Sept. 27, 1966 G. F. HEWSON, JR 3,274,997

BRACES FOR CORRECTING HIP DISLOCATION

Filed Sept. 23, 1963 2 Sheets-Sheet 1

Fig 1

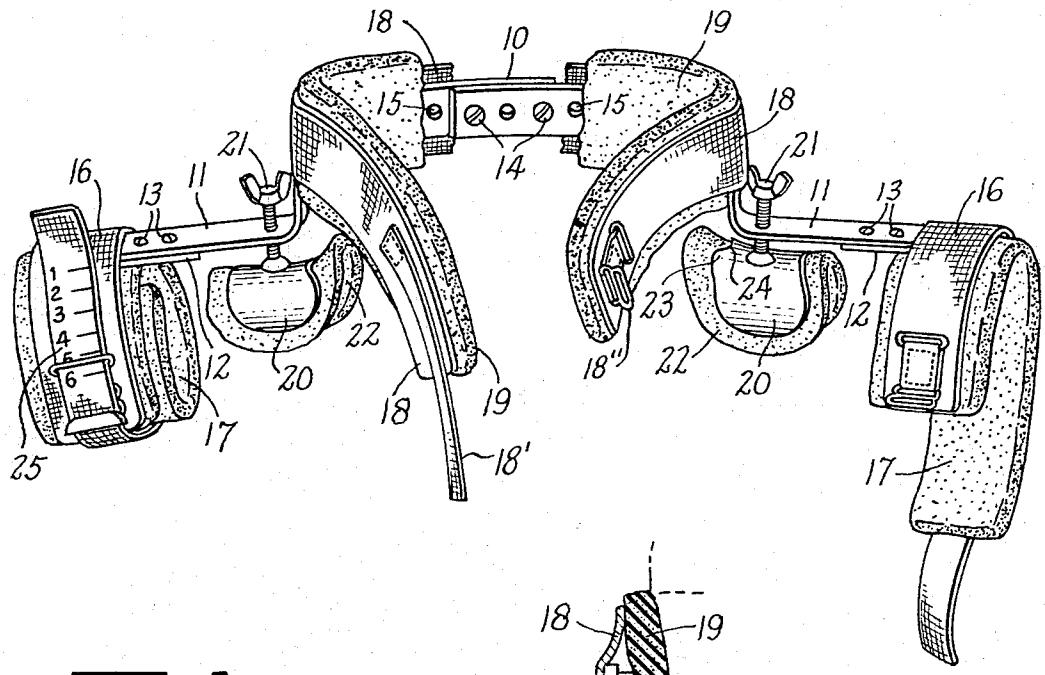
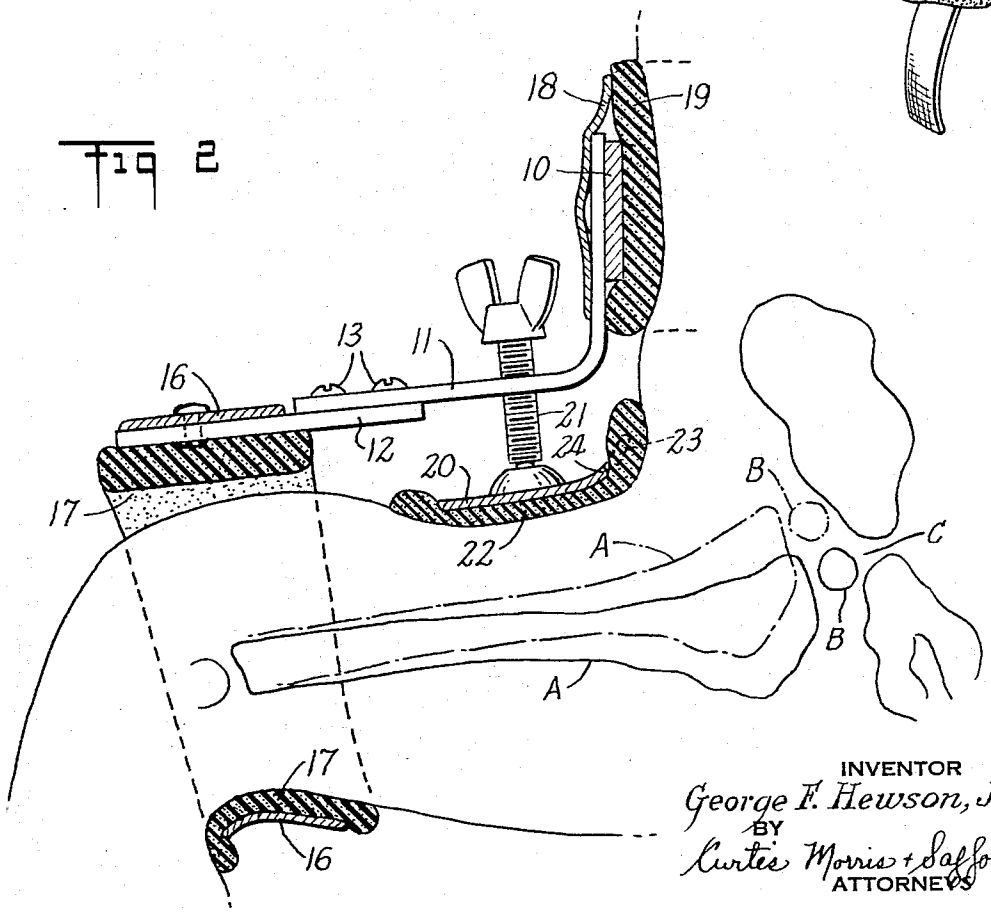


