APPLICATION FOR A (b) STANDARD/PETTY PATENT

X/We (c)
DENYERS PTY. LTD.

of (d)
283-285 Wickham Road,
Moorabbin, Victoria 3189
Australia

hereby apply for the grant of a (e) Standard/Petty Patent for an invention entitled

"IMPROVED AXLE STRUCTURE"

which is described in the accompanying (e) complete

specification.

(Note: The following applies only to Convention applications)

Details of basic application(s)

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<th>Application No.</th>
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APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 16. 9. 85

Address for Service:
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Dated (i) 16 September 1985

PHILLIPS ORMONDE & FITZPATRICK
Attorneys for:
DENYERS PTY. LTD.

Note: No legalization or other witness required.

PHILLIPS ORMONDE AND FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia
DECLARATION FOR A PATENT APPLICATION

In support of the application made by

DENYERS PTY. LTD.

(herinafter called "applicant(s) for a patent for an invention entitled"

"IMPROVED AXLE STRUCTURE"

I/We—Jack C. Morris, Joint Managing Director of
Denyers Pty. Ltd., of 283-285 Wickham Road, Moorabbin,
Victoria 3189, Australia

do solemnly and sincerely declare as follows:

1. I am authorized to make this declaration on behalf of the applicant(s).
2. Richard Allan Morris of 392 St. Kilda Road, Elwood, Victoria, Australia and Erwin Hirt of Flat 2, 6A Marriott Street, Caulfield, Victoria, Australia—is—the actual inventor(s) of the invention and the facts upon which the applicant(is)—is—entitled to make the application are as follows:

   a) The said actual inventors made the said invention out of and in the course of employment with applicant as Joint Managing Director and Chief Engineer, respectively, and have acknowledged applicant's rights to the said invention and right to make this patent application and applicant is therefore a person entitled under Section 34(1) of the Patents Act 1952.

(Note: Paragraphs 3 and 4 apply only to Convention applications)

3. The basic application(s) for patent or similar protection on which the application is based is/are identified by country, filing date, and basic applicant(s) as follows:

4. The basic application(s) referred to in paragraph 3 hereof was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Declared at Moorabbin
Dated 15th February 1988

To: The Commissioner of Patents
1. An axle structure adapted for releaseable engagement of a wheel with a vehicle, said axle structure including an elongate axle having an elongate tubular body and a centre shaft extending longitudinally within said tubular body, means for rotatably mounting a wheel of the vehicle at or adjacent one end of said elongate axle, and means for releaseably securing the other end of the axle to the vehicle comprising members located in lateral openings in said tubular body adjacent the other end and movable between a first position in which they project outwardly from said tubular body under the action of the centre shaft and a second position in which they can enter partly into a recess means formed in or on the outer surface of the centre shaft.
COMPLETE SPECIFICATION

Class
Int. Class

AUSTRALIAN PATENTS ACT

COMPLETE SPECIFICATION
(ORIGINAL)

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
P Published:

Priority

Related Art:

Name(s) of Applicant(s): DENYERS PTY. LTD.

Address(es) of Applicant(s): 283-285 Wickham Road,
Moorabbin, Victoria 3189,
Australia

Actual Inventor(s): Richard Allan Morris
Erwin Hirt

Address for Service is:

Complete Specification for the invention entitled:

"IMPROVED AXLE STRUCTURE"

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):
This invention relates to an improved axle structure, in particular a releaseable axle structure.

In many applications, there is a need for a releaseable mounting for a vehicle wheel. One such application is in wheel chairs, where removal of wheels of the chair is highly desirable. Such removal can be for facilitating storage of a wheel chair or for reduction of the size and weight of a chair for ease of loading it into a vehicle and subsequent unloading. Also, removal of a wheel can be required, such as to enable repositioning of the wheel axis, such as where a chair is to be used from time to time for sporting purposes.

According to the present invention there is provided an axle structure adapted for releaseable engagement of a wheel with a vehicle, said axle structure including an elongate axle having an elongate tubular body and a centre shaft extending longitudinally within said tubular body, means for rotatably mounting a wheel of the vehicle at or adjacent one end of said elongate axle, and means for releaseably securing the other end of the axle to the vehicle comprising members located in lateral openings in said tubular body adjacent the other end and movable between a first position in which they project outwardly from said tubular body under the action of the centre shaft and a second position in which they can enter partly into a recess means formed in or on the outer surface of the centre shaft.
This invention relates to an improved axle structure, in particular a releaseable axle structure.

In many applications, there is a need for a releaseable mounting for a vehicle wheel. One such application is in wheel chairs, where removal of wheels of the chair is highly desirable. Such removal can be for facilitating storage of a wheel chair or for reduction of the size and weight of a chair for ease of loading it into a vehicle and subsequent unloading. Also, removal of a wheel can be required, such as to enable repositioning of the wheel axis, such as where a chair is to be used from time to time for sporting purposes.

