Sept. 2, 1958 P. S. MORGAN 2,850,129

CLUTCH FOR A BRACE

Filed July 26, 1952

Fig. 1

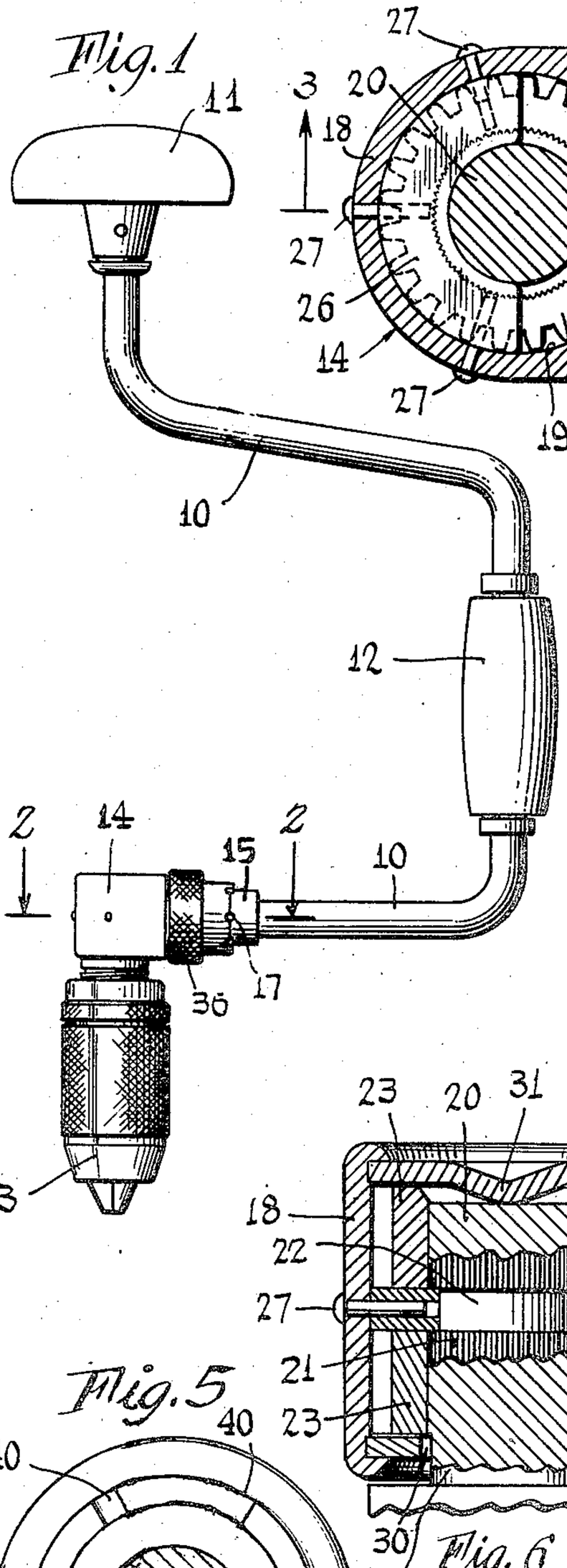


Fig. 2

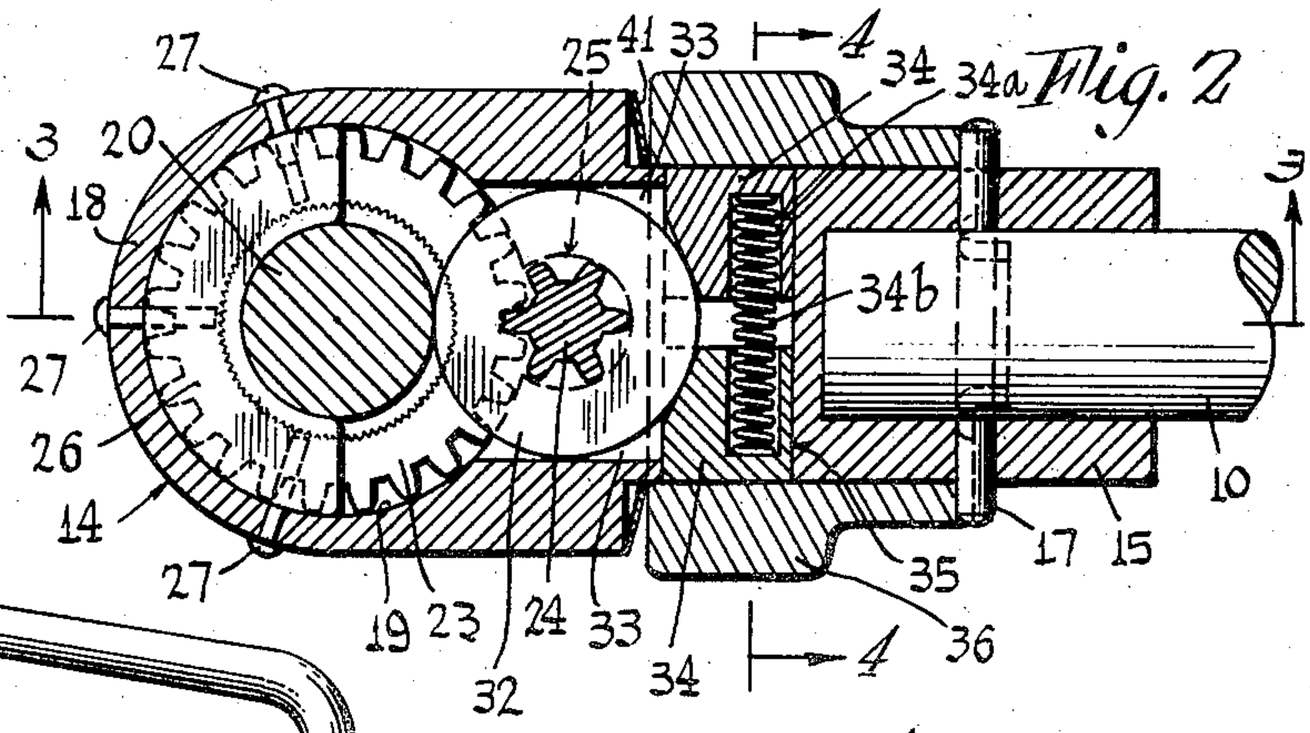


Fig. 4

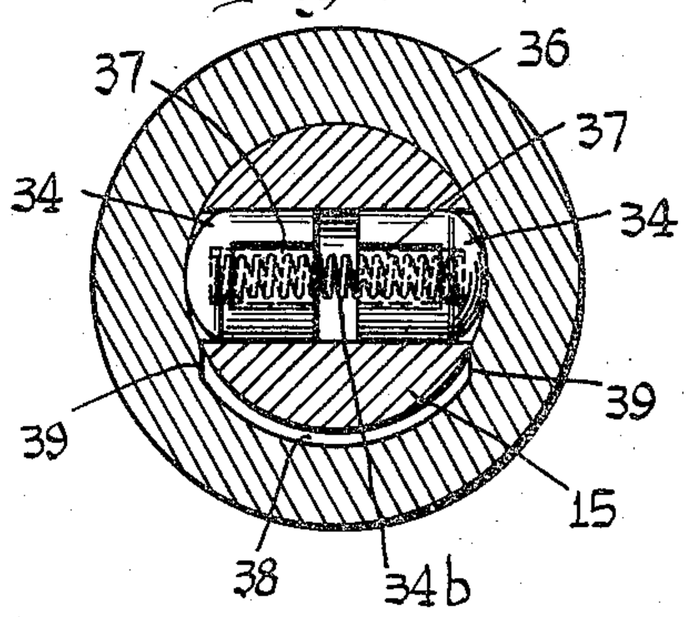


Fig. 3

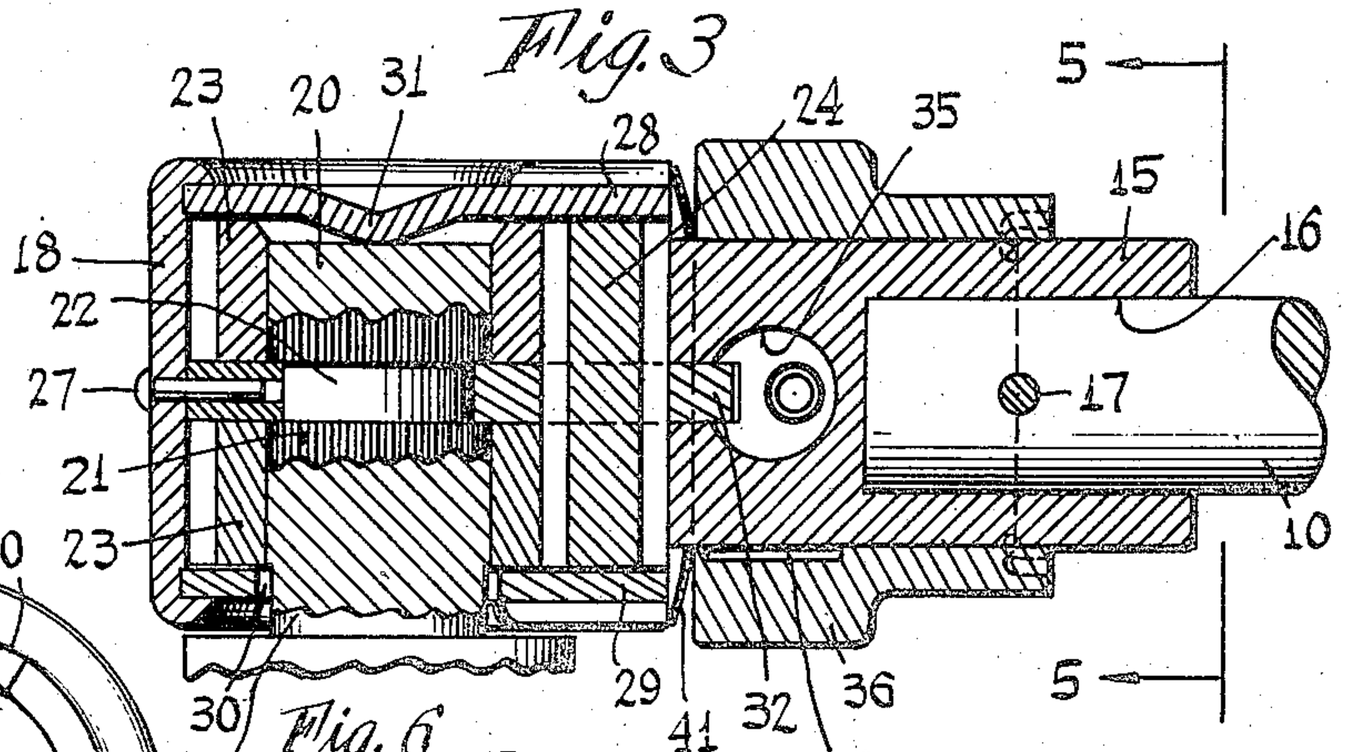


