

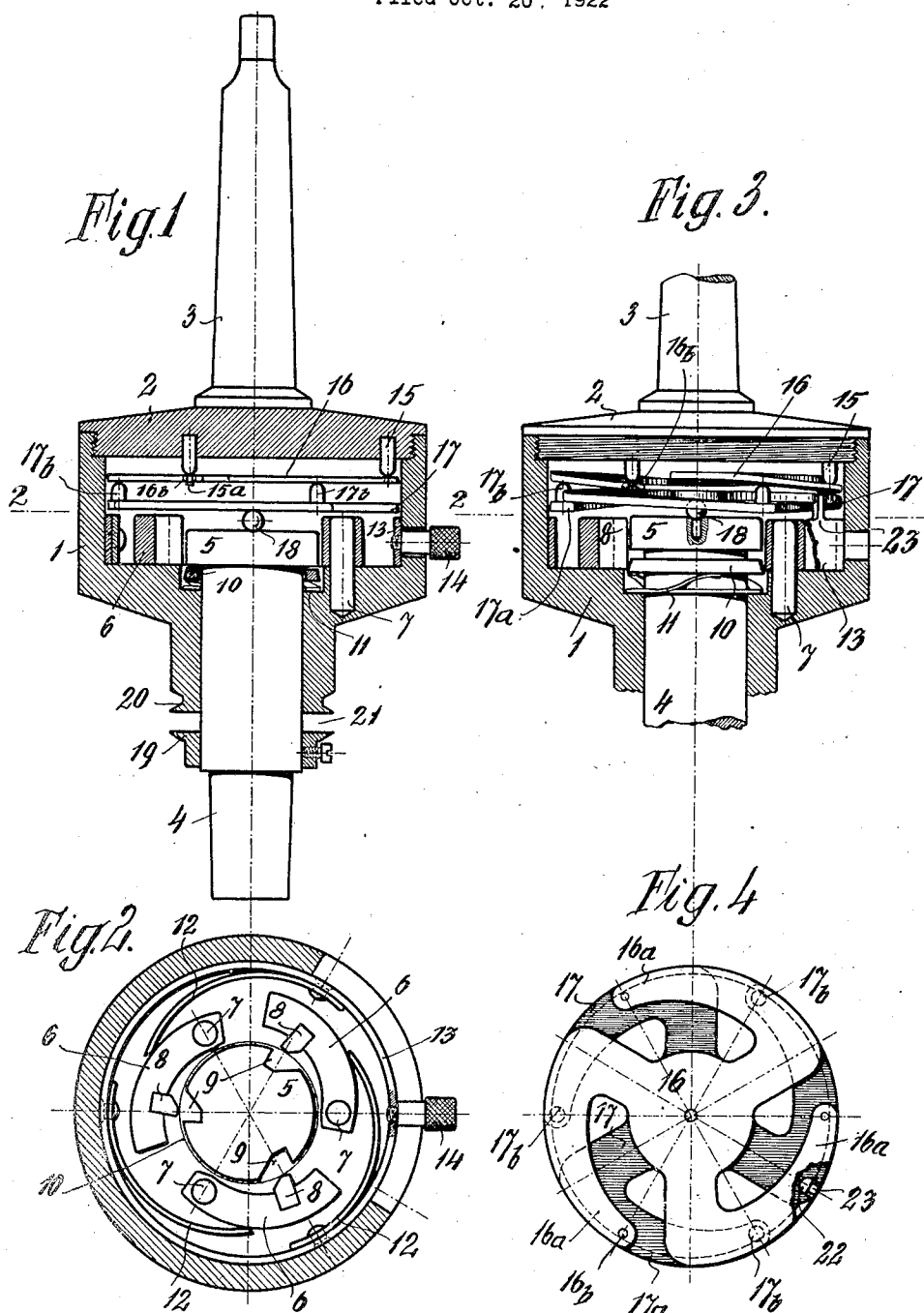
May 13, 1924.