Fig 2



INVENTOR
George F. Hewson, Jr.
BY
Curtis Morris & Safford
ATTORNEYS

Sept. 27, 1966 G. F. HEWSON, JR 3,274,997

BRACES FOR CORRECTING HIP DISLOCATION

Filed Sept. 23, 1963 2 Sheets-Sheet 2

Fig 3

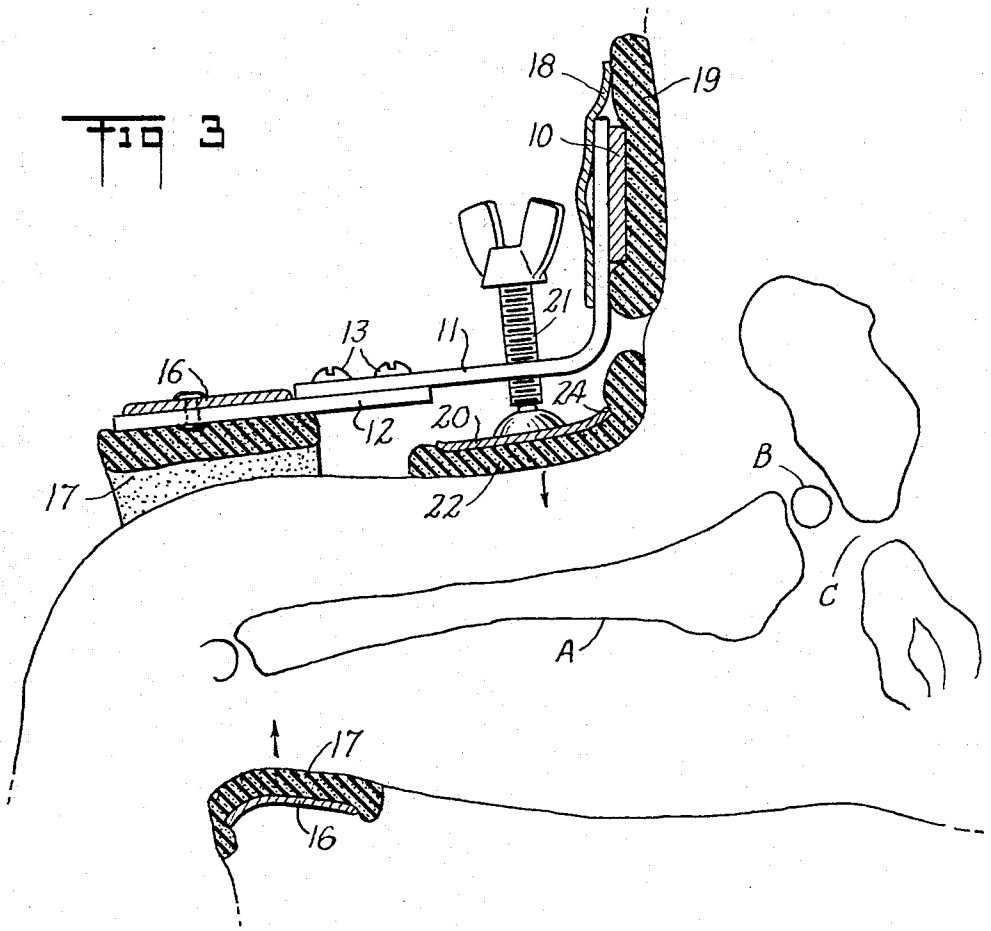


Fig 4

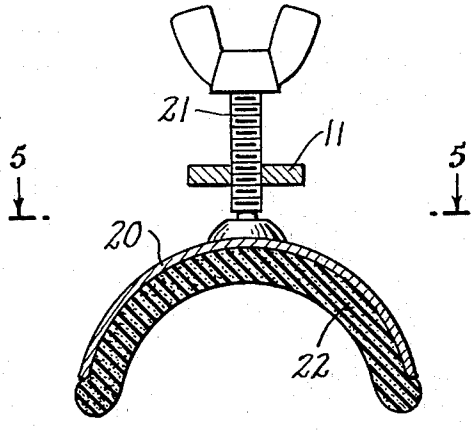
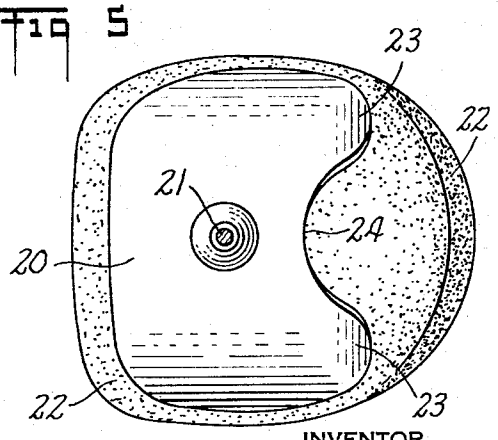


Fig 5



INVENTOR
George F. Hewson, Jr.
BY
Curtis Morris & Safford
ATTORNEYS

United States Patent Office 3,274,997 Patented Sept. 27, 1966

3,274,997

BRACES FOR CORRECTING HIP DISLOCATION

George F. Hewson, Jr., Palisade, N.J., assignor to St. Luke's Hospital Center, New York, N.Y., a corporation of New York

Filed Sept. 23, 1963, Ser. No. 310,787
1 Claim. (Cl. 128—78)

The present invention relates to a hip abduction brace of improved type adapted more particularly for the treatment and correction of congenital dislocation of the hip.

The correction of hip dislocations existing before or occurring at the time of birth has long presented baffling problems to the medical profession. Among various known expedients heretofore employed for this purpose in hospitals, for example, are the Frejka pillow, the Jordan abduction brace, the Freiburg brace, traction-abduction braces, the Ilfeld brace, the plaster spica or bandage and others. Although these devices have been used effectively in treating many congenital hip dislocations, they have failed in more difficult cases to maintain the femoral head in the acetabulum after reduction, as where re-dislocation occurs during post reduction treatment, for example.

In general, the treatment for congenital hip dislocation commonly involves manual adjustment of the femur to bring its inner end or head into proper register with the acetabulum while the patient's hips are at 90° flexion and 90° abduction. Thereafter, the problem is to maintain this relationship with sufficient accuracy and long enough so that a normally effective hip socket may be developed. In some cases manual reduction cannot be effected; and mechanically aided reduction involves prolonged procedures and the use of uncomfortable appliances or expedients.

