

April 9, 1946.

A. R. BOERNER

2,398,072

CHAIR

Filed June 15, 1942

2 Sheets-Sheet 1

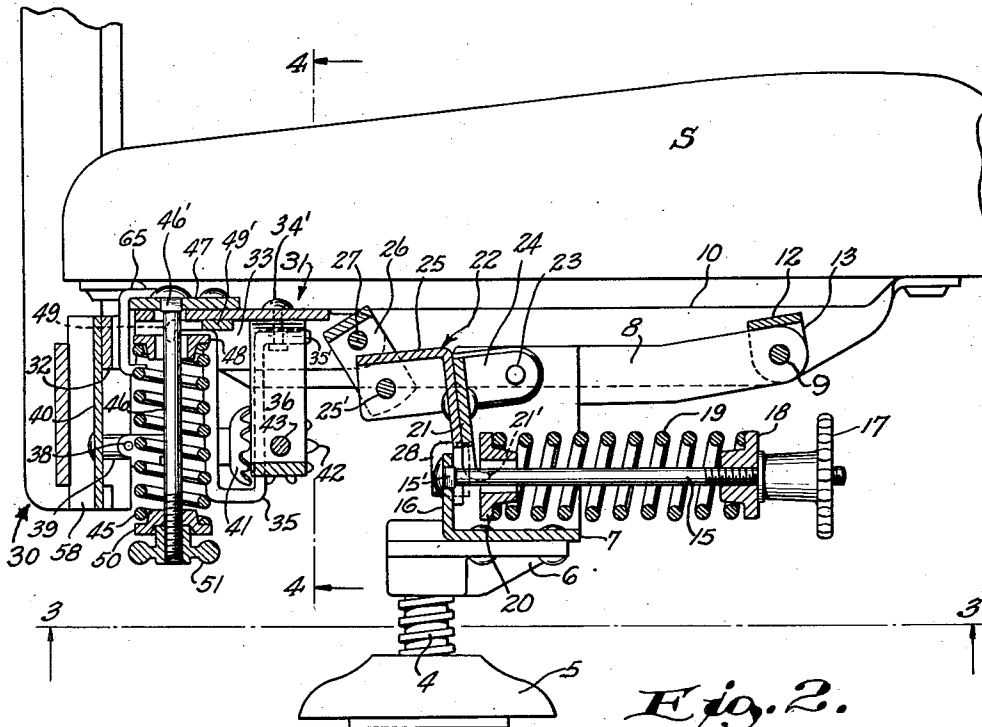
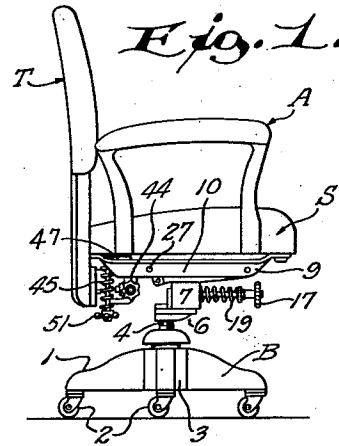
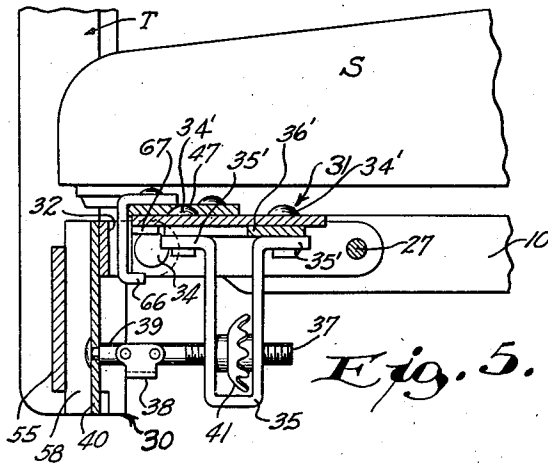


Fig. 6.

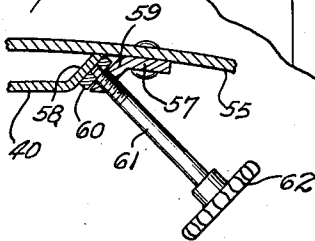


Fig. 2.

