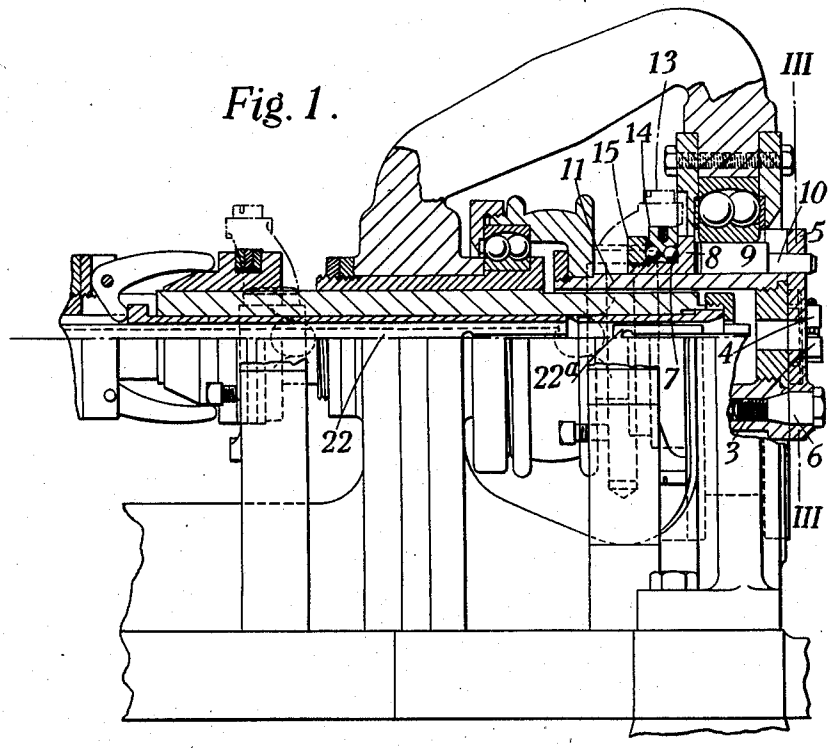



Fig. 2.

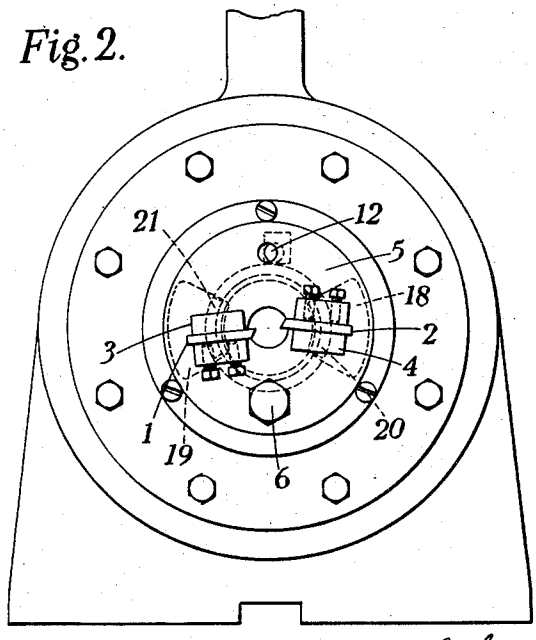
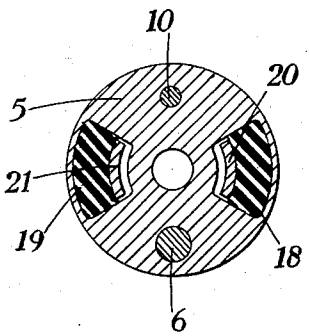



Fig. 3.




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Fig. 4.

