Dec. 14, 1954 A. E. ENGELHARDT 2,696,996

CLAMPING DEVICE

Filed July 14, 1952

Fig. 1

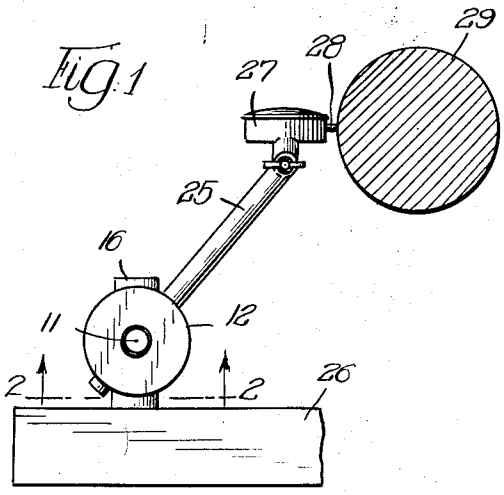


Fig. 2

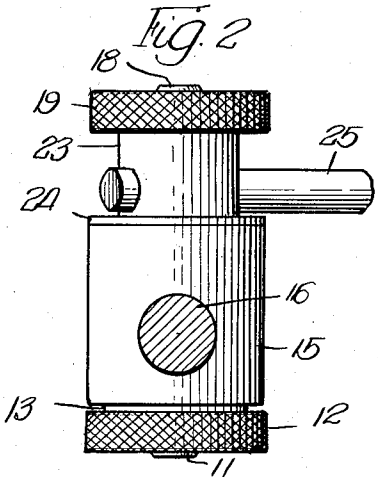


Fig. 3

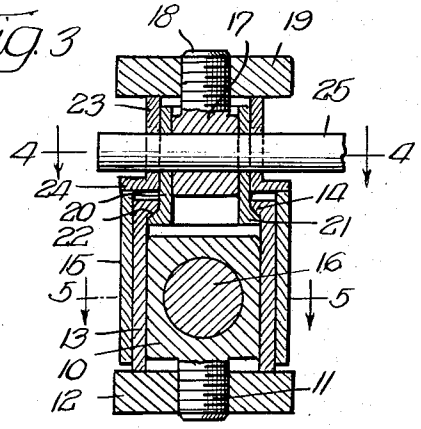


Fig. 4

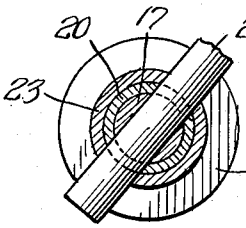


Fig. 5

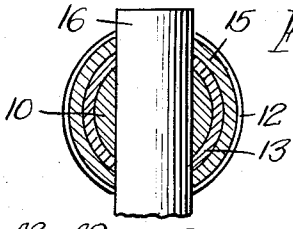


Fig. 6

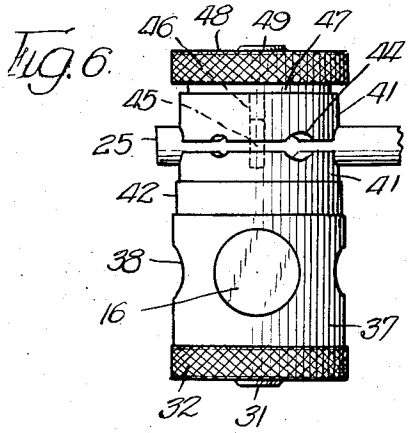
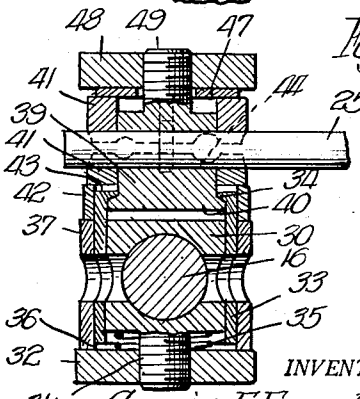


Fig. 7



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CLAMPING DEVICE

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2 Claims. (Cl. 287—14)

The present invention relates to clamping devices, and has for its main object the provision of a clamping unit for simultaneously clamping a pair of shafts or rods in their mutually adjusted position.