Fig. 5

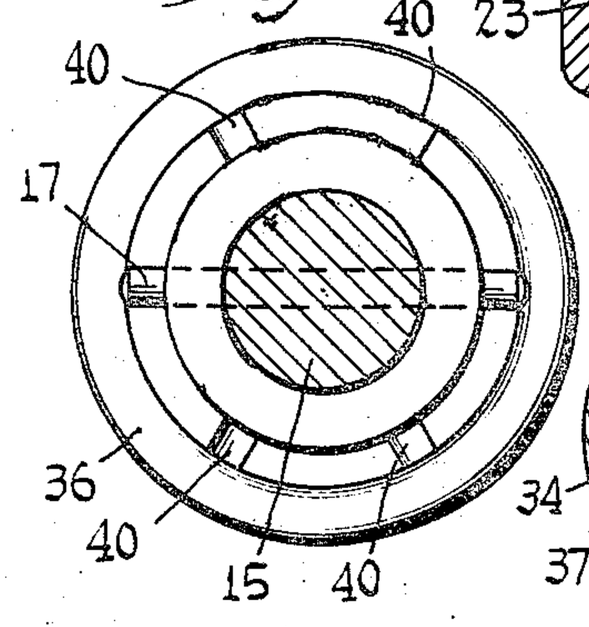
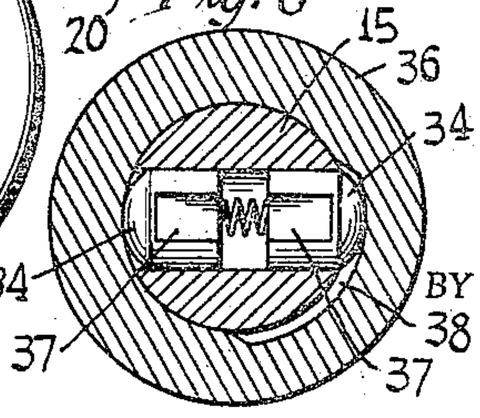


Fig. 6



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United States Patent Office

2,850,129

Patented Sept. 2, 1958

2,850,129

CLUTCH FOR A BRACE

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Application July 26, 1952, Serial No. 301,044

6 Claims. (Cl. 192—44)

This invention relates to bit stocks or braces, and more particularly to such devices in which unidirectional clutch means are provided, as for instance by a ratchet.