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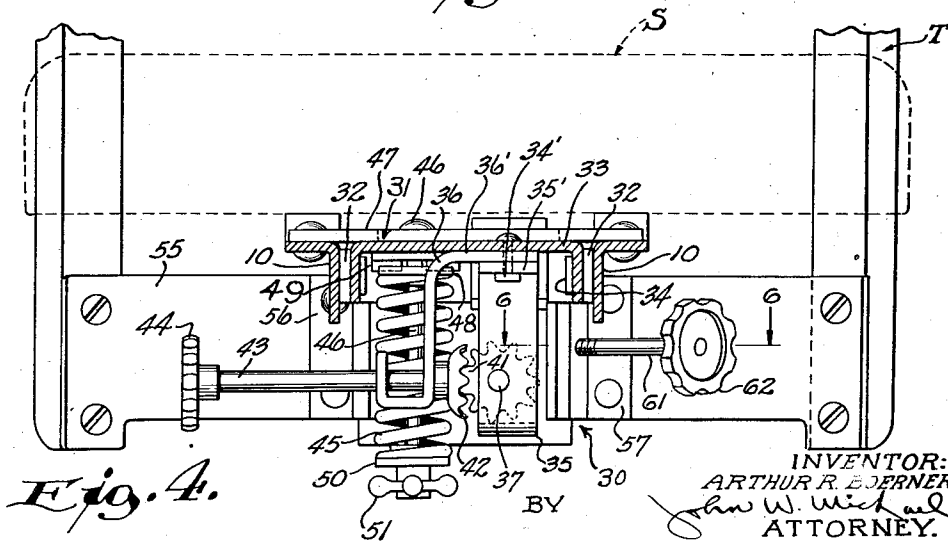
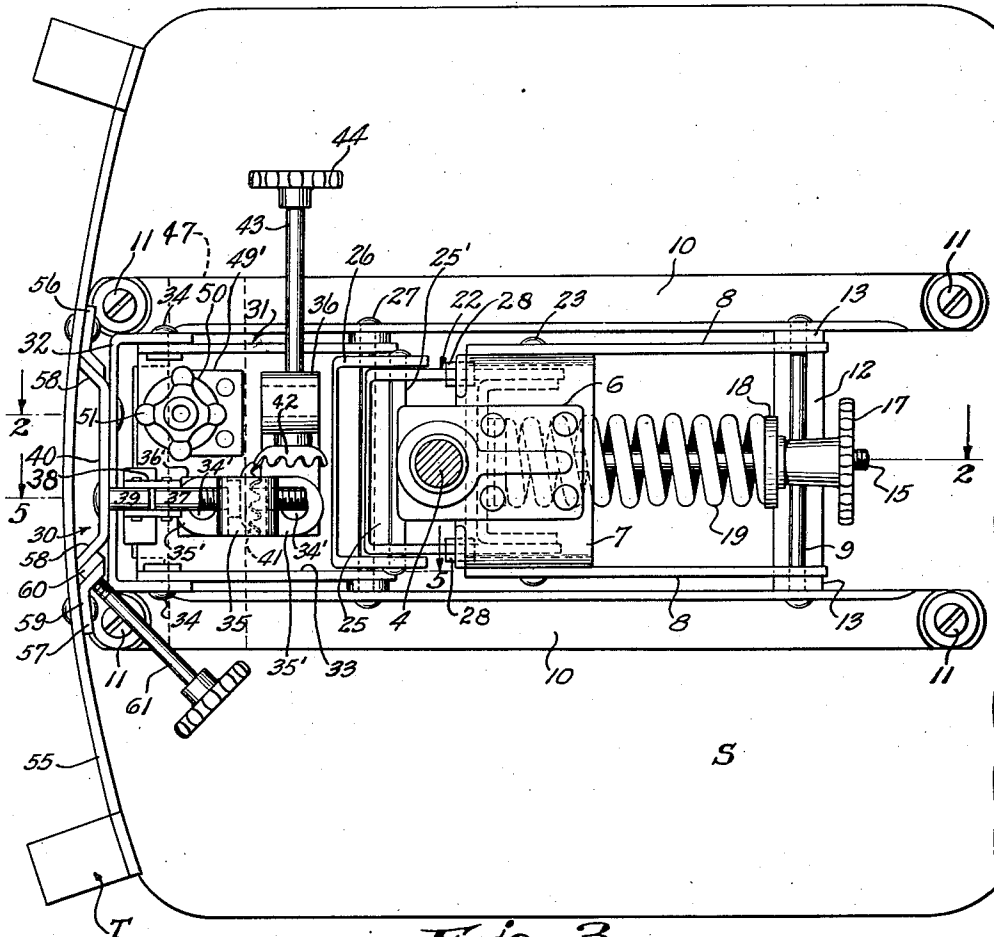
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2 Sheets-Sheet 2