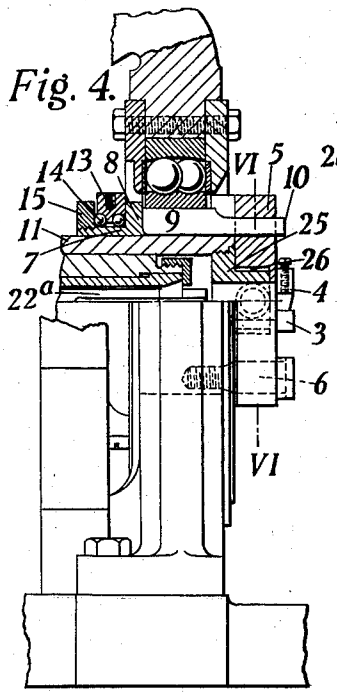



Fig. 6.

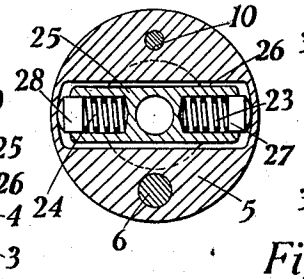



Fig. 7.

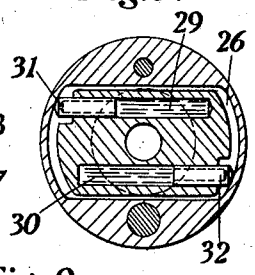



Fig. 8.

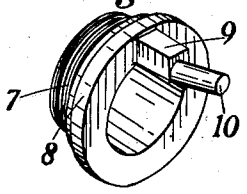



Fig. 5.

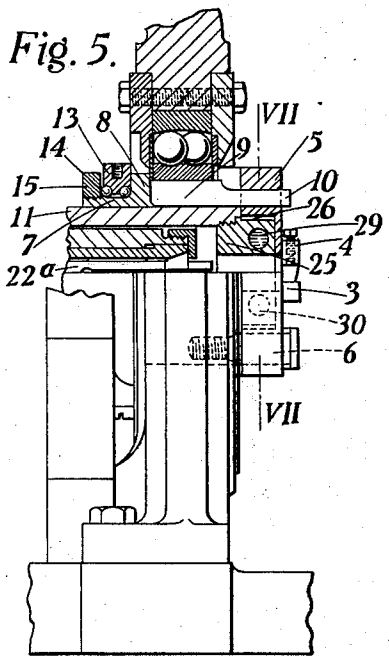
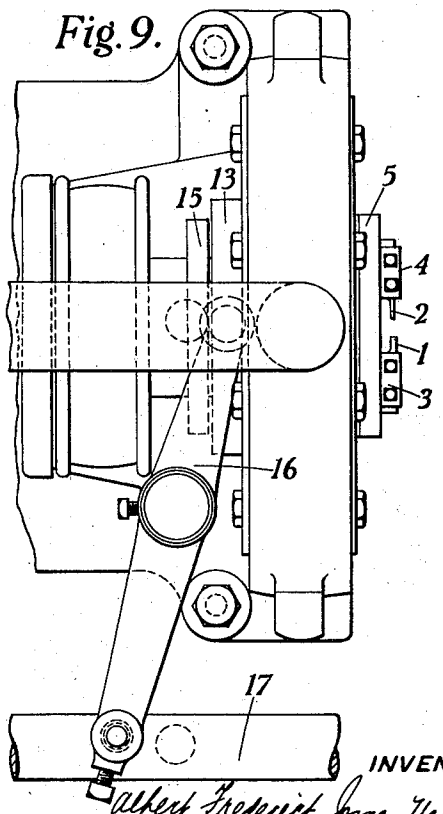



Fig. 9.




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# UNITED STATES PATENT OFFICE

1,997,353

## AUTOMATIC SCREW MAKING MACHINE AND THE LIKE

Albert Frederick James Wright, Walthamstow, England

Application September 25, 1933, Serial No. 690,933
In Great Britain October 7, 1932

17 Claims. (Cl. 82—20)

An application has been filed in England dated 7th October 1932.

