US008752985B2

(12) **United States Patent**
Quadri

(10) **Patent No.: US 8,752,985 B2**
(45) **Date of Patent: Jun. 17, 2014**

(54) **GOBO SUPPORT ASSEMBLY FOR A STAGE LIGHTING FIXTURE, AND STAGE LIGHTING FIXTURE EQUIPPED WITH SUCH A GOBO SUPPORT ASSEMBLY**

(75) Inventor: **Pasquale Quadri**, Torre De' Roveri (IT)

(73) Assignee: **Clay Paky S.p.A.**, Seriate (IT)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 371 days.

(21) Appl. No.: **12/934,759**

(22) PCT Filed: **Mar. 25, 2009**

(86) PCT No.: **PCT/IB2009/000588**

§ 371 (c)(1),
(2), (4) Date: **Dec. 13, 2010**

(87) PCT Pub. No.: **WO2009/118608**

PCT Pub. Date: **Oct. 1, 2009**

(65) **Prior Publication Data**

US 2011/0110099 A1 May 12, 2011

(30) **Foreign Application Priority Data**

Mar. 27, 2008 (IT) MI2008A0518

(51) **Int. Cl.**
F21V 17/02 (2006.01)

(52) **U.S. Cl.**
USPC **362/322**; 362/277; 362/282; 362/283; 362/293; 362/319; 362/324; 362/418; 359/813; 359/814; 359/889; 359/892

(58) **Field of Classification Search**
USPC 362/277, 278, 282, 319, 321, 322, 418; 359/821, 892
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,401,326	A	3/1995	Mihelic	
5,402,326	A *	3/1995	Belliveau	362/284
6,601,973	B2 *	8/2003	Rasmussen et al.	362/282
7,370,990	B2 *	5/2008	Juřík	362/227
8,262,262	B2 *	9/2012	Mahaffey	362/322
2002/0075685	A1	6/2002	Rasmussen	
2009/0323355	A1 *	12/2009	Mahaffey	362/323

FOREIGN PATENT DOCUMENTS

WO	WO 2004031825 A1 *	4/2004	
WO	2004/046607	6/2004	

OTHER PUBLICATIONS

International Search Report and Written Opinion from International Application No. PCT/IB2009/000588.

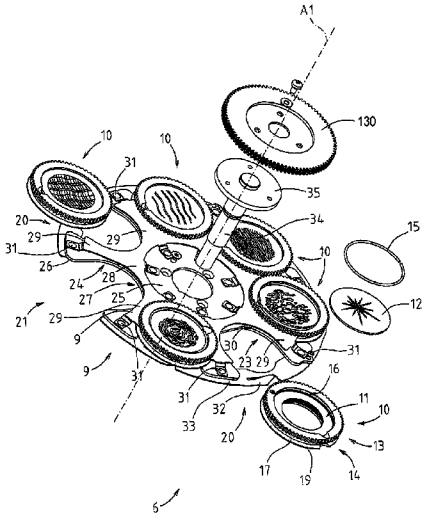
* cited by examiner

Primary Examiner — Robert May
Assistant Examiner — Tsion Tumebo
(74) *Attorney, Agent, or Firm* — Dorsey & Whitney LLP

(57) **ABSTRACT**

A gobo support assembly, for a stage lighting fixture, has a disk-shaped gobo; a gobo support having a first seat for housing the gobo; and a gobo carrier wheel rotating about an axis and having a second seat for housing the gobo support; the gobo carrier wheel and the gobo support being connectable in sliding manner in a direction substantially perpendicular to the axis, and being locked mutually by a reversible click-on locking mechanism to hold the gobo support in a given position inside the second seat.