Another object of the present invention is the provision of a clamping device embodying a pair of clamping mechanisms, each capable of receiving and clamping one shaft or rod, each of which mechanisms is actuated to an operative position by a separate knob, the two mechanisms being so interrelated and interconnected that when one of said knobs is operated only one shaft or rod is capable of being clamped, with the other shaft or rod unaffected, and when the other of said knobs is turned both clamping mechanisms being capable of simultaneously clamping or locking the two shafts or rods.

A still further object of the present invention is the provision of a clamping device of the type indicated which may be capable of rigidly engaging or clamping a pair of shafts or rods in their mutually adjusted relation longitudinally of the shafts, as well as in their mutually adjusted angular relation.

A still further object of the present invention is the provision of a clamping device which may be capable of receiving a pair of shafts of various diameters.

With the above general objects in view and others that will appear as the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing and pointed out in the appended claims.

In the drawing forming a part of this application and in which like designating characters refer to corresponding parts throughout the several views:

Fig. 1 shows an end elevational view of the present device, illustrating one of the possible uses thereof, namely, when the same supports a dial indicator for measuring the surface of a cylinder fashioned by a lathe or like machine, the view illustrating a stationary shaft upon which the clamping device may be adjusted, and also another shaft which supports the dial indicator;

Fig. 2 is a side elevational view of the present clamping device, the view having been taken along the plane indicated by lines 2—2 of Fig. 1;

Fig. 3 is a longitudinal cross sectional view through the clamping device of a preferred form;

Fig. 4 is a transverse cross sectional view on line 4—4 of Fig. 3;

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a side elevational view of the present device of a modified form; and

Fig. 7 is a longitudinal cross sectional view through the device of a modified form, shown in Fig. 6.

Referring to the present drawing, and particularly to the preferred form of the present device, illustrated in Figs. 2 to 5, inclusive, the same includes cylinder 10, which is provided at one of its ends with a reduced, concentric and threaded boss 11. Said boss 11 receives in a threaded engagement knob 12. Set upon said cylinder 10 in an encompassing relation is sleeve 13, one, outer end of which is adapted to contact with the adjacent end of knob 12. The opposite end of said sleeve 13 is provided with an inwardly extending bevelled flange 14, for the purpose later described.

Set upon said sleeve 13, in an encompassing relation therewith, is outer sleeve 15, the adjacent end of which is in a spaced relation with said knob 12, the opposite

end of which extends beyond the adjacent end of sleeve 13, all as is clearly seen in Fig. 3. Said cylinder 10 and two cooperating sleeves 13 and 15 are provided with diametric and registering openings for receiving therewithin shaft 16.

From the hereinabove description it will be quite clear that when knob 12 is turned around boss 11 and in the direction toward the adjacent end of cylinder 10, the said cylinder will tend to be driven toward said knob 12, as is obvious. Since the adjacent end of sleeve 13 remains in contact with the adjacent face of knob 12 the shifting of said knob 12 toward cylinder 10 will necessarily tend to urge said sleeve 13 to shift to the direction opposite to that to which said cylinder 10 is urged to shift.

Therefore, due to the operation of the knob aforesaid tendencies to shift to the opposite directions are imparted to cylinder 10 and sleeve 13. These shifting tendencies to the opposite directions by the two parts will cause the two parts to press and bear against shaft 16 by the body portions thereof adjacent said openings, which function will cause the clamping action of cylinder 10 and sleeve 13 upon shaft 16, preventing the latter from either shifting within the clamp or from being entirely withdrawn therefrom.

The clamping device further includes cylinder 17, which is provided at one of its ends with a concentric, reduced, threaded boss 18, for receiving in a threaded engagement knob 19. Said cylinder 17 is of comparatively smaller dimensions than cylinder 10, and of course its diameter is considerably smaller than of cylinder 10. Set upon said cylinder 17 in an encompassing relation is sleeve 20, the inner end of which is provided with an outwardly extending bevelled flange 21. Said sleeve 20 is telescopically receivable within sleeve 13, flanges 14 and 21 of said sleeves 13 and 20, respectively, being interengaged and normally having their bevelled surfaces in contact, as at 22. The outer free end of said sleeve 20 is in a spaced relation with the adjacent face of knob 19.

Set upon said sleeve 20 is another outer sleeve 23, the inner end of which is provided with an outwardly extending flange 24, substantially of the diameter corresponding to the diameter of sleeve 15. Said flange 24 is in contact with the adjacent end of said sleeve 15.