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2,398,072

CHAIR

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Application June 15, 1942, Serial No. 447,093

5 Claims. (Cl. 155-77)

This invention relates to an improvement in chairs of the type having a tiltable seat and a tiltable back, and one wherein the back may, if desired, be adjustable vertically as well as tiltable about a horizontal axis.

The present application is a division of my application for improvements in "chairs," filed February 3, 1941, Serial No. 377,084, which matured into Patent No. 2,363,935, November 28, 1944.

An object of the invention is to provide a chair of this character wherein the tiltable mounting of the chair, seat, and back are so constituted and so closely and advantageously organized as to simplify and compact the construction while maintaining it strong and rugged and stable, and rendering its action smooth and comfortable.

Another object of the invention is to provide a chair of the character mentioned, wherein not only the seat but also the back of the chair is supported for rearward tilting, and wherein the means for yieldably resisting the tilting movement of the seat and back are independently adjustable in an easy and convenient manner.

A further object of the invention is to provide a simple and yet highly effective means for rendering the chair back vertically adjustable while securely maintaining it in any selected adjustment.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts, which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view on a reduced scale showing generally a chair constructed in accordance with the present invention;

Figure 2 is a fragmentary view in longitudinal, vertical cross section taken on line 2-2 of Figure 3 and looking in the direction of the arrows, and with parts shown in elevation for the sake of simplicity in illustration;

Figure 3 is a view in horizontal cross section taken on line 3-3 of Figure 2 and looking in the direction of the arrows;

Figure 4 is a view in transverse, vertical cross section taken on line 4-4 of Figure 2 and looking in the direction of the arrows;

Figure 5 is a fragmentary view in vertical cross section taken on line 5-5 of Figure 3 and looking in the direction of the arrows, parts being omitted for the sake of simplicity in illustration; and

Figure 6 is a fragmentary view taken on line 6-6 of Figure 4 and illustrating the means which controls the vertical adjustment of the chair back.

Referring to the drawings, it will be seen that a chair embodying the present invention com-

prises generally a base designated at B, a seat designated at S having side arms A fixed thereto, and a tiltable chair-back designated at T.

The base B may be of any suitable type and has the usual legs 1 equipped with casters or rollers 2. The legs 10 diverge from the hub 3 of the base. A vertical spindle 4 is supported in the hub 3 of the base in the usual manner, and is controlled as to its vertical adjustment by means of a capped nut 5 in the conventional or any suitable manner.

A head casting 6 is securely fixed to the top of the spindle 4 and has riveted thereto a U-shaped head-piece 7 of heavy gauge sheet metal, the body portion of the U-shaped head-piece resting flatly on the head casting 6 and being riveted or otherwise rigidly fastened thereto. The legs of the U-shaped head-piece 7 extend vertically and their upper ends are riveted, welded, or otherwise suitably secured to forwardly projecting metallic supporting arms 8. These arms 8 extend well forward of the seat; that is, to a point adjacent the forward edge of the seat, and the forward ends of the arms are pivotally connected to the metallic spider arms 10, the ends of which are fastened by means of screws 11 to the underside of the seat S. The pivotal connection between the supporting arms 8 and the spider arms 10 is effected by means of a pivot pin 9 which also extends through aligned pivot openings provided therefor in the forward ends of the supporting arms 8 and in the spider arms 10. The forward ends of the arms 8 are cross-braced preferably by means of a cross strip 12 provided with integral down-turned ends 13 fitting over the outer surfaces of the forward ends of the arms 8 and welded thereto. The pivot pin 9 also passes through openings provided therefor in the down-turned end 13 of the cross-brace 12.

