

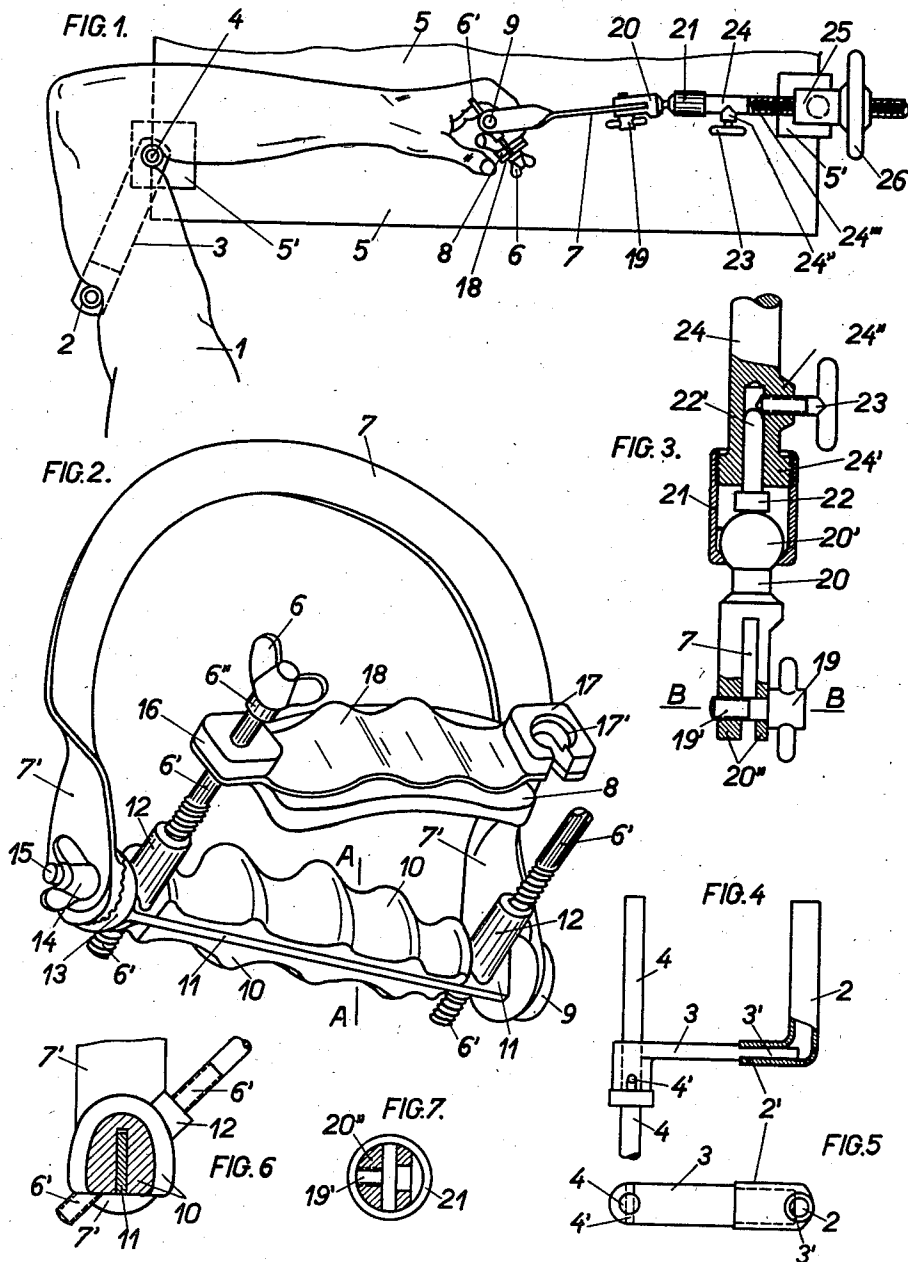
Jan. 12, 1937.

A. GRUCA

2,067,567

APPLIANCE FOR SETTING AND BANDAGING FOREARM FRACTURES

Filed June 12, 1935



Inventor:
Adam Gruca
by *S. Sokal*
Attorney.