The outer free end of said sleeve 23 is normally in contact with the adjacent inner face of knob 19.

Cylinder 17, and sleeves 20 and 23 are each provided with diametric openings of a sufficient tolerance to receive therewithin for loose positioning of shaft or rod 25. This is also true of the openings made in cylinder 10 and sleeves 13 and 15, which, before the operation of either of knobs 12 or 19, are capable of receiving shaft 16 for loose positioning.

If it be assumed that shaft 16 is held loosely within the camp, that is before knob 12 has been turned upon boss 11 to shift the former toward cylinder 10, turning of knob 19 toward cylinder 17 will alone suffice in order to clamp both shafts. Due to the engagement of said knob 19 with the adjacent end of sleeve 23 turning of knob 19 toward cylinder 17 will cause flange 24 to exert strong pressure against and upon sleeve 15 tending to urge the same toward knob 12. This urge is facilitated by the space between the adjacent end of said sleeve 15 and the adjacent face of knob 12. Simultaneously with the pressure exerted upon the adjacent end of sleeve 23 by knob 19, a pressure in the opposite direction is exerted upon cylinder 17 due to the interconnection of the latter with knob 19 through boss 18. The two opposite forces upon shaft 25 brought about by turning of knob 19 upon boss 18, that is the force of sleeve 23 to one direction, and the force of cylinder 17 in the opposite direction, will firmly clamp said shaft 25 within the end of the clamping device within which cylinder 17 is positioned. Simultaneously with the last mentioned clamping action of the device upon shaft 25 clamping action upon shaft 16 is exerted due to the two forces to opposite directions set in operation by knob 19, namely the force of tendency to shift on the part of sleeve 15 toward knob 12, brought about by pressure upon the adjacent end of said sleeve 15 by flange 24, and the

force to the opposite direction exerted upon sleeve 13 brought about upon said sleeve 13 by the action thereon by sleeve 20 due to the interconnection of the latter with sleeve 13 through flanges 14 and 21 and their contacting bevelled surfaces 22. This latter force was due to the tendency of cylinder 17 to shift toward knob 19, and since cylinder 17 is interconnected with sleeve 20 through shaft 25, it necessarily must follow that when cylinder 17 shifts toward knob 19 it must exert an urge upon sleeve 20 to shift to the same direction. The latter urge to shift on the part of sleeve 20 will be transferred to sleeve 13 through the flanged connection between the two sleeves.

From the hereinabove description it will be apparent that when knob 19 is loose upon boss 18 and out of engagement with the adjacent end of sleeve 23, the operation of knob 12 alone will suffice to lock shaft 16 in the clamp without affecting shaft 25. The latter will remain loose within the clamp. This result is due to the fact that operation of knob 12 alone actuates only cylinder 10 and sleeve 13 for drawing the two in the opposite directions. This result does not affect in any manner either cylinder 17 or sleeve 20 or 23. However, regardless of the condition of knob 12, that is irrespective whether the latter knob is loose or in locked engagement with sleeve 13, the operation of knob 19 will tend to clamp shaft 16 due to the urging of sleeves 13 and 15 to shift to the opposite directions, by virtue of the action upon said two sleeves 13 and 15 by flange 21 and flange 24, respectively, under the influence of knob 19, as was hereinabove described.

It is further observed that due to the interengagement of sleeves 13 and 20 through flanges 14 and 21, respectively, the two principal parts of the clamping device will be incapable of separation in a longitudinal direction, when attempted to be drawn in the direction away from the two cylinders 10 and 17.

Separation of the two principal parts of the clamping device to the direction toward cylinders 10 and 17 will equally be impossible due to the bearing of flange 24 against the adjacent end of sleeve 15.

However, when knob 19 is loose, irrespective of the condition of knob 12, it is possible to bring about bodily rotary shifting movement of cylinder 17 and its cooperating parts, including sleeves 20 and 23 and knob 19, together with shaft 25, with relation to cylinder 10 and its cooperating parts, including sleeves 13 and 15, knob 12 and shaft 16. This result is due to the fact that when knob 19 is loose the contacts between flanges 14 and 21 at bevelled surfaces 22, on one hand, and between flange 24 and the adjacent end of sleeve 15, on the other, are devoid of friction and therefore susceptible of relative rotation.