In the machine with which the invention is concerned, the tools are brought into and out of operation by being moved towards and away from the center of rotation of the machine. For this purpose, they may be mounted so as to be moved individually or they may be mounted on a tool plate which is movable relatively to the head of the machine. The tools or the tool plate are subjected to a centrifugal force which varies according to the position of the tools or the tool plate and this centrifugal force has to be overcome before the tools can be moved towards the center of rotation. If the speed of rotation of the machine is high, as is the case in automatic screw making machines, or if the tools and the parts partaking of their movement are heavy, this centrifugal force is quite considerable and, therefore, a considerable expenditure of energy is involved in moving the tools and members of heavy construction have to be provided for this purpose. Further, the tools are most conveniently displaced by a pivotal movement transmitted to them by a member moved parallel to the axis of the machine. The displacing mechanism has of necessity to include a member which is inclined to the axis of the machine so that only a component of the force exerted on the displacing member is available for displacing the tools. It is therefore of great advantage to provide means for balancing the centrifugal force on the tools or the tool plate which tends to drive the latter into a position in which this centrifugal force increases as then, the displacing force required is not substantially greater than that required were the parts at rest. This, in fact, is done in accordance with the invention in which means are provided which store up energy when a tool or the tool plate is moved away from the center of rotation of the machine and thus provide a force which balances the said centrifugal force and which is available to assist in moving the tool or the tool plate towards the center of rotation. The preferred means for this purpose consist of rubber blocks which are disposed so as to be compressed on the outward movement of a tool or of the tool plate. Other means such as springs or a compressible fluid such as air could be used.

In order that the invention may be thoroughly understood and be more readily carried into effect some examples of construction will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation of an automatic machine in accordance with the invention and having two tools.

Figure 2 is an end elevation showing the tool plate.

Figure 3 is a section on the line III—III in Figure 1.

Figures 4 and 5 are sectional elevations corresponding to the right hand end of Figure 1 showing modified forms of construction.

Figures 6 and 7 are sections on the line VI—VI in Figure 4 and VII—VII in Figure 5 respectively.

Figure 8 is a perspective view of a detail of construction, and

Figure 9 is a plan view of the device for moving the tool plate.

In the machine illustrated there are two tools 1 and 2 which are held in holders 3 and 4 on the tool plate 5 which is pivoted to the rotating head of the machine on a pin 6. The material is held in the split collets 22 and 22*a* and does not rotate and the tools are brought onto it by a pivotal movement of the plate 5.

The pivotal movement of the tool plate is obtained by means of the member shown separately in Figure 8. It consists of a barrel portion 7 having a radial flange 8, a projection 9 of square section parallel to the axis of the drum and a pin 10 of circular section extending from the projection 9 at an angle to the axis of the drum. This member is mounted on the rotated sleeve 11 and rotates with it and the pin 10 engages in a hole 12 in the tool plate 5. A ring 13 is mounted on ball bearings 14 on the barrel portion 7 of the shifting member 7 and is prevented from moving axially on this member by the flange 8 and a locking ring 15. The ring 13 can together with the shifting member be moved axially on the sleeve 11 by means of a pivoted lever 16 (Figure 9) actuated by a cam operated shaft 17.

It is clear that if the shaft 17 is moved, for example so that the point of attachment to it of the lever 16 moves into the dotted position, the shifting member 7 will be moved axially and as the pin 10 is situated diametrically opposite the pivot pin 6 of the tool plate 5 and is inclined to the axis of the tool plate, the latter will be caused to swing about its pivot pin 6. This pivotal movement brings one of the tools 1 and 2 into contact with the material. To bring the other tool into the working position, the movement of the shaft 17 is reversed so that the tool plate is caused to swing in the opposite sense and past

its dead center into a displaced position on the other side.