According to the present invention there is provided an axle structure adapted for releasable engagement of a wheel with a vehicle which includes an elongate axle on which a wheel for the vehicle is rotatably mounted at or adjacent one end of said axle and means for releasably securing the other end of the axle in a bore defined in an axle housing of the vehicle.

The axle may have an elongate tubular body and a centre shaft extending longitudinally within the body. In such case, the means for securing the other end of the axle in the axle housing bore may comprise members, such as balls, located in lateral openings in the body adjacent the other end and movable between a first position in which they project outwardly from the body under the action of the shaft, and a second position in which they can enter partly into recess means formed in or on the outer surface of the shaft.

To provide such action, the shaft may be urged by resilient means to a holding position in which its outer surface holds the securing means in its first position, but movable against that resilient means to a release position in which the recess means is located to receive the securing means. Preferably, the shaft is urged so as to project beyond the body at the one end of the axle, such as by a helical spring co-axially located within the body, around the shaft. In such case, the shaft preferably has an annular recess formed in its outer surface, and can be pressed axially against the spring to locate the recess so as to permit the securing means to move from its first to its second position. On allowing the shaft to return to its initial projecting position, the
securing means preferably are cammed out of the recess and then held by the shaft outer surface in their first position.

At its one end, the axle may have a wheel retaining flange means; the wheel being axially received onto the axle from the other end of the axle. Such flange means may be formed integrally with the axle body, or it may be secured thereto. In one convenient arrangement, the flange means may be provided by a pair of lock nuts screwed onto the body at the one end of the axle.

Where the centre shaft projects beyond the one end of the axle, the shaft preferably is provided with an enlarged head to facilitate the application of manual pressure to move the shaft against its resilient means. Preferably, the axle body has an enlarged diameter extension sleeve located co-axially around such enlarged head. Such sleeve may project from the wheel retaining flange, and preferably is integral with the latter.

The axle structure of the invention may include a mounting sleeve co-axial with the axle and facilitating securement of the other end of the axle in the bore of an axle housing. The mounting sleeve may be cylindrical. Intermediate its ends, its external surface may be stepped to define respective end portions of larger and smaller external diameter. The larger diameter portion, at its end face remote from the other portion, may define a wheel hub abutment surface; with the sleeve at the junction of those portions defining an axle housing abutment shoulder. The smaller diameter portion may be adapted to pass through the axle housing and, in such case, it may be externally threaded for receiving a locking nut to lock the sleeve and the axle therein in relation to the axle housing. Preferably, the end face of the smaller diameter portion, which is remote from the other portion, defines an abutment surface engageable by the axle securing means when the latter are in their first position.

Where such mounting sleeve is provided, the length of the axle preferably is such that, with the axle securing means engaging the abutment surface of the smaller diameter portion of the sleeve, the length of the axle externally of the sleeve is sufficient to rotatably accommodate the hub of the wheel.
with which the axle is to be used. That is, the spacing between the wheel hub abutment face and the wheel retaining flange means preferably is sufficient to receive the axial extent of the hub.

In the drawings, Figure 1 shows an axle according to the invention. Figures 2 and 3 show an axle in an axle structure.

The axle 10 comprises a tubular body 12 and a central shaft 14 extending through bore 16 of body 12. Bore 16 has, at the axially outer end of axle 10, an enlarged diameter portion 18 which terminates at annular boss 20 secured to body 12. Shaft 14 has within bore portion 18 a boss 22 formed thereon, the extent of axial movement of shaft 14 relative to body 12 being limited by boss 22, boss 20 and the inner end of bore portion 18. A spring 24 located around shaft 14, between that inner end and boss 22 urges shaft 14 to the axially outer end of body 12; while cap 26 at that end of shaft 14 enables the latter to be pushed against the bias of spring 24.

At the axially inner end of axle 10, body 12 has two diametrically opposed radial openings 28 in each of which a respective ball 30 is held captive. With shaft 14 urged to the outer end by spring 24, balls 30 are held by the surface of shaft 14 in radially outermost positions in which they project beyond the outer surface of body 12. When so projecting, balls 30 are able to serve as axle securing means. However, shaft 14 has an annular groove 32 in its outer surface and, when cap 26 is pressed, groove 32 is moved to a position enabling balls 30 to move radially inwardly so as not to project beyond the outer surface of body 12.

As can be appreciated from consideration of Figures 1 and 2, pressing cap 26 enables axle 10 to be inserted axially through a wheel hub 34, and then through mounting sleeve 36, by allowing balls 30 to enter groove 32. Release of cap 26 thereafter causes balls 30 again to project outwardly of body 12. Axle 10 and hub 34 then are secured in relation to sleeve 36, due to engagement of balls 30 with the adjacent end face 38 of sleeve 36 and shaft 14 preventing balls 30 from being able to move inwardly out of such engagement. Also, hub 34 is retained between the other end 40 of sleeve 36 and flange means 42 on
body 12. The overall length of axle 10, between flange means 42 and balls 30 is such that hub is held against axial movement between end 40 and means 42, but able to rotate freely.