An object of the invention is to provide an improved brace having a unidirectional drive or ratchet action associated with the chuck, which is characterized by virtually no back drag.

Another object of the invention is to provide an improved brace having a unidirectional drive associated with the clutch, which is characterized by virtually no lost motion.

A still further object of the invention is to provide an improved brace having unidirectional drive associated with the chuck, which is characterized by a continuous or smooth gripping action as distinguished from an intermittent or stepped action.

Still another object of the invention is to provide an improved brace according to the foregoing, in which the unidirectional clutch action may be easily and quickly made to operate in either of reverse directions.

A feature of the invention is the provision of an improved brace as above set forth, which is simple and sturdy in its construction and reliable in use, being constructed of relatively few parts and being economical to fabricate.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a side elevational view of an improved brace made in accordance with the invention.

Fig. 2 is a fragmentary horizontal section, enlarged, taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical section taken on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary vertical section taken approximately on line 4—4 of Fig. 2, the locking members being shown in elevation.

Fig. 5 is a view partly in elevation and partly in vertical section taken on line 5—5 of Fig. 3.

Fig. 6 is a view like Fig. 4, but reduced in size and showing the parts in position to effect a unidirectional drive.

Referring to Fig. 1 the improved brace of this invention comprises a handle or frame part 10 formed with the usual crank shape, having at one end a kob 11 and, on the crank portion a hand grip 12. At its other end the handle part 10 has the usual type of chuck 13 adapted to mount bits and the like.

In accordance with the present invention an improved, stepless, smooth-acting unidirectional clutch mechanism is provided between the chuck 13 and the handle part 10, enabling the brace to be used in the manner of a ratchet brace but without back drag or lost motion being present. The improved unidirectional drive is further characterized by an advantageous stepless action, by few and simple parts, and by convenience of operation.

Referring to Figs. 1, 2 and 3, this improved drive comprises a casing or fitting 14 which I hereinafter term

an "angle fitting," in which the chuck 13 is rotatably mounted and to which the handle part 10 is rigidly secured. The angle fitting 14 comprises a body having a laterally extending portion 15 provided with a bore 16 in which the handle part 10 is secured, as by means of a pin 17 passing through said part. The angle fitting 14 has a main body portion 18 which is somewhat barrel-like in its shape, having a vertical bore 19 extending completely through it.

The chuck 13 has a shank or shaft 20 which is preferably provided with knurling 21, and which has an annular groove 22 intermediate its ends. On the knurled portions 21 of the shaft 20 spur gears 23 are carried, meshing with a pinion gear 24 rotatable in a small vertical bore 25 in the body portion 18 of the fitting, Fig. 2.

The shank or shaft 20 is retained in the fitting 14 by a crescent-shaped member 26 which is received in the groove 22 of the shaft, said member being secured to the fitting 14 as by drive pins 27.

Top and bottom plates 28 and 29 respectively are carried by the fitting 14, enclosing the shaft 20, gears 23 and pinion 24, the bottom plate having an opening 30 through which the shaft 20 extends. As shown in Fig. 3 the fitting 14, at its upper and lower portions, is preferably laid over the top and bottom plates 28 and 29 to secure these in place.

The top plate 28 is provided with a depressed portion 31 for engagement with the end of the shaft 30 to act as a thrust bearing therefor.

To effect a unidirectional clutch or braking action I provide a friction brake wheel 32 which is carried by and rotatable with the pinion 24. The brake wheel 32 may have a bore conforming to the cross sectional shape of the pinion 24 to enable the pinion to be passed through it and yet have a driving fit therewith.

As seen in Figs. 2 and 3 the brake wheel 32 extends into the groove 22 in the shaft 20 and is adapted to have engagement with the bottom of the groove. The fitting 14 has clearance spaces 33 intermediate its top and bottom, which spaces are aligned with the groove 22 of the shaft 20 to accommodate the brake wheel 32.

It will be understood that any retarding or braking force which is applied to the brake wheel 32 will result in the chuck 13 tending to lock and therefore to turn with the fitting 14. I preferably make the gears 23 of substantially larger pitch diameter than the pinion 24, and make the friction brake wheel 32 of larger diameter than the pinion 24, and thus obtain a desirable mechanical advantage whereby a relatively small braking force applied to the brake wheel 32 will result in a much greater force being required on the chuck 13 if it is to be turned with respect to the fitting 14.