Means is provided for yieldably or resiliently resisting pivotal movement of the seat S about the axis of the pivot pin 9 and comprises a tension rod 15 extended through a non-circular opening provided therefor in an abutment lug 16 which may be formed integral with the body portion of the head-piece 7 and of such width as to overlap the rearward edges of the legs thereof. The head of the tension rod 15 abuts flush up against this abutment lug 16, and while the shank thereof is circular for the major portion of its extent, it does have a non-circular portion 15' adjacent the head which interfits with the non-circular opening in the lug 16 to hold the tension rod 15 against rotation. The outer end of the tension rod 15 is threaded to adapt it to be interthreaded with a hand nut 17. The inner end of the hand nut 17 abuts a spring cup or spring abutment 18 which is slidable along the tension rod 15 and which engages the outer end of a compression coil spring 19. The inner

end of the spring 19 engages a spring cup or abutment 20 having its rearward face formed with diametrically opposite notches to adapt it to fulcrum on knife edges 21' provided on the downwardly extending arm 21 of an approximately T-shaped lever designated as a whole at 22. The lever 22 may conveniently be built up of sheet metal parts shaped as illustrated in the drawings and riveted together. The forwardly extending lateral arm 24 of the lever 22 is pivoted or fulcrumed as at 23 on the upper portions of the legs of the head-piece 7. The rearwardly extending lateral arm 25 of the T-shaped lever 22 is pivotally interconnected as at 25' to the lower ends of the legs of a downwardly and forwardly inclined U-shaped link 26, the upper portions of the legs of this link 26 being pivotally connected by a pivot pin 27 to the spider arms 10.

With the construction as thus far described, when the user of the chair tilts backwardly on the seat S, the link 26 is thrust downwardly and forwardly and rocks the lever 22 about its fulcrum 23 in a counter-clockwise direction as viewed in Figure 2, thereby swinging the knife edges 21' of the downwardly extending arm 21 of the lever 22 forwardly. The coil spring 19 acting through the spring cup 20 resists its forward movement of the knife edges 21' and lever arm 21 and consequently yieldably resists the tilting of the chair seat. Due to the fact that the axis of tilt (pivot pin 9) of the chair seat is disposed well forwardly of the seat, that is near the front edge thereof, tilting movement of the chair seat is had with a minimum amount of upward movement of the forward end of the chair seat. This enables the user of the chair to lean back as far as he may desire without swinging the forward end of the chair seat upwardly to such an extent as to lift or raise his feet off of the floor. However, the tilting of the chair seat backwardly to an extreme or dangerous extent is prevented by the positive engagement of the lower edges of the side flanges of the rearwardly extending lateral arm 25 with the lug 16 or preferably with cushions or bumpers 28 folded over and fastened to the upper edges of the lug 16 adjacent the legs of the U-shaped head piece 7. The cushions or bumpers 28 may be constituted of blocks of felt, rubber or the like, adhesively or otherwise suitably attached to the lug 16 of the head-piece 7.

The adjustable tilting mounting for the chair-back T comprises generally two pivotally interconnected metal sections designated generally at 30 and 31, the section 30 including a U-shaped strip 32, whereas the section 31 comprises an inverted channel 33. The legs of the U-shaped strip 32 overlap the rearward ends of the side flanges of the channel 33 and are pivotally interconnected therewith as indicated at 34.

Means is provided for adjusting the sections 30 and 31 angularly with respect to each other and for maintaining them in any selected angular adjustment, and this means comprises two supporting brackets designated at 35 and 36, the supporting bracket 35 being generally U-shaped and the supporting bracket 36 being generally in the shape of a J. The legs of the bracket 35 are formed with outturned attaching lugs 35' at their upper ends. The bracket 36 also has a similarly outturned but longitudinally enlarged or extended attaching lug 36' at its upper end, the lug 36' being integral with or welded to its bracket 36. In the assembly the attaching lug 36' is disposed between the attaching lugs 35' and the web of