1,494,056

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AUTOMATIC TOOL DRIVING DEVICE

Filed Oct. 20, 1922



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UNITED STATES PATENT OFFICE.

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AUTOMATIC TOOL-DRIVING DEVICE.

Application filed October 20, 1922. Serial No. 595,880.

To all whom it may concern:

Be it known that I, IVAN BENKÖ, subject of the King of Hungary, residing at Vienna, V. Brauhausgasse 39, Austria, have invented certain new and useful Improvements in Automatic Tool-Driving Devices, of which the following is a specification.

The invention relates to tool holders or chucks such as are used with drills and taps and in which the tool is secured against breakage by a too great torsional strain or by a too strong pressure and bending strain, automatic releasing means being provided which show automatically that the limit of the strain which is permissible by safety is already attained at the operative movement.

The object of my invention is to provide, between the driving and the driven part of the tool holder, coupling means which are automatically releasing as soon as the resistance of the material exceeds a certain predetermined degree which is adjustable by spring action, at the same time that the coupling means are thrown out of action, thereby assuring a noiseless rotation of the driving part and rendering the whole device noiseless. To this end I provide a self-actuating locking means which is holding the coupling parts in the released position and which is automatically thrown out of action when the resistance against the rotation is diminishing that is when the tool is uplifted from the material or pulled out of the material and this way the tool is automatically set again into rotation. Another object of my invention is to provide means which show or indicate the amount of the feeding pressure exerted upon the tool in order to move the tool axially into the material, the feeding pressure being transmitted to the tool carrying part by means of adjustable spring pressure and a certain indicator part which is supported by the spring pressure is relatively moving against that means approaching or moving into a greater distance from a collar or another fixed point of the tool carrier when the working pressure is altered.

In the drawings one form of execution of the object of invention is shown by way of examples; Fig. 1 is a vertical longitudinal section through the tool holder which is provided with a casing containing the adjusting means; Fig. 2 is a horizontal sectional view along the line 2—2 of Fig. 1; Fig. 3 is a broken-off vertical section show-

ing the springs by which the axial working pressure is exerted in the working position and Fig. 4 shows in a plan view from above, the two superposed disk-shaped springs.

The driving part 1 forms a casing containing in its interior the acting means and closed by a cover 2 which can be threaded in and which is transmitting the rotative motion of the shaft 3 to the casing 1.

The driven part is the means which is directly or by other parts carrying the tool and in the form of execution shown this driven part is the tool carrying shaft or stud 4 which is located in the hub shaped lower part of the casing 1 and which is provided at its upper end with a head or enlargement 5, which is designed to form a coupling part of a lever arms coupling. Said coupling consists of two or more, for instance three lever arms 6 arranged in equal distances from each other around the stud 4 and pivoted each at a pivot 7. The pivot 7 is fastened in the body of the casing 1 and the coupling arms can swing around the pivot and carry noses 8 with which they can enter into notches 9 of the head of the driven part and said notches are provided with a slanting wall at one side. The rotation in one direction is transmitted from the part 1 by means of the noses 8 to the part 4 and if this part meet a too high resistance of the material which is cut by the tool and the rotation of the tool is interrupted, then the noses 8 are sliding along the slanting wall out of the notches 9 and the part 1 is rotating on for itself uncoupled, whereas part 4 is standing. In order to prevent any noise from the continuous sliding of the noses 8 into and out of the notches and to assure the working coupling means against wear by the continuous friction, means are provided for locking the coupling arms 6 in the open position of the coupling. To this end the driven part 4 is axially movable and carries thereby the locking part which is arranged to enter between the coupling arms 6. The locking part is an annular disk 10 which is arranged below the head 5 and which is forced upwards by an annular spring 11 which tends to push the annular disk 10 axially upwards. If the coupling is closed, the noses 8 are seated above the ring disk 10 and prevent an upward movement thereof, but when the coupling is released the arms 6 are swung out and their noses no longer

prevent the upward movement of the disk 10 and as soon as the tool is pressed upon the material and the shaft 4 is axially moving upwards, it is followed by the annular disk 10 and it enters between the noses 8 and keeps the arms 6 distanced in open position of the coupling. If the tool is thereupon pulled out of the piece of work, the shaft or stud 4 is thereby obviously moving axially downwards relatively in the casing 1, the annular disk 10 is thereby taken along by the head 5 the arms 6 are thereupon falling under the action of their springs 12 into the notches 9 and the tool carrying part 4 is now starting again automatically to rotate.