For the purpose of selectively unidirectionally locking the brake wheel 32 against movement in one direction or the other I provide locking members 34 in the lateral extension 15 of the fitting 14, said members being preferably substantially cylindrical in shape and being carried in a cylindrical bore 35 which extends horizontally in the extension 15 and communicates with the clearance spaces 33 of the fitting. The locking members 34 have bores 34*a* accommodating a helical compression spring 34*b* by which they are yieldably urged apart or away from each other, and said members have milled cuts 37 providing braking surfaces for engagement with the periphery of the brake wheel 32. The locking members 34 are normally held in closely spaced or juxtaposed positions as shown in Fig. 2, wherein the braking surfaces thereof are engageable with the periphery of the brake wheel 32, by a collar 36 which is rotatable on the extension 15 of the fitting and which encircles the locking members 34.

Referring to Figs. 4 and 6 the collar **36** has a portion of its bore relieved, providing a clearance space **38** having camming surfaces **39** at its ends. The purpose of this clearance space is to enable one or the other of the locking members to be moved outward by the spring **34***b*, thereby to disengage the brake wheel **32** and relinquish all control thereover.

As shown in Fig. 6 the collar **36** has been shifted counterclockwise from the position of Fig. 4, resulting in the rightmost locking member **34** shifting outward to separate its brake surface from the brake wheel **32**.

A detent means is provided in conjunction with the collar **36**, said detent means comprising the pin **17**, comprising notches **40** in the outer edge of the collar **36**, and comprising a concavo-convex spring washer **41** disposed between the collar and the body portion of the fitting. It will be understood that this detent means will retain the collar **36** in either of three positions in which it is placed. One such position is shown in Figs. 2 and 4, wherein both of the locking members **34** are brought substantially in contact with the brake wheel **32**. Another position of the collar **36** is shown in Fig. 6, wherein the rightmost locking member may occupy an outwardly shifted position. The third position of the collar **36** is opposite to that shown in Fig. 6, and enables the leftmost locking member **34** to occupy an outwardly shifted position.

The braking action on the brake wheel **32** is effected as follows: When the collar **36** is in the position shown in Figs. 2 and 4, the brake surfaces **37** of the locking members **34** will be engageable with spaced points on the periphery of the brake wheel **32**, which points define a small arc of said periphery. The brake wheel will also engage the shaft **20**, or more properly the bottom of the groove **22** in the shaft **20**, and this point of engagement will be directly opposite the arc bounded by the points of engagement of the brake wheel with the locking members **34**. A wedging action is thus obtained, and if for example the shaft **20** should experience clockwise turning force with respect to the fitting **14**, as viewed in Fig. 2, it will because of the meshing engagement of the gears shift the brake wheel **32** downward and wedge the wheel between the shaft **20** and the lower of the two brake members **34**. Counterclockwise turning applied to the shaft **20** will in a similar manner result in the brake wheel **32** being shifted upward and being wedged between the shaft **20** and the upper of the two locking members **34**. Thus the chuck **13** will be locked to the handle part **10** against relative rotation in both directions. If now the collar **36** should be turned in one direction or the other it will enable one or the other of the locking members **34** to be shifted away from the locking wheel **32**, to disengage the latter. If, for example, the lower of the two locking members **34**, as seen in Fig. 2, is shifted out of engagement with the locking wheel **32** the said wheel will be permitted to have free counterclockwise rotation at all times, allowing the shaft **20** as viewed in Fig. 2 to have free clockwise rotation. Any clockwise turning force exerted on the shaft **20** will tend to shift the pinion **24** and brake wheel **32** downward and maintain the brake wheel out of wedging engagement with the shaft **20** and the upper of the locking members **34**. Opposite turning force exerted on the shaft **20** will however immediately shift the pinion **34** and brake wheel **32** upward, causing the wheel to be wedged between the shaft **20** and the upper of the two locking members. Thus a unidirectional clutch action is obtained, and I have found that such action is highly desirable in a tool of the character described in that there is practically no lost motion involved at any time, inasmuch as the shifting movement experienced by the pinion **24** and brake wheel **32** is extremely slight. Moreover, when one or the other of the locking members **34** is in its outward or releasing position, free turning of the brake wheel and pinion is permitted in the one direction without restraint, and accordingly no back drag is experienced in the operation of the brake. Thus when starting a hole with the bit, particularly if it is a small size bit, there will be no necessity to hold the chuck **13** against retrograde movement if the ratchet action is being utilized. Moreover, where space is limited, the present improved unidirectional clutch mechanism is advantageous in the elimination of a stepped movement such as is characteristic of a ratchet device having teeth. Often when employing a ratchet device in a limited space, part of the movement of the handle is lost because the click or pawl cannot be made to pass the next tooth of the ratchet wheel. This, however, is not experienced when using the brace of the invention, inasmuch as there is complete absence of any stepped movement in the unidirectional drive.