From what has been said it will therefore be clear that when both knobs 12 and 19 are loosely positioned upon their respective bosses 11 and 18 shafts 16 and 25 may be freely shifted to one or the opposite direction so as to relatively adjust said shafts in longitudinal directions. When said knobs 12 and 19 are in a loose position the shafts may also be relatively adjusted angularly by imparting relative rotary movements to the two principal parts of the clamping device. When one or the other, or both adjustments have been made one or the other of the said knobs are manipulated to firmly clamp one or both of the said shafts within the clamping device.

Referring now more particularly to Fig. 1 there is shown one exemplification of the practical adaptation of the present device to use. Shaft 16, which in this instance is stationary, is rigidly supported upon base 26. Said shaft 16 of course is passed through cylinder 10 and sleeves 13 and 15, said cylinder 10 and sleeve 13 being actuable by knob 12. Moving the clamping device to or away from base 26 will adjust the device with relation to shaft 16.

When the device has been shifted upon shaft 16 to a predetermined height above base 26, by turning knob 12 shaft 16 will be locked to the clamping device.

The upper end of shaft 25 in Fig. 1 is made to support casing 27 containing a dial indicator actuable by pin 28 extending from casing 27 and made to contact with cylindrical work 29 which is being fashioned by a lathe or a similar machine.

After the clamping device had been made firm with shaft 16 shaft 25 was longitudinally shifted within the clamping device in order to bring pin 28 in contactual relaton with the periphery of work 29. When that was done knob 19 is turned in order to lock shaft 25 in its adjusted position within the clamping device. Great many instances may be found of various practical applications of the clamping device where knob 12 need not be operated first in order to clamp shaft 16 first in the clamping device, but knob 19 may be resorted to directly to clamp both shafts 16 and 25 simultaneously.

The modified form of the invention illustrated in Figs. 6 and 7 includes cylinder 30 having at one of its ends reduced, concentric, threaded boss 31 engageable by knob 32. Sleeve 33 superimposes said cylinder 30 in an encompassing relation. The end of said sleeve 33 farther removed from knob 32 has an inwardly directed flange 34. A coil spring 35 encompasses boss 31 and is interposed between the adjacent end of cylinder 30 and knob 32. The adjacent end of said sleeve 33 is spaced from knob 32, as at 36.

Encompassing said sleeve 33 is outer sleeve 37, the adjacent end of which is normally in contact with knob 32, while the opposite end of said sleeve 37 terminates short of the adjacent end of inner sleeve 33.

A diametrical bore is made through cylinder 30 and sleeves 33 and 37 for reception therewithin of shaft 16. Another bore 38 is made in the said three parts at a right angled relative position to said first named bore. Bore 38 however is of a diameter smaller than the diameter of the first named bore. The two bores are capable of receiving two shafts, one at a time, of two varying diameters. Thus, when shaft 16 is removed from its bore another shaft, of a smaller diameter may be inserted within the clamp and bore 38.

The operation of the parts of the modified form of the invention last hereinabove described is similar to the corresponding parts of the preferred invention. When knob 32 is turned to drive the same in the direction of cylinder 30, said cylinder tends to shift toward knob 32. Knob 32 exerting pressure at the adjacent end of sleeve 37 tends to urge the latter to the direction opposite from that to which cylinder 30 is being urged. The opposite pressures upon shaft 16 by cylinder 30 and sleeve 37 firmly clamp said shaft 16 within the clamping device.

Coacting with sleeve 33 is cylinder 39, having at one of its ends an outwardly extending flange 40. The inner end of said cylinder 39 and the adjacent end of cylinder 30 are in a mutually spaced relation. Flange 40 is normally in engagement with flange 34, by virtue of which arrangement cylinder 39 is interlocked with inner sleeve 33.

Set upon cylinder 39 in an encompassing relation is a pair of rings 41. One of said rings 41 is seated upon the adjacent end of ferrule 42 which encompasses the adjacent end of inner sleeve 33, and rests upon the inner end of outer sleeve 37. Ferrule 42 extends beyond the adjacent end of inner sleeve 33, effecting space 43 between the adjacent end of sleeve 33 and one of said rings 41.