16 Claims, 4 Drawing Sheets



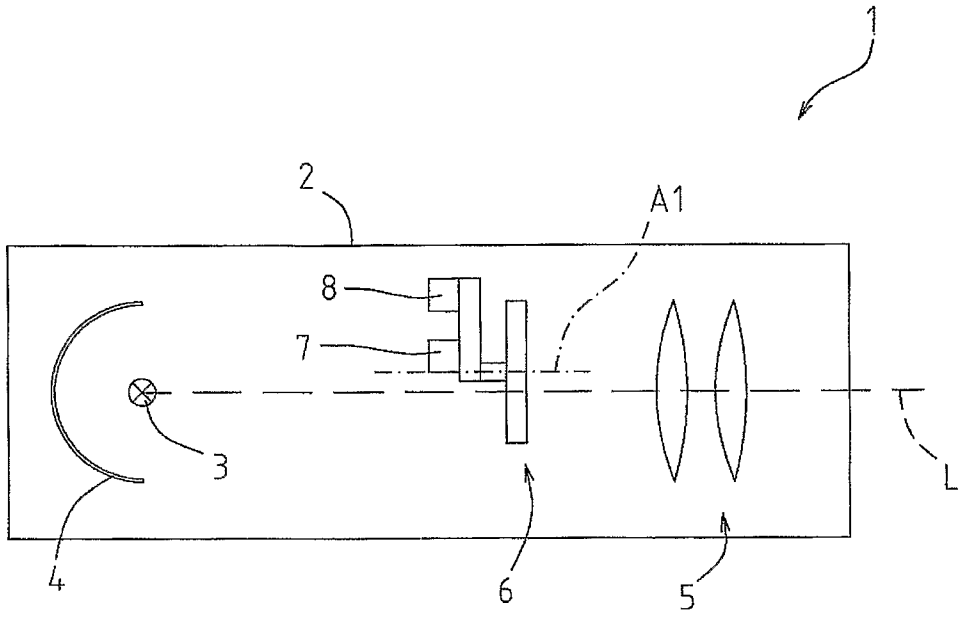


Fig.1

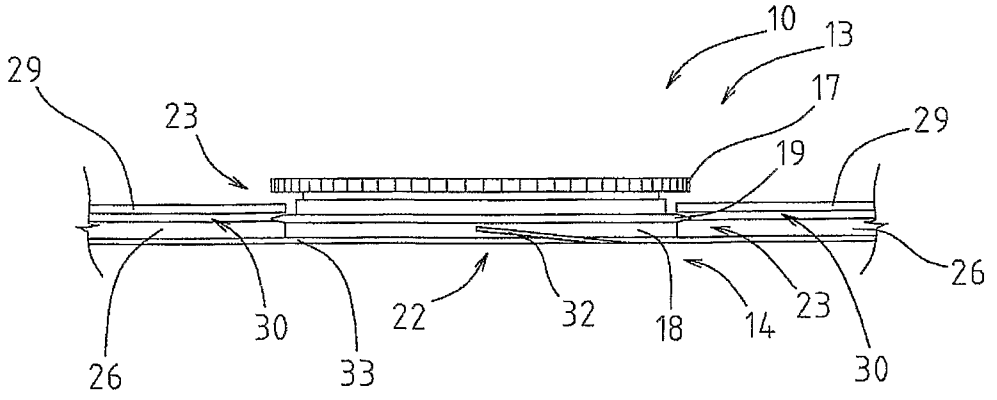


Fig.5

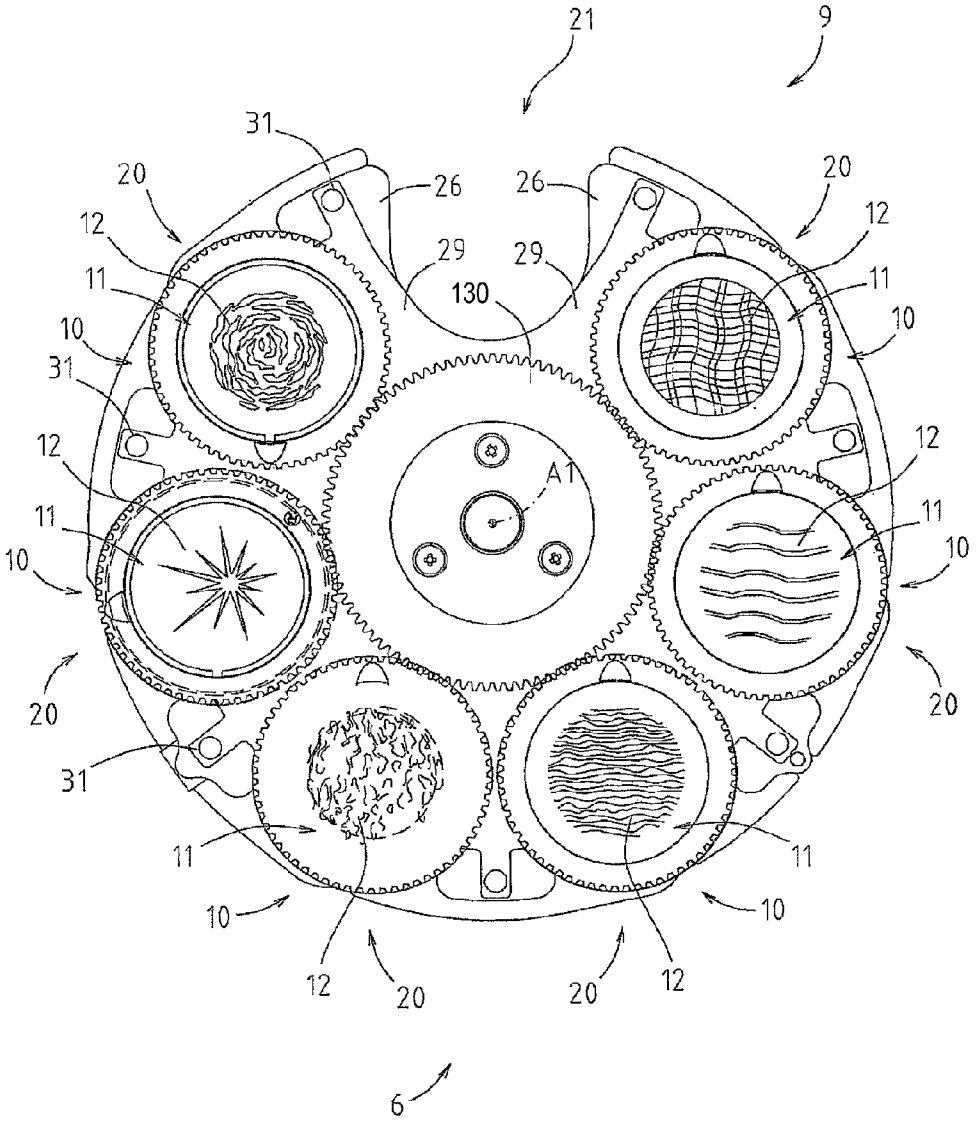

21
9
31
20
26
26
20
12
29
29
12
11
130
11
10
10
31
12
12
A1
11
11
10
10
20
20
31
11
11
10
10
12
20
20
12
6

Fig.2

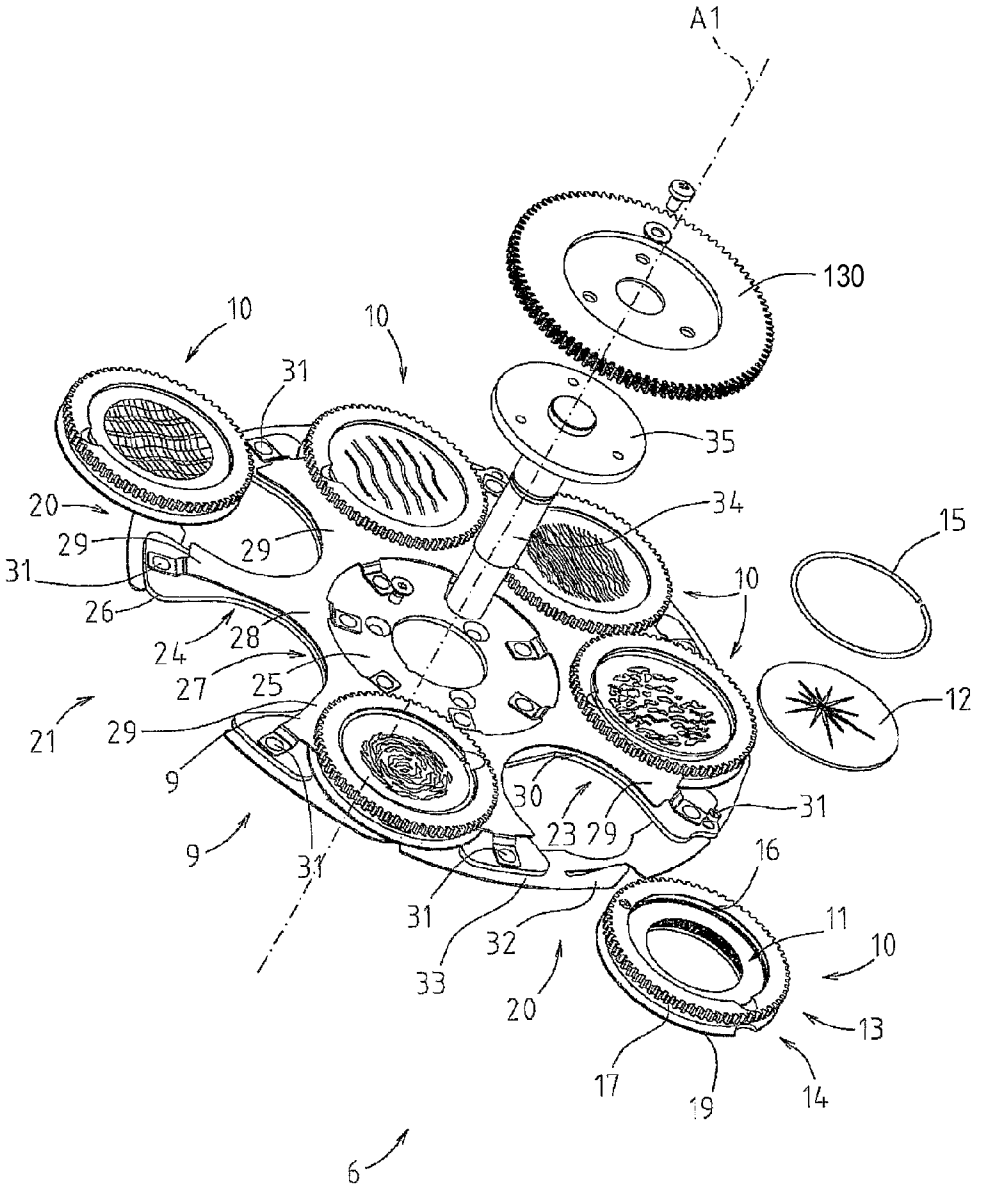

A1
130
10
10
31
35
20
34
15
29
29
31
10
26
28
24
27
25
12
21
29
9
30
31
23
29
9
31
16
31
32
11
10
33
20
13
17
19
14
6

Fig.3

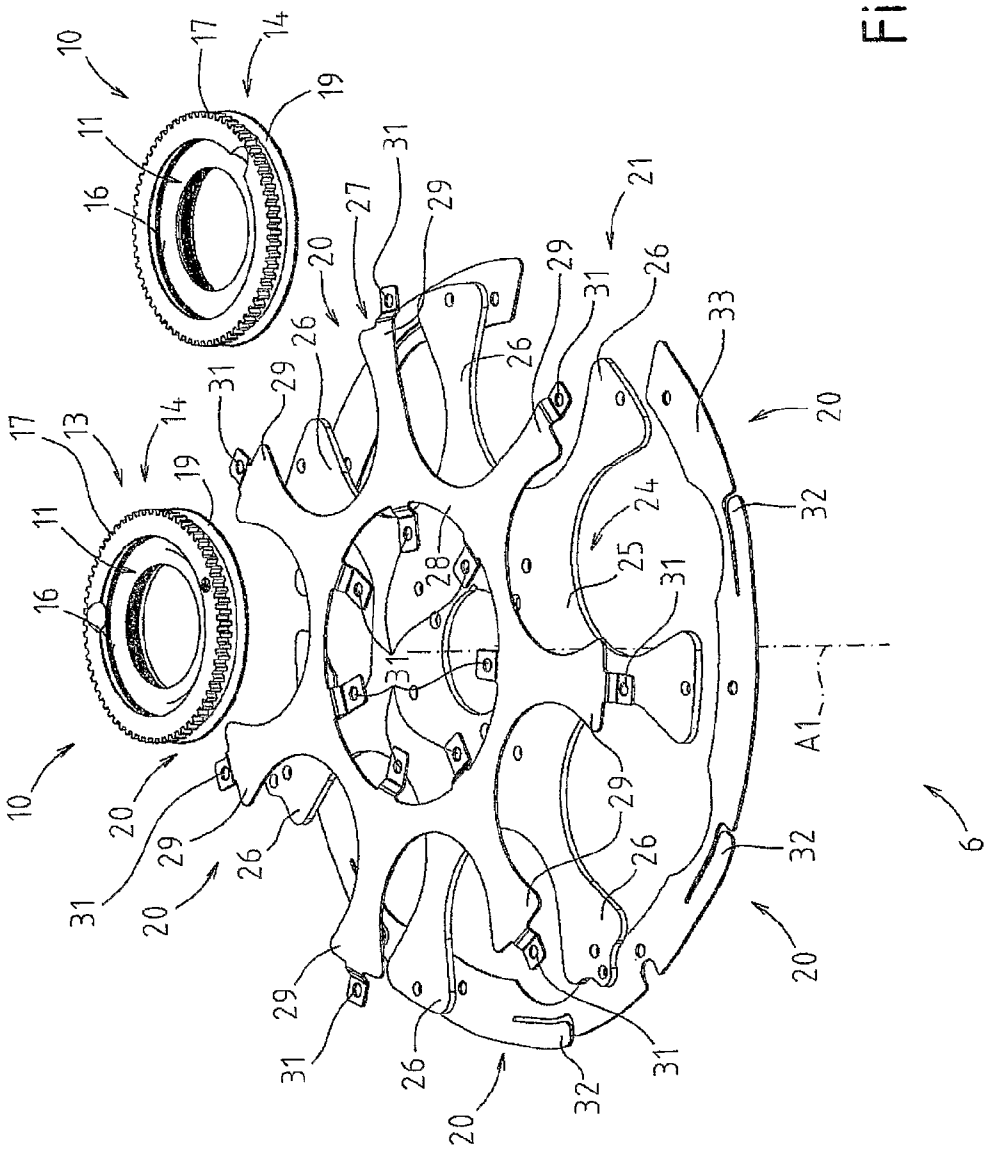


Fig.4

GOBO SUPPORT ASSEMBLY FOR A STAGE LIGHTING FIXTURE, AND STAGE LIGHTING FIXTURE EQUIPPED WITH SUCH A GOBO SUPPORT ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a U.S. Nationalization of PCT International Application No. PCT/IB2009/000588 filed 25 Mar. 2009, entitled "GOBO SUPPORT ASSEMBLY FOR A STAGE LIGHTING FIXTURE, AND STAGE LIGHTING FIXTURE EQUIPPED WITH SUCH A GOBO SUPPORT ASSEMBLY," which claims priority to Italian Patent Application No. MI2008A000518 filed on 27 Mar. 2008, the contents of both of the foregoing applications are incorporated herein, in their entirety, by this reference.

TECHNICAL FIELD

One or more embodiments of the present invention relate to a gobo support assembly for a stage lighting fixture.