These machines are made to run at speeds of 5,000 revolutions per minute and higher and it will be readily appreciated that as soon as the tool plate is out of its dead center position there is a tendency due to centrifugal force for it to fly further out of this position. At the high speeds used this tendency is very great and makes the provision of a very large force necessary for returning the tool plate to its dead center position, especially in an arrangement in which the pivotal movement of the tool plate is caused by means of an axial movement of a shifting member. Provision is therefore made in the construction illustrated for the force which tends to urge the tool plate out of its dead center position to be stored up so as to be available to help in restoring the tool plate to that position. In Figures 1 to 3 rubber blocks 18 and 19 are provided for this purpose. These rubber blocks are situated as seen clearly in Figure 3 in recesses in the tool plate so that when the tool plate is moved out of its dead center position one or the other of them is compressed between the tool plate and a part 20 or 21 of the sleeve 11. Thus when the tool plate is returned to the dead center position, the energy stored in the rubber block during its compression is released and helps in this movement. The force tending to make the tool plate swing out of the dead center position is proportional to the displacement of the plate out of that position and if the member in which the energy due to this force is stored approximately obeys Hooke's law then it is clear that on the return movement the force required for this movement should not be greater than that required were the parts at rest.

An alternative device is shown in Figures 4 and 6. Here, instead of the rubber blocks 18 and 19, springs 23 and 24 are used. These are housed in diametrically opposite bores in a member 25 fixed to the sleeve 11 and located in a slot 26 in the tool plate and have plungers 27 and 28 which are pressed by the springs 23 and 24 against the closed ends of the slot 26. The reasoning applied above makes it clear that the desired effect is obtained.

Other arrangements are of course possible. For example, the restoring force might be stored in a compressible fluid such as air in a chamber formed between the tool plate and one of the rotating parts of the head of the machine. Such an arrangement is shown in Figures 5 and 7. Here the member 25 has two parallel blind bores 29 and 30 in each of which there is a closely fitting plunger 31, 32, the outer end of which bears against an end of the slot 26 in the tool plate 5. It will readily be seen that this device operates in exactly the same fashion as that illustrated in Figures 4 and 6. When the tool plate is moved out of its central position, the air behind the plunger in one bore is compressed and that behind the plunger in the other bore is rarified and energy is, therefore, stored up which is available for restoring the tool plate to its original position.

Other arrangements could also be used for displacing the tool plate such as a sleeve having a pin passing through the tool plate and having a cam slot in it so that by axial displacement of a pin in this slot, the sleeve was caused to rotate relatively to the sleeve 11. Again, the tool plate need not necessarily be subjected to a pivotal movement to bring the tools into and out of action. For example, the tool plate might be made with two flats on its rear face which registered with corresponding flats projecting from the rotating head so that is was displaced by a sliding movement. In such an arrangement, the resistance to this sliding movement might be lessened by the provision of balls or rollers between the sliding surfaces.

I claim:—

1. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a plurality of tools on said plate, means for causing said plate to take up a position eccentric to said head to bring one or the other of said tools nearer the axis of rotation and means for storing up the force exerted on said plate due to its eccentric position.

2. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a tool on said plate, means for displacing said plate relatively to said head to vary the distance of said tool from the axis of rotation of said head, abutments on said plate and on said head and a rubber insert located between said abutments and adapted to be compressed on displacement of said tool away from said axis of rotation.

3. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a tool on said plate, means for displacing said plate relatively to said head to vary the distance of said tool from the axis of rotation of said head, abutments on said plate and on said head and a radially disposed spring located between said abutments and adapted to be compressed on displacement of said tool away from said axis of rotation.

4. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a pivot for said tool plate on said head, a pin on said head normally located in line with said pivot and the axis of rotation of the machine on the side of said axis remote from said pivot and the axis of which is inclined to the plane containing the axis of rotation and the axis of said pivot, and which pin passes through a correspondingly inclined hole in said plate, means for displacing said pin parallel to the axis of rotation whereby said tool plate is displaced about said pivot, and resilient means located between said tool plate and said head adapted to be compressed by said displacement.

5. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine and having its center of mass in the axis of rotation, means for displacing said center of mass whereby centrifugal force tends to increase said displacement and separate resilient means for storing up the force thus exerted on said plate in one direction or the other.

6. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, an eccentric pivot for said tool plate on said rotating head, two tools mounted on said plate and adapted to be advanced towards the axis of rotation by movement of said tool plate about said pivot in one sense or the other, a pin traversing said tool plate and mounted for rotation with and for axial movement relatively to said head and said tool plate and inclined so that such axial movement produces said pivotal movement of said tool plate, two rubber blocks located on opposite sides of said pivot between abutments formed respectively on said tool plate and said rotating head and adapted to

be compressed by said pivotal movement of said tool plate.

7. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, an eccentric pivot for said tool plate on said rotating head, two tools mounted on said plate and adapted to be advanced towards the axis of rotation by movement of said tool plate about said pivot in one sense or the other, a pin traversing said tool plate and mounted for rotation with and for axial movement relatively to said head and said tool plate and inclined so that such axial movement produces said pivotal movement of said tool plate, two helical springs located on opposite sides of said pivot between abutments formed respectively on said tool plate and said rotating head and adapted to be compressed by said pivotal movement of said tool plate.

8. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a tool on said plate, means for displacing said plate relatively to said head to vary the distance of said tool from the axis of rotation of said head, a blind bore in said head, a closely fitting plunger in said bore and an abutment for said plunger on said tool plate whereby said plunger is caused to move axially in said bore on displacement of said tool plate.

9. In a machine of the type set forth, a tool plate mounted to rotate with the rotating head of the machine, a tool on said plate, means for displacing said plate relatively to said head to vary the distance of said tool from the axis of rotation of said head, two oppositely disposed blind bores in said head, a compressible fluid in said bores, a closely fitting plunger in each of said bores and abutments for said plungers on said tool plate whereby on displacement of said tool plate said plungers are caused to move axially one into and the other out of its bore.

10. A machine for working on metal and like materials, comprising a power driven rotary head, a tool holder mounted on said head to rotate therewith and to be moved towards and away from the axis of rotation and relatively to said head, a tool in said holder and resilient means located between said tool holder and said rotary head so as to be compressed when said tool holder is moved in the direction in which the centrifugal force on it is increased.

11. A machine for working on metal and like materials, comprising a tool head mounted to rotate about the work, at least one tool mounted on said head to be moved towards and away from the work and means for exerting on each of said tools a force substantially equal and acting in the opposite direction to the centrifugal force acting on it.

12. A machine for working on metal and like materials, comprising a rotary head, a tool plate mounted to rotate about the axis of rotation of said head and to be moved relatively thereto, a tool mounted on said plate to partake of movement therewith and resilient means located between said tool plate and said rotary head so as to be compressed when the center of gravity of said tool plate and any parts moving with it is displaced away from said axis of rotation.

13. A machine for working on metal and like materials, comprising a rotary head, a tool plate mounted to rotate about the axis of rotation of said head and to be moved relatively thereto, a plurality of tools mounted on said plate to partake of movement therewith and adapted to be brought into and out of operation by movement of said tool plate relatively to said rotary head and resilient means located between said tool plate and said rotary head so as to be compressed when the center of gravity of said tool plate and any parts moving with it is displaced away from said axis of rotation.

14. A machine for working on metal and like materials, comprising a rotary head, a tool plate mounted to rotate about the axis of said head, at least one tool mounted on said plate, means for causing said tool plate to take up a position eccentric to said rotary head to bring a tool into operation and resilient means located between said tool plate and said rotary head so as to exert on said tool plate a returning force proportional to the eccentricity of said tool plate.

15. A machine for working on metal and like materials, in which the tools rotate about the work, comprising a tool mounted for pivotal movement and to rotate with the rotating head of the machine, means for pivoting said tool relatively to said head and resilient means located between said tool and said head and adapted to be compressed when said tool is moved away from the axis of rotation of said rotary head.

16. A machine for working on metal and like materials comprising at least one tool mounted to rotate about the axis of rotation of the machine, means associated with each tool for moving said tools towards and away from the axis of rotation and resilient means associated with each tool mounted so as to be compressed when said tool is moved away from the axis of rotation.

17. A machine for working on metal and like materials comprising at least one tool mounted to rotate about and be moved towards and away from the axis of rotation of the machine, means for positively actuating said tool to bring it into and out of operation, and resilient means mounted to be compressed when the said tool is moved away from the axis of rotation.

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