Sleeve 36 is shown mounted in axle housing or bracket 44 of a vehicle. The left hand, smaller diameter portion of sleeve 36 projects through bore 46 of housing 44 and is retained by nut 48 engaged on external thread on that portion. If it is desired to remove hub 34 (and the wheel of which it forms part), it is necessary simply to press cap 26 manually and, simultaneous pull hub 34 axially to draw axle 10, with hub 34, out of engagement with sleeve 36.

Flange means 42 may, as depicted in Figure 2, be integral with axle body 12. Alternatively, as shown in Figure 1, it may be provided by two lock nuts 50 threaded onto the end of body 12. In each case, means 42 has a sleeve or cylindrical extension 52 co-axially around cap 26 so as to protect the latter against being unintentionally pressed, such as due to a vehicle on which the axle is mounted hitting against some object. Also, cap 26 is relatively large for ease of manual pressing in intentionally removing axle 10 and its wheel.

Hub 34 preferably is of the type illustrated; this being light, but strong, and well suited to use with vehicles such as wheel chairs. Hub 34 has two annular body members 54 secured in axially spaced relation by a relatively stiff cylindrical sleeve 56. The inner periphery of each member 54 is inturned to define a channel 58 into which a bead 60 at the adjacent end of sleeve 56 is received in a force fit. The outer periphery of each member 54 projects radially beyond sleeve 56 to receive spokes connecting hub 34 to the rim of its wheel. A bearing 62 received in a force fit within each channel 58 facilitates rotation of the wheel on axle 10.

Axle 10 preferably is of steel. Where it is to be used in a chair required for sporting purposes, a high tensile steel most preferably is used. A solid, rather than viscous liquid, lubricant is preferable for axle 10, particularly on the external surface of body 12.

Finally, it is to be understood that various alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described.
without departing from the spirit or ambit of the invention.
The claims defining the invention are as follows:

1. An axle structure adapted for releasable engagement of a wheel with a vehicle, said axle structure including an elongate axle having an elongate tubular body and a centre shaft extending longitudinally within said tubular body, means for rotatably mounting a wheel of the vehicle at or adjacent one end of said elongate axle, and means for releasably securing the other end of the axle to the vehicle comprising members located in lateral openings in said tubular body adjacent the other end and movable between a first position in which they project outwardly from said tubular body under the action of the centre shaft and a second position in which they can enter partly into a recess means formed in or on the outer surface of the centre shaft.

2. An axle structure according to claim 1 wherein action of the centre shaft is provided by urging said centre shaft by resilient means to a holding position in which its outer surface holds the securing means in its first position but movable against said resilient means to a release position in which the recess means is located to receive the securing means.

3. An axle structure according to claim 1 or 2 wherein said members are balls.

4. An axle structure according to claim 2 or 3 wherein said resilient means is a helical spring co-axially located within said tubular body, around the shaft.

5. An axle structure according to any one of claims 2 to 4 wherein the centre shaft has an annular groove formed in its outer surface and can be pressed axially against said securing means to locate the groove so as to permit the securing means to move from its first to its second position.

6. An axle structure according to any one of claims 1 to 5, wherein the axle has a wheel retaining means.

7. An axle structure according to claim 6 wherein said wheel retaining means is formed integrally with or secured to said tubular body.

8. An axle structure according to claim 6 or 7 wherein said wheel retaining means is provided by a pair of lock nuts.
screwed onto said tubular body at said one end of the axle.

9. An axle structure according to any one of claims 2 to 8 wherein said centre shaft projects beyond said one end of the axle and is provided with an enlarged head to facilitate the application of manual pressure to move the shaft against said resilient means.

10. An axle structure according to claim 9 wherein said tubular body has an extension sleeve located co-axially around said enlarged head.

11. An axle structure according to any one of claims 1 to 10, including a mounting sleeve co-axial with the axle and facilitating securement of said other end of the axle in the bore of an axle housing.

12. An axle structure according to claim 11 wherein the mounting sleeve is cylindrical and has its external surface stepped to define respective end portions of larger and smaller external diameter such that the end face of the larger diameter portion defines a wheel hub abutment surface and wherein the smaller diameter portion is adapted to pass through the axle housing and is provided with means to lock the sleeve and the axle therein in relation to the axle housing.

13. An axle structure according to claim 1 substantially as herein described with reference to the accompanying drawings.

14. A wheel chair which includes an axle structure in accordance with any one of claims 1 to 13.


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