The point at which the described coupling 8, 9 is released, the limit of torsional strain at which the rotation of the tool is interrupted can be adjusted by altering the action of the springs 12 upon the arms 6. To this end the point upon which the spring 12 is bearing upon its lever arm 6 can be shifted and thereby the distance between the pivot 7 and the point of pressure is altered and if increased, the lever action is also thereby increased. The springs 12 are flat springs and fastened to a common adjusting ring 13 which also is located within the casing and which can be moved around by gripping the stud 14. By turning the ring 13 the distance of the point at which the spring 12 is bearing upon the lever from the pivot 7 can be altered between zero to a maximum, the maximum being obtainable at the free end of the arms 6 and this way the resistance of the coupling can be adjusted from the smallest to the greatest value, as required for the size or diameter of the tool which has to be used. But the tool holder can also have another detail for adjusting the spring pressure upon the coupling arms, for instance it is possible to provide means for increasing the spring tension or additional springs are arranged.

The above described means assure the tool against an excess of torsional strain but the object of my invention is also to provide means by which the tool is perfectly safeguarded against an excess of axial pressure and therefor against a breaking by forcing the tool too hard or too quick upon or into the material and it will no more depend upon the testing attention of the operator whether the tool is safe or is broken, because the operator will now see exactly upon the tool holder whether the axial pressure which he is exerting is kept within permitted limits for the given tool or whether it is going to trespass this limit. This is especially advantageous for tools of small diameter which are liable of breaking easily at a too high axial or bending strain.

The means for transmitting a permissible pressure upon the tool and for making visible the trespassing of the permissible pressure are in the main based on the same ideas as the device described, that is a spring of a constant capacity is provided and the spring or springs can transmit their strain at variable leverage by shifting the points of action or of support of the springs.

In order to make the axial or forwarding pressure visible this pressure is transmitted from the driving part 1 or 2 to the driven part 4 by an interposed spring arrangement or by means under spring pressure and the springs are adjustable whereby the device may be adjusted for the use with tools of different diameter. As shown in the drawing the axial pressure is transmitted from the part 1 or from part 2 to part 4 or its head 5 by means of the two superposed springs 16 and 17 which are formed by steel disks, each disk provided with several, for instance three legs 16 and 17^a respectively which form spring arms. The upper spring legs 16^a receive the axial pressure by the studs 15 which are secured at the inside of the cap 2 and transmit the pressure to the lower spring legs disk 17 by means of other studs 17^b which are riveted into the legs 17^a of the part 17 and upon which the spring legs 16^a are resting. The spring disk 17 transmits the axial pressure by the ball 18 upon the head 15, said part supporting centrally the spring arrangement 16 and 17.

The shaft 4 is carrying a collar 19 or other visible fixed sign and between the rim 20 of the hub part of the casing and between the collar 19 is an annular space 21 which will decrease if the axial pressure upon the shaft 3 will be increased, the value of the axial pressure at which the decrease will start depends on the strain for which the spring arrangement 16, 17 is adjusted, and the operator has only to take care, that the space 21 is always kept open and that no direct contact takes place between the rim 20 and the collar 19.

The spring legs of the upper disk 16 are weaker and their spring action corresponds to the minimum of axial pressure required, while the spring-legs of the other disk 17 are stronger and are able to support the highest axial pressure required. The upper spring-legs disk 16 is secured against rotation for which purpose one of the studs 15 may reach with its reduced end 15^a into a hole 16^b drilled in the disk 16. The other spring-legs disk 17 can be rotated around the main longitudinal axis of the device. Therefor the studs 17^b can be situated either directly in the axis of the studs 15 or at any distance thereof and sitting upon the legs 16^a.