UNITED STATES PATENT OFFICE

2,067,567

APPLIANCE FOR SETTING AND BANDAGING
FOREARM FRACTURES

Adam Gruca, Lwow, Poland

Application June 12, 1935, Serial No. 26,257
In Germany March 22, 1935

3 Claims. (Cl. 128—85)

Forearm fractures have hitherto been set by two operators, one operator pulling the broken forearm either directly by the fingers or indirectly by means of a sling, and the other operator holding the elbow or tying the elbow to a stationary support. It is also known to put a steel wire between the finger bones of the hand of the patient or around the lower end of the forearm bones, and connect the wire to a yoke connected with a pulling appliance. The first-mentioned method is very painful to the patient and fatiguing to the operators. Moreover, the method is not satisfactory as the broken bones may be accidentally displaced relatively to each other upon the pull exerted by the operators being relaxed or discontinued owing to fatigue. The second-mentioned method constitutes a surgical operation which, owing to the unavoidable infliction of a wound, may have unpleasant consequences and can be carried out only under narcosis or with the aid of a local anaesthetic. Mechanical appliances hitherto proposed for exerting the required pulling action have been very little used in practice, owing to their structural imperfections. The known appliances are not suitable for fixing exactly the forearm or they are so painful to the patient that they cannot be used even under narcosis or with the aid of a local anaesthetic.

The subject of the present invention is an appliance for setting and bandaging forearm fractures which avoids the above-mentioned drawbacks. The invention provides for pulling or stretching the forearm by gripping the joined fingers of the hand in a manner which is quite free from pain to the patient, so that the improved appliance may be employed with narcosis or a local anaesthetic. A considerable pulling force can be exerted by the improved appliance in a direction which can be exactly determined in accordance with the requirements of the case. Moreover, the direction of the pulling force and the magnitude of the force may be controlled and adjusted in all planes. The fractured arm remains quite free and is perfectly accessible for the application of gypsoplastic dressing or other bandages.

An important feature of the invention consists in that the improved appliance comprises a device for fixing the elbow and an adjustable pull device acting upon the joined fingers, the two devices being adapted to be clamped or otherwise fixed to any suitable support, for instance, an ordinary table, a bed, an operating table or the like. The drawing device comprises, accord-

ing to the invention, means for clamping the fingers of the patient's hand which are pivoted to a yoke-shaped arcuate member and are fixable relatively thereto in any adjusted angular position. The pull is exerted by means of a nut and screw device, the screw spindle of which is connected to the arcuate yoke-shaped member by means of a ball joint adapted to be clamped and fixed in any adjusted position by means of a screw, and by means of an adjustable joint between the arcuate yoke-shaped member and the ball joint. This adjustable connection permits of an adjustment of the arcuate yoke-shaped member in the plane of the member and approximately about the centre of the arcuate portion of the yoke. The device for clamping and gripping the fingers comprises a first gripping member made, for instance, of aluminium or other suitable material and shaped in accordance with the inner surface of the joined second to fifth fingers of the hand, and a second gripping or clamping member which bears upon the outer surface of the fingers, is bent in accordance with the shape of the fingers, is provided with a soft rubber plate lining, and is pressed against the outer surface of the fingers by any suitable device, for instance, by means of two screws. The device for fixing the elbow which is separate from the device gripping the fingers, preferably consists of a supporting arm which is mounted upon and fixable to a vertical rod. The supporting arm preferably carries at the end a vertical rod which holds the upper arm. When a gypsoplastic bandage is applied after the setting operation, the supporting arm, together with the vertical rod carried by the supporting arm, can be slid upwards upon the vertical rod carrying the supporting arm, and both the supporting arm and the vertical rod carried thereby can then be removed from the bandage by pulling first the supporting arm and then the rod from the bandage.

One constructional form of the invention is shown in the accompanying drawing by way of example.