Regardless of the extent of their functional effectiveness, some of the known devices in the art also present difficult problems of patient care, maintenance of hygiene and adequate accessibility of the involved parts for obtaining periodic X-rays.

In this connection, previously attained abduction is commonly lost when the brace is removed for any reason, as for toilet care, X-ray examination, etc. These unfavorable conditions have not been satisfactorily resolved.

An object of the present invention, accordingly, has been to provide a hip abduction brace of simple and relatively inexpensive construction which, when applied to a patient having a congenital hip dislocation, will facilitate or effect socketing of the femoral head or reduction of the dislocation where, as in some cases, manual reduction is not feasible and will effectively immobilize the defective joint in reduce condition and so prevent any redislocation during further corrective treatment.

An object has been also to provide a hip abduction brace adapted to maintain permanent closed reduction of both hips simultaneously where needed, thus allowing the acetabulum to develop most effectively toward normal condition in one or both hips.

A further object is to provide a brace whereby any desired or necessary degree of pressure may be applied to an area of the upper thigh in a direction to effect corrective movement of the femur and to control and thus effectively retain its inner end or femoral head in proper relation to the acetabulum, in spite of all activity of the child

patient and in spite of handling incident to nursing care.

A further purpose has been to provide an appliance for the indicated use which may remain in operative position on the patient over extended periods of time, as months where needed, with minimum discomfort to the wearer; which permits complete toilet care and handling by other than a physician; and which, while in place permits the taking of all necessary X-rays.

In general, a conventional hip abduction brace, as of the Jordan type, illustrated in Orthopedic Appliances pp. 242–244 London, Oxford Univ. Press, 1939, includes a rigid frame comprising posterior pelvic and lateral thigh bars, a frame retaining belt adapted to be fastened around the patient's waist, and a knee strap attached to an outer end of each thigh bar. Appropriate pads are interposed in use between the frame parts and the patient. A brace according to the present invention and constituting an improvement over said Jordan device, for example, includes a rigid frame having pelvic and thigh bars as above described and, in addition, a pressure plate and pad mounted for adjustment on each thigh bar at its under side near its inner end.

The pressure plate is advantageously swivelled at the lower end of a stem which is mounted on the thigh bar and adjustable in use in a direction to move said plate by closely controlled increments toward the upper end portion of the thigh and thus to apply corrective pressure to the upper or inner end portion of the femur. In a preferred embodiment, the pelvic bar and the thigh bars are made adjustable to permit variation of the frame dimensions to accommodate patients of different sizes, or for adjustment to growth of the same patient where the period of correction is of extended duration, and to facilitate proper positioning of the pressure plate over the head of the femur.

Other objects and distinctive features of the present invention not above referred to will appear from the following specification and claims and from the accompanying drawings wherein is shown a preferred embodiment thereof incorporated in a hip abduction brace as described in said specification. The showing so made is not intended to be either exhaustive or as limiting the scope of the subject invention. The present purpose is to illustrate the invention so that others skilled in the art may so fully understand it, its principles and applications, that they may embody it and adapt it in any of various forms appropriate to the attainment of any particular or appropriate purpose in use.

In the drawings:

FIG. 1 is a front view in perspective of a brace according to the invention with parts broken away and with the front retaining strap and one of the leg straps in open condition;

FIG. 2 is a fragmentary view on enlarged scale with parts broken away and with parts shown in longitudinal vertical section of a portion of said hip abduction brace as it appears when applied to a patient's body, indicated in dotted lines, to maintain the femur in corrected condition (shown full line) after reduction from dislocated condition (shown dotted);

FIG. 3, a diagrammatic view illustrating a typical hip dislocation prior to reduction to corrected position (seen in FIG. 2 full line) of the upper femur and femoral head (shown dotted) in relation to the acetabulum and with the brace in position to effect said reduction;

FIG. 4, a transverse vertical section showing details of construction of the pressure plate; and

FIG. 5 is a top plan view of the pressure plate seen in FIGS. 1, 2 and 3 from the line 5—5 of said FIGURE 4.