The bearing for the shaft **20** in the fitting **14** is provided by the engagement of the crests of the teeth of the gears **23** with the bore **19**. Likewise engagement of the pinion **24** with the bore **25** provides sufficient bearing for the pinion and the brake wheel **32**.

I prefer to effect the assembly of the device as follows: With the parts all disassembled, the bottom plate **29** is assembled and secured to the fitting **14**. The brake wheel **32** is then slipped into the bore **19** from the top and shifted edgewise into the clearance spaces **33** provided in the extension **15**. The brake wheel is shifted until it passes into the transverse bore **35** as far as it will go. The shaft **20** is passed up through the bottom plate **29**, and the lower gear **23** pressed on the shaft. The crescent-shaped retainer member **26** is then put in place and secured by the drive pins **27**. The upper gear **23** is then pressed on the shaft **20**, the pinion **24** dropped into place, passing through the brake wheel **32**, whereupon the top plate **28** is positioned and secured to the fitting **14**. The locking members **34** may then be inserted in the bore **35**, together with the spring **36**. The washer **41** and collar **36** are placed on the extension **15**, the handle part **10** inserted in the extension **15** and the pin **17** driven into place.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A unidirectional drive mechanism for use in a brace or the like, comprising a turnable driving part; a shaft which is to be driven, rotatably mounted on said driving part; a friction brake wheel rotatably mounted on the driving part; a driving connection between the shaft and brake wheel, causing turning of the wheel when the shaft is turned with respect to said driving part; normally operative releasable friction braking means to lock the friction wheel against turning solely in one direction; and manually operable means for rendering said braking means inoperative, thereby to provide for free turning of the brake wheel in said one direction, said driving connection comprising step-up gearing between the shaft and the brake wheel causing angular movements of the latter to be greater than those of the shaft.

2. The invention as defined in claim 1 in which the braking means includes a portion of said shaft, having a surface engageable with the friction wheel, said shaft portion when engaged under pressure tending to lock the wheel against turning.

3. The invention as defined in claim 1 in which the driving connection includes a large gear secured to the driven shaft, and a small gear secured to the brake wheel and meshing with the large gear, and in which the brake wheel is of larger diameter than the small gear, providing a mechanical advantage in the transmission of force to the driven shaft when braking force is applied to the brake wheel.

4. In combination, a handle part; a driven member rotatably mounted on said part; a friction brake wheel rotatably mounted on said part; a mechanical advantage step-

up gear driving connection between the driven member and brake wheel, causing turning of the wheel when the handle part is turned with respect to the driven member but at a greater angular speed; normally operative releasable friction braking means to lock the friction wheel against turning in one direction; normally operative releasable friction braking means to lock the friction wheel against turning in the other direction; and manually operable means for selectively rendering inoperative one or the other of said braking means, thereby to selectively provide for free turning of the brake wheel in one direction or the other and wedging of the wheel against turning in the opposite direction.

5. The invention as defined in claim 4 in which the braking means include a pair of aligned members movable on said handle part toward and away from each other along a path generally tangential to said brake wheel, said members having brake surfaces engageable with said wheel, and in which the manually operable means includes a rotatable collar on the handle part, extending around the aligned members and having cam means engageable with the members to control the positions thereof.

6. In a device of the character described, an angle fitting; a driven member rotatably mounted on the fitting; a first gear within the fitting, secured to the driven member to turn therewith; a second gear rotatable in the fitting, meshing with the first gear; a friction brake wheel secured to the second gear to turn therewith when the driven member is turned with respect to the fitting; a

pair of members having brake surfaces for engagement with the brake wheel, said members being movable in the fitting between operative positions wherein the brake surfaces thereof engage adjacent points on the periphery of the brake wheel bounding a small arc, and positions wherein they disengage the wheel; means providing a brake surface in the fitting for engagement with the periphery of the brake wheel opposite to the said bounded arc, enabling said wheel to be wedged between said means and either of said members to prevent its rotation; and manually operable means for selectively holding one or the other of said members in its operative position, thereby to selectively provide for free turning of the brake wheel in one direction or the other and wedging of the wheel against turning in the opposite directions.

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