Fig. 1 is a top view of the complete appliance in use,

Fig. 2 is a perspective view of the finger gripping device and the yoke-shaped member attached thereto,

Fig. 3 shows in end elevation and partly in section, the joints between the yoke-shaped member and the pulling device,

Fig. 4 is an elevation partly in section, and

Fig. 5 a corresponding top view of the elbow-fixing device,

Fig. 6 is a section on line A—A of Fig. 2, and Fig. 7 a section on line B—B of Fig. 3.

5 The appliance comprises two separate parts which are adapted to be clamped in the required position upon a suitable support, for instance, upon a table 5 (Fig. 1). The means for fixing and holding the elbow comprises a vertical rod 10 4 which is connected with a fixing or clamping plate 5'. Upon the rod 4 (Figs. 1, 4 and 5) is slidably mounted a horizontal arm 3 which is locked against rotation by a pin 4'. The supporting arm 3 rests upon a collar of the rod 4. 15 Upon the somewhat reduced end portion 3' of the flat supporting arm 3 can be slid an auxiliary support 2 in such a manner that the suitably shaped tubular portion 2' of this auxiliary support encloses the end portion 3'. When using 20 the appliance, the arm I (Fig. 1) of the patient is so inserted between the rod 4 and the auxiliary support 2, that the latter bears against the upper arm and the rod 4 forms a good support for the elbow joint. The forearm to be treated is 25 in this manner freely accessible and may be rested by the patient upon a suitable padded support 3 in such a manner that the patient does not feel any fatigue.

30 The draw device which forms the second part of the appliance is mounted upon a second fixing or clamping plate 5' which may be clamped in known manner to the edge of the table. The draw device comprises a sleeve 25 connected with the clamping plate and a screw spindle 24, 24''' 35 mounted in the sleeve 25 and adapted to be drawn with considerable and adjustable force by means of a nut operable by means of a hand wheel 26. The sleeve 25 is secured to the clamping plate 5' by means of a vertical rod of circular cross section, not shown in detail but indicated by a dotted 40 circle in Fig. 1. The screw spindle 24 is connected by means of a threaded end portion 24' (Fig. 3) with a tubular sleeve 21, the other end of which is somewhat reduced in diameter and contains the ball shaped end portion 20' of a clamp 20 which 45 latter is connected to the yoke 7. The ball shaped end 20' rests against the reduced open end of the sleeve 21 and is pressed against that end by means of a bolt 22' having a head 22 bearing 50 upon the ball shaped end 20'. The other end of the bolt 22' is spherically shaped and is acted upon by the conical end of a set screw 23 mounted in a thickened portion 24'' of the spindle 24. By turning the screw 23, pressure is exerted upon 55 the head 22 and the latter is pressed against the ball 20' whereby the clamp 20 may be fixed in any adjusted angular position.

60 The clamp 20 is formed with a fork 20'' between the limbs of which can be clamped the yoke 7 (Fig. 2) of the finger clamping device, by means of a clamping screw 19, 19'. The clamping screw passes through a hole in one of the limbs and has a threaded portion engaging a thread hole in the other limb.

65 The yoke 7 which is clamped between the limbs 20'' (Figs. 2 and 6) has an arcuate shape and has ends 7' twisted through 90° with regard to the plane of the main portion of the yoke. These ends 7' are provided with holes through which 70 are passed the ends of the rod 11 carrying the finger grip member 10. The finger grip 10 is preferably made of cast metal, for instance, aluminum, in such a manner that it conforms exactly to the space between the joined fingers II—V. This 75 cast metal member may, for instance, be made

to conform to a model made of clay, by putting a piece of clay into the hand of the patient and compressing the clay by joining the fingers and closing the hand. In this manner, recesses are 5 formed in the finger grip 10 which conform exactly to the individual fingers of the patient. The rod 11 which inwardly supports the finger grip 10 is provided at the ends with two threaded tubular members 12, 12 through which are passed 10 screws 6', 6' provided at their ends with wing heads 6 and collars 6''. Upon the screw bolts 6' slides, by means of end holes 17', a finger clamping plate 18, the ends of which are provided with washers 16, 17. The plate 18 is again curved or 15 shaped to conform with the form of the fingers. It is provided with a lining 8 of soft rubber in order to soften the pressure upon the fingers.