Referring to FIG. 1 of the drawings, a brace embodying the invention as there shown includes a rigid frame of suitable material providing a torso conforming band as pelvic bar **10** and a thigh bar **11** including an upright portion secured at its upper end to an end portion of said pelvic bar **10** and an arm portion extending substantially perpendicularly from the lower end of said upright portion to an extent approximately the length of the intended patient's thigh, or the distance from knee to hip. The length of said arm portion may be varied by providing at its outer end a longitudinally adjustable extension piece **12** conveniently secured in different longitudinal positions thereon by suitable means, as screws **13**. Also the effective length of pelvic bar **10** may be varied by making it in two pieces, for example, with their inner ends overlapping in different degrees and secured together in a desired position as by screws **14** engaging holes **15**. This arrangement provides not only for use of the brace on patients of different torso dimensions or on the same patient at different stages of growth but also permits more accurate adjustment of the pressure plate, i.e., either outwardly from or inwardly toward the hip joint. The upright portion of each thigh bar **11** is secured by suitable means, as rivets, to a front end portion of the torso conforming bar **10**.

Provision is made for securing the rigid frame of the brace to the body of a patient by suitable attaching devices. In a typical case, where the patient is brought into conventional splinting position with hips at 90° flexion and 90° abduction, the arm portion of thigh bar **11** is positioned above and opposite the upper surface of the patient's thigh and at an angle thereto depending on the angle of dislocation of the femur and the extent and direction of its intended reduction. Thus, bar **11** has secured at the outer end of its arm position, as by rivets for example, a band means **16** (FIG. 2) which encircles the patient's lower thigh above or inwardly from the knee joint; and a pad **17** of suitable shape and material, as foam rubber, is inserted between the band means **16** and the thigh. The frame including the inner upturned end of thigh bar **11** and the posterior pelvic bar **10** is fastened to the patient's torso by a belt **18** secured in front, as by a strap **18'** and **18''**, in position to cover said pelvic bar **10** and the upper end of the upright portion of thigh bar **11** and to retain a suitable pad **19** interposed between the frame and the patient's torso.

The brace fastening devices above referred to are conventional and provide in effect secure attachment of the brace to the patient. However, a conventional brace so attached is not capable of use in effecting reductions of hip dislocations, and under some conditions, is inadequate to maintain a reduction previously made between the femur head and the acetabulum, such maintained relation being necessary to effect permanent correction of the hip dislocation. Accordingly, to provide a brace according to my invention and which in use accomplishes the desired results a pressure plate **20** is mounted at the under side of and adjacent to an inner or pelvic end portion of bar **11**. To exert controlled pressure on plate **20**, the latter is conveniently connected, as by a swivel joint, at the lower end of the stem of a set screw **21** extending through a threaded hole in bar **11**. Thus, when the frame including said bar **11** is attached to the patient, as above described, and the desired pressure is applied to and maintained on an inner end portion of the femur in reduced condition through plate **20** and pad **22** by manipulating said screw **21**, a three point stabilization is effected which can maintain optimum immobilization of the hip joint over extended periods.

The inner end edge of plate **20** is advantageously flared upwardly at **23**, as seen in FIG. 2 for example, to conform to thigh contours as defined by soft tissue overlying the hip joint and lateral wall of the ilium and to gently control motion of the confined parts. Said edge is also slightly indented or reentrant in contour, as at **24**, FIG. 5. As seen in FIG. 4, plate **20** is of arched or bowed cross sectional contour and all its peripheral edges are preferably rounded. These details of the form of pressure plate **20** and its swivel mounting not only contribute to the comfort of the patient wearing the brace but also tend to transmit to the femur and retain the applied corrective pressure in the proper direction and in the most effective manner; and to limit and control lateral as well as upward movement of the head end of the upper femur, while permitting a desirable degree of free movement by the patient in other respects.