In the first case where the studs 15 and 17^a are in one axis, the axial pressure is transmitted from the studs 15 upon the studs 17^b without cooperative action of the spring legs 16^a and therefore the axial pressure which can be transmitted from the driving part to the driven part corresponds to the pressure which the legs 17^a of the stronger spring can support, that is to the maximum.

In the second instance where there is a distance in a horizontal plane between the studs 15 and 17^b the spring legs 16^a are serving as resilient levers by which the axial pressure is transmitted from the studs 15 to the studs 17^b and the resiliency is increasing with the active length of the legs 16^a. When the studs 17^b are placed by rotation of the disk 17 near to the end of the legs 16^a the pressure which has to be transmitted is acting upon the longest lever arm and, at this maximal lever action the deflection of the spring legs 16^a reaches the maximum and the minimum of axial pressure for the two given coaxing springs 16, 17 can be transmitted to the driven part. That is the action of the stronger spring 17 is reduced by the cooperation of the spring legs 16^a of the softer spring. The arrangement might however be also provided in such a way that the action of the one spring is increased by the cooperation of the second spring.

The rotation of the spring disk 17 can be effected by an actuating button or a stud 14, which can be grasped by hand and moves along a scale, not shown, provided upon the outside of the casing. The stud 14 is fixed to a ring 13 located within the casing and fitting with a rib 23 or any protruding part into a notch 22 of the disk 17.

The cooperating springs 16 and 17 which are interposed as pressure transmitters between the driving part and the driven part are not only permitting of the variable adjustment of the device for tools of different sizes they act also as means for the automatic withdrawing of the locking disk 10 from its engagement with noses 8 of the coupling levers at the time, when the tool is pushed out of the material because in this case the springs are acting with their own spring pressure upon the head 5 and this pressure must of course be provided with such a value that it is more effective than the action of the spring 11 upon the ring disk 10.

The means described for securing the tool against an excess of torsional strain or against an excess of axial pressure can be also arranged in screw-die.

Tool machinery may also be provided with such means, which can be arranged on any suitable point within the main drive or at transmitting parts of the machinery and which act in the manner described by pre-

venting excess of strains and by showing to the operator whether the safe forwarding pressure is not trespassed.

Having now described my invention what I claim to have secured by Letters Patent is:

1. In a device of the character described a driving member connected with a casing enclosing the coupling means between the driving member and the driven member, the driven member lodged in the casing with a coupling head at an axial distance from the driving member, superposed pressure transmitting springs between the driving member and the driven member, said springs in the form of spring legs of a disk shaped spring, pressure transmitting parts between the upper spring and the driving member and between the upper spring and the lower spring and between the lower spring and driven member, the contact points between the pressure transmitting parts located between the upper spring and the lower spring being variable by relative rotation of the pressure transmitting springs substantially as described.

2. In a device of the character described with coupling means between the driving member and the driven member an axially movable driven member and a locking means provided at the driven member as a follower under springs action, said locking means co-acting with the released parts of the coupling substantially as described.

3. In a device of the character described with coupling means between the driving member and the driven member an axially movable driven member and a locking means provided at the driven member as a follower under spring action, said locking means co-acting with the released parts of the coupling, a spring provided for the axial displacement of the follower, substantially as described.

4. In a device of the character described with coupling means between the driving member and the driven member an axially movable driven member and a locking means provided at the driven member as a follower under spring action, said locking means co-acting with the released parts of the coupling a spring provided for the axial displacement of the follower superposed pressure transmitting springs between the driving member and the driven member the action of said pressure transmitting springs opposed to action of the spring at the follower acting as locking means of the coupling parts, substantially as described.

In testimony whereof I have signed my name to this specification.

IVAN BENKÖ.

Witnesses:

CARL SONDENBERG,
CARL ROHRER.