the channel 33, as illustrated in Figures 4 and 5, so that a single set of rivets 34' (Fig. 3) may be employed to fasten the lugs 35' and 36' to the web of the channel 33. The lug 36' also stiffens and strengthens the structure. The legs of the bracket 35 are provided with alined bearing or guide openings through which an adjusting screw 37 loosely extends (see Figure 5). The screw 37 is connected by means of a channel-shaped link 38 to a short or stub shaft 39 fixed to a back-supporting plate 40 which is rigidly fastened to and forms part of the section 30 of the adjustable back mounting. A beveled gear 41 is disposed between the parallel legs of the supporting bracket 35 and has an internally threaded hub threadedly engaged with the screw 37. The teeth of the gear 41 mesh with a similar beveled gear 42 (see Figures 3 and 4) fixed to a cross shaft 43 rotatably supported in bearings provided therefor in the bracket 36, and rotated by means of a hand-wheel 44 (see Figures 3 and 4).

The sections 30 and 31 of the back mounting are pivotally supported as a unit on the spider arms 10, and the present invention proposes to utilize for this purpose the same pivot pin 27 which interconnects the link 26 with the spider arms, the pivot pin 27 passing through the side flanges of the channel 33 of section 31 of the back mounting.

Pivotal movement of the back mounting as a whole about the pivot pin 27 as an axis is yieldably or resiliently resisted by means of a compression coil spring 45. The spring 45 surrounds a tension rod 46 which is passed through a cross-plate 47 riveted or otherwise suitably secured to the top flanges of the spider arms 10. The head of the tension rod abuts the portion of the cross-plate 47 which surrounds the opening therein through which the tension rod 46 extends. While the tension rod is of circular cross section for the major portion of its extent, it has a non-circular portion 46' adjacent its head which is interfitted with the correspondingly formed opening in the plate 47 to hold the rod 46 against rotation. One end of the spring 45 abuts the spring centering cap or spring abutment 48. The upper surface of spring centering cap 48 is provided with radial notches (Fig. 2) which rockably receive a knife edge fulcrum 49 carried on plate 49', fastened to the underside of the web of the channel 33. The knife edge fulcrum 49 is notched so as to straddle the tension rod 46. The lower end of the spring 45 abuts a spring cap or spring abutment 50 which in turn engages a hand nut 51 threaded on the lower end of the tension rod 46.

The back of the chair is interconnected with the section 30 of its mounting for vertical adjustment although it is rigidly secured to the section 30 in any selected vertical adjustment. For this purpose an adjustable back-supporting plate 55 is rigidly fastened to the lower part of the chair-back and extends transversely thereof. Guides or ways 56 and 57 are riveted to the supporting plate 55 and overlap the angularly extending flanges or guide members 58 which are integrally formed with the side edges of the fixed supporting plate 40 of the section 30 of the chair-back mounting. The guide or way 56 comprises a single piece of metal bent or formed in the manner illustrated in Figure 3. The guide or way 57 includes a similar piece of metal 59 and also includes a brake shoe 60 which is interposed between the metal member 59 of the way 57 and the adjacent flange 58 of the fixed supporting plate 40 of the section 30 of the chair-back

mounting. A screw 61 is threaded through an opening in the metal member 59 of the way 57 and has its inner end reduced and smooth and rotatably interfitted with an opening in the shoe 60 so that while the shoe 60 is free to rock or float on the end of the screw 61, it cannot drop out when the screw is backed up for adjustment purposes. The outer end of the screw 61 is equipped with a hand-wheel 62. With this construction, when the screw 61 is backed up to relieve the pressure on the brake shoe 60, the chair-back may be freely adjusted vertically. However, when the screw is tightened up to press the shoe against the guide flange 58 of the fixed supporting plate 40, the back is firmly and securely held in selected adjustment.