Each of said rings 41 at the adjacent opposed ends has a plurality of semi-circular recesses 44. Said recesses 44 extend radially in each of said rings 41. Two pairs of opposed recesses in the two rings upon a diametrically transverse line through the device define a bore of the same diameter for passing therethrough a shaft of a certain diameter. Shaft 25 is extended through complementary bores in the two rings 41 and in a diametrical relation therewith, for clamping the same within the two of said rings 41. Extending from one ring 41 is pin 45. The other of said rings 41 is provided with bore 46 into which said pin 45 enters. By virtue of this arrangement two rings 41 are interlocked in a lateral direction, but are capable of separation in a longitudinal direction.

The opposed pairs of recesses 44 in rings 41 may be made in different diameters. Cylinder 39 may have a plurality of bores also of different diameters, all for the purpose of accommodating shafts 25 of corresponding diameters.

Washer 47 is placed upon the adjacent end of one ring 41. Knob 48 in a threaded engagement with threaded boss 49 normally contacts said washer 47. The adjacent end of cylinder 39 is in a spaced relation with said washer 47 or knob 48.

When knob 48 is turned upon boss 49 toward cylinder 39, said cylinder will necessarily be drawn toward

said knob **48**. Washer **47** bears against the adjacent end of one of said rings **41** causing said ring to exert clamping pressure upon shaft **25**. The pressure exerted by said knob **48** upon two rings **41** is transferred through ferrule **42** to outer sleeve **37**. Said pressure exerted upon sleeve **37** is in turn transferred to and upon shaft **16** to the direction toward the opposite knob **32**. Simultaneously, due to the pull exerted upon cylinder **39** by knob **48** pulling force is exerted upon inner sleeve **33** to the direction away from said knob **32**. This latter pulling force is of course accomplished through the interconnection of cylinder **39** with inner sleeve **33** through flanges **34** and **40**. Due to the opposed pulling pressures upon shaft **16** exerted thereon by sleeves **33** and **37** shaft **16** is firmly clamped within the device.

Thus, by virtue of the operation of knob **48** hereinabove described both shafts **25** and **16** will be firmly and rigidly interlocked with the clamping device. Of course, said shafts may be longitudinally as well as angularly adjusted with relation to each other, same as in the preferred form of the invention. Spring **35** has no other function except to urge cylinder **30** away from knob **32**, and with it also sleeve **33**, the latter due to the interconnection with cylinder **30** through shaft **16**, so that in cooperation with the outer sleeve **37** a frictional force may be maintained at all times upon shaft **16**, even though knob **32** is quite loose. By virtue of that frictional force the weight of the device alone will not be sufficient to cause shifting of the device downwardly in a vertical direction before proper adjustment of the device upon shaft **16** had been made and prior to driving knob **32** to its operative condition.

It is noted that the bores in sleeve **23** should preferably be made of somewhat larger diameter than the bores in cylinder **17** and sleeve **20**.

It is further observed that for all practical intents and purposes, and without detracting in any manner from the proper operation of the modified form of the invention shown in Figs. 6 and 7, ferrule **42** may be made an integral part of the outer sleeve **37**. Accordingly, sleeve **37** and ferrule **42** may be considered as one sleeve **37**, the adjacent end of which extends to and contacts the adjacent end of ring **41**.

While there is described herein preferred embodiments of the present invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

What I claim as new is:

1. A clamping device comprising a pair of clamping units, each of said clamping units including a plurality of cylindrical members in a telescopic mutual relation, said cylindrical members in each clamping unit being provided with registering transverse bores for extending a shaft therethrough, means in association with one of said clamping units for urging said cylindrical members in opposite directions for clamping the shaft which remains extended through said unit, and means in association with the other of said clamping units for selectively urging the cylindrical members in both of said units in the opposite directions for simultaneously clamping both shafts within said clamping units.

2. A clamping device comprising a pair of clamping units, each of said clamping units including a plurality of cylindrical members in a telescopic mutual relation, said cylindrical members in each clamping unit being provided with registering transverse bores for extending a shaft therethrough, means in association with one of said clamping units for urging said cylindrical members in opposite directions for clamping the shaft which remains extended through said unit, and means in association with the other of said clamping units for selectively urging the cylindrical members in both of said units in the opposite directions for simultaneously clamping both shafts within said clamping units, some of the cylindrical members in both of said clamping units being interconnected in such a manner as to cause the action of said second named means to be extended upon the cylindrical members of the said first named unit.

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