FIG. 3 represents diagrammatically a dislocation wherein the inner end or head B of the femur A is displaced from normal hip socket engaging position. To effect reduction the brace is attached as shown in FIG. 1 and pressure plate **20** is adjusted downwardly by set screw **21** (see arrow) as above described. Thus, the head end of femur A is, in effect, directed downwardly toward its reduced position opposite the acetabulum C. Concurrently, the knee strap **16** at the knee joint is adjusted in a direction (see arrow) to direct the outer end of femur A upwardly, or, when adjusted to a desired position, to function as a fulcrum to limit downward deflection of the outer end of the femur when downward pressure is applied to the inner end thereof. The net effect is to adjust femur A gradually from its dotted line position toward its reduced corrected position (full line) as seen in FIG. 2.

Where plate **20** and/or band means **16** are adjusted periodically by small degrees which may conveniently be indicated by spaced (one centimeter, for example) and numbered markings **25** on band means **16**, the progress of the reduction can be accurately checked by X-ray procedures without disturbing or removing the brace. And when the reduction has been attained, as in FIG. 2 (full line), the brace operates to maintain the femur in corrected or reduced position. Thus, plate **20** cooperating with knee band means **16** prevents displacement in a vertical plane while the depending edge portions of plate **20** defining its transversely bowed or arched contour tend to restrain the femur against displacement of the head B thereof in a horizontal direction, as seen in FIG. 2.

It appears from the foregoing that a brace according to my invention serves the novel and highly desirably function in use of completely stabilizing or maintaining a reduction regardless of the method by which it has been achieved. In some cases, where reduction had been effected but was unstable, I was able, by the use of a brace embodying my invention, to effectively maintain the reduction without redislocation in spite of the activity of the patient and handling by physicians and nurses, or by the mother at home.

In many cases of congenital hip dislocation, reduction can be accomplished by known manual procedures and, in other more resistant cases, by various mechanical or combined mechanical and manual operations. However, the above described reducing procedure effected by use of a brace according to my invention is also particularly effective in hip dislocations which resist conventional manual reduction and which would commonly call for more complex and long duration operations involving traction, casts, etc. Thus, by the use of my brace in a case resistant to manual reduction methods, I have accomplished a novel and unexpected reduction in gradual degrees within a period of five days with a minimum of discomfort to the patient and complete accessibility by physician and nurse for all usual purposes.

What is claimed is:

In a brace for treating congenital hip dislocation, the combination of a rigid frame including a pelvic bar of

longitudinally curved contour for conformably engaging a peripheral portion of a patient's torso and two laterally arranged thigh bars each secured to an end portion of said pelvic bar, each thigh bar including an upright portion secured at its upper end to a portion of said pelvic bar and an arm portion extending substantially perpendicular from said upright portion, said arm portions extending outwardly from said pelvic bar in opposite directions and substantially colinear, each of said arm portions having band means at its outer end adapted to be fastened around and encircle a patient's lower thigh opposite the outer end of the femur, each thigh bar having a pressure plate mounted on the arm portion adjacent the upright portion, said pressure plate being concave and having a flared inner edge portion to conform to the thigh and body junction, said pressure plate mounting means including adjustable means to exert corrective pressure on the upper thigh in a direction toward the femur head while the outer end of the femur is held against displacement by said band means encircling the patient's lower thigh above the knee joint.

References Cited by the Examiner

UNITED STATES PATENTS

2,091,643	8/1937	Longfellow	128—84
2,187,323	1/1940	Kelton et al.	128—87
2,584,203	2/1952	Hart	128—84

OTHER REFERENCES

The Journal of Bone and Joint Surgery, vol. 39–A, No. 1, January 1957, "The Management of Congenital Dislocation and Dysplasia of the Hip by Means of a Special Splint," by Ilfield.

Orthopedic Appliances Atlas, vol. 1, 1952. FIGURES A and 725 on p. 435.

RICHARD A. GAUDET, *Primary Examiner.*

J. W. HINEY, *Assistant Examiner.*