With this construction, the back may be vertically adjusted to suit the comfort of the user of the chair, and in use the back as well as the seat is tiltable. When the back is tilted the sections 30 and 31 of its mounting swing as a unit about the pivot pin 27 as an axis, and such swinging is against the force of the spring 45. Moreover, the extent to which the back may be tilted rearwardly is positively limited by means of a stop 65 which is fastened to and depends from the cross-plate 47 and which has an inturned lower end 66 (see Figure 5) which is engageable with a stop block 67 of felt, rubber, or the like, suitably secured to the underside of the web of the channel 23 to limit the downward swinging movement of this channel and consequently the extent to which the back may be tilted rearwardly. By having the stop blocks 28 and 67 of felt, rubber, or similar material, the action of the chair is rendered noiseless as well as smoother and more comfortable.

The resilient means which yieldably opposes the tilting of the seat and of the chair-back are independently adjustable and may be set to obtain the action desired. Moreover, since the seat and back are tiltable independently of each other, the user of the chair may not only swing his entire body backwardly, but may swing his body about his hips so as to assume a position of maximum comfort, and in all positions of seat and back the back of the chair is in supporting relation to the back of the user and the feet of the user always remain on the floor.

The independent adjustability of the seat and back tensions is a feature of substantial advantage. Some people are built heavier in the upper part of the body, due to broad muscular shoulders, whereas others are heavier in the legs and in the lower abdominal regions. It is obvious that providing for an independent or separate adjustment of the seat and back, the chair can be adapted for comfortable use by individuals of different build.

While I have shown and described one construction in which the invention may be advantageously embodied, it is to be understood that the construction shown has been selected merely for the purpose of illustration or example, and that various changes in the size, shape, and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A chair of the type including a base, a seat, and a vertically adjustable back, and comprising a spindle supported on the base, a head-piece fixed to the upper end of the spindle, a spider fixed to the underside of the seat, means interconnecting the head-piece and the spider for

mounting the seat on the head-piece, an adjustable mounting for the chair-back including a relatively fixed supporting plate mounted on the spider having angled guides, a supporting plate secured to the lower end of the back and extending transversely thereof and having ways overlapping the angled guides of the fixed supporting plate, one of said ways being in direct engagement with its guide, a brake shoe interposed between the other way and its guide, and a screw threadedly connected with said last mentioned way and swiveled to said brake shoe for pressing the brake shoe into locking engagement with its angled guide.

2. A chair of the type including a base, a seat, and a vertically adjustable back, and comprising a spindle supported on the base, a head-piece fixed to the upper end of the spindle, a spider fixed to the underside of the seat, means interconnecting the head-piece and the spider for mounting the seat on the head-piece, an adjustable mounting for the chair-back including a relatively fixed supporting plate mounted on the spider and having guides, a supporting plate secured to the lower end of the back and extending transversely therewith and having ways overlapping the guides of the fixed supporting plate, one of said ways being in sliding engagement with its guide, a brake shoe interposed between the other way and its guide, and manually operable means for forcing the brake shoe into locking engagement with its guide.

3. A chair of the type having a base, a seat, and a back, and comprising a spindle supported on the base, a head-piece fixed to the upper end of the spindle, a spider secured to the underside of the seat, a pivotal connection between the spider and the head-piece, resilient means for resisting rearward tilting movement of the seat about said pivotal connection as an axis, a lever fulcrumed on the head-piece and having an arm cooperable with said resilient means, a link pivotally connected to said lever, a mounting frame having its rearward end secured to said back, a common pivot pin for pivotally interconnecting the link with the spider and pivotally mounting the forward end of said frame on said spider, and means interconnected with the spider and said mounting frame for yieldably resisting rearward tilting of said back with respect to said seat.

4. In a chair, a head piece, a seat tiltably mounted on said head piece, a lever carried by said head piece, means for resiliently urging said lever in one direction, a pivot pin carried by said seat, a connecting link extending between said lever and said pin whereby motion is transmitted between said lever and said seat, a chair back, a mounting for said chair back having a forwardly extending member carried on said pivot pin whereby said back is free to tilt with respect to said seat, and means acting between said seat and said mounting to resiliently urge said back toward said seat.

5. In a chair, a head piece, a seat tiltably mounted on said head piece, a pivotally mounted lever, means for resiliently urging said lever in one direction, a link for connecting said lever and said seat to positively transmit motion therebetween in any direction of movement, a chair back, a mounting for said chair back having a portion adapted to be pivotally mounted to said seat, and a single pivot pin connecting said link and said portion to said seat.

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