The ends 9 and 15 of the supporting rod 11 are turnably mounted in openings of the ends 7' of the yoke 7. One of the yoke ends 7' is provided 20 with a toothed projection cooperating with a corresponding toothed projection 13 of the adjacent end of the plate 11' and the corresponding end 15 of the rod 11 is threaded and provided with a wing nut 14 so that by turning the wing nut 14, 25 the rod 11, and consequently also the finger grip 10, may be fixed in any angular adjusted position with regard to the yoke 7.

The mode of using the described appliance is 30 as follows:—

After loosening the clamp 19, 20'', the finger clamping device, together with the yoke, is removed from the draw device, the fingers are placed round the grip 10 and are clamped by 35 turning the winged head 6. The elbow is then placed upon the arms 3 and the rod 4 and auxiliary support 2 are suitably adjusted. The yoke 7 is now inserted into the clamp 19, 20'', whereupon by turning the wheel 26, the screw spindle 24, 24''' is pulled and the forearm is stretched between the support 2, 3, 4 and the finger clamping 40 device 10, 18, the arm remaining quite free between the support and the draw device.

If, during the operation, the direction of the draw needs to be altered at right angles to the 45 plane of the hand, the ball 20' is released by loosening the screw 23, whereupon the hand may be suitably adjusted and the screw 23 screwed home. If, on the other hand, it is desired to increase the draw action in the direction of the 50 elbow, the screw 19 is loosened and the yoke 7 is adjusted in the required direction. The direction of turning is regulated by means of the clamp 23.

After the forearm fracture has been set and 55 a fixed bandage has been applied, the fingers are first released from the clamping device 18, 10, whereupon the whole forearm is slid upwardly parallel to its original position, the support 3 with the counter support 2 upon the rod 4 being moved 60 upon the rod 4 upwardly and remaining in the plaster or other mass. By pulling in the longitudinal direction of the support, the latter can be withdrawn from the plaster, as well as subsequently the auxiliary support 2 which is likewise 65 withdrawn in the longitudinal direction. The operation may be performed with the patient being either seated or lying down.

I claim:

1. Appliance for setting and bandaging forearm fractures comprising: means for supporting 70 and fixing the elbow; means for gripping the fingers, and a draw device connected with said gripping means; a common support for said draw device and said elbow fixing means, both the 75

5 elbow fixing means and the draw device being independently adjustable upon the common support, said draw device comprising an arcuate yoke pivoted to said finger gripping means; means
10 for fixing said arcuate yoke after adjustment relatively to said finger gripping means; a screw and nut device; a ball joint at the end of the screw; means for clamping said ball joint in an adjusted position; and a clamping device connected to said ball joint for connecting the arcuate yoke, said arcuate yoke being slidable in said clamping device for adjustment.

2. Appliance for setting and bandaging forearm fractures comprising: means for supporting
15 and fixing the elbow; means for gripping the fingers, and a draw device connected with said gripping means; a common support for said draw device and said elbow fixing means, both the elbow fixing means and the draw device being
20 independently adjustable upon the common support, said finger gripping device comprising an

inner finger plate to be gripped by the fingers and an outer plate; and screw means for fixing the outer plate to the inner plate, both the inner and the outer plate being shaped to conform with the shape of the fingers.

5 3. Appliance for setting and bandaging forearm fractures comprising: means for supporting and fixing the elbow; means for gripping the fingers, and a draw device connected with said gripping means; a common support for said draw
10 device and said elbow fixing means, both the elbow fixing means and the draw device being independently adjustable upon the common support, said elbow fixing device comprising a fixed
15 vertical rod; a horizontal arm slidable upon said rod and fixable thereto; and an auxiliary rod detachably mounted upon said arm, said horizontal arm being removable from said fixed rod by sliding upwardly and said auxiliary rod being removable from said arm by sliding horizontally.
20

ADAM GRUCA.