More specifically, the gobo support assembly comprises at least one disk-shaped gobo; at least one gobo support having a first seat for housing a gobo; and a gobo carrier wheel that rotates about an axis and comprises a second seat for housing a gobo support.

BACKGROUND ART

A "gobo" is a metal, normally stainless steel, or glass disk, in which a pattern or shape is formed to produce a light pattern when the gobo intercepts a light beam. Each gobo is normally fitted releasably inside a first seat in a gobo support of the type described in U.S. Pat. No. 5,401,326, and the gobo support is in turn fitted to the gobo carrier wheel, inside a second seat. More specifically, as described in U.S. Pat. No. 5,401,326, each gobo support is riveted to the gobo carrier wheel, so, to change the gobos, they must be extracted axially from the respective supports, which, given the limited amount of space available axially in a lighting fixture, can prove awkward.

To eliminate this drawback, two technical solutions for gobo support assemblies have been proposed, in which the gobo supports are fitted in selectively releasable manner inside the respective second seats on the respective gobo carrier wheels. The two solutions are similar, and are disclosed in Patent Applications US 2002/0075685 and WO 2004/046607 respectively.

In a first solution disclosed in Patent Application US 2002/0075685, the gobo support is inserted at least partly inside the second seat, which is defined by a hole formed in a plate of the gobo carrier wheel; and the gobo support is retained inside the hole by a leaf spring which acts on a gobo support flange resting on one edge of the plate.

A second solution disclosed in Patent Application WO 2004/046607 differs from the first by the gobo support having at least two projections, and by the second seat comprising, in addition to the main hole, two auxiliary holes engaged axially by the projections. In this case, too, the projections are retained inside the respective seats by a leaf spring which acts on a gobo support flange resting on the plate.

Functionally speaking, both the above solutions involve extracting and inserting the gobo supports parallel to the gobo carrier wheel axis, and so require room for manoeuvring.

Using either of the above solutions, the axial space allowed in the stage lighting fixture for the gobo support assembly must therefore equal the axial size of the gobo support assembly plus the manoeuvring space required to insert and extract the gobo supports.

A technical solution that partly solves the problem is described in the 1999 Manual of the Società Coemar S.p.A. CP 1200 Hard Edge stage lighting fixture, available on-line at http.com/Pages/Manual_fix.htm.

Coemar S.p.A. adopted a similar technical solution in their NAT 4000 lighting fixture of 1997, the manual of which can be found on the above web page.

Pages 28 and 29 of the CF 1200 Hard Edge manual describe a gobo support assembly comprising a gobo carrier wheel that rotates about an axis and comprises a plate perpendicular to the axis of rotation, and interchangeable gobo supports. Each gobo support comprises a wedge-shaped flange that fits inside a seat formed inside pins mounted on the base plate; and the gobo support is held in a given position inside the second seat by a spring, which has a first end hinged to the plate, and a second end that hooks onto a projection on the base plate.

Though involving no axial movement to insert and extract the gobo supports, this solution has the drawback of having to detach and reattach the spring whenever a gobo support is extracted and inserted respectively. Moreover, given the axial distance of the gobo support seat, the "axial" size of the gobo support assembly is considerable.

Since the gobo supports are changed entirely by hand by an operator, the tight space available inside the lighting fixture makes it difficult to position the gobo support correctly and to detach and reattach the spring.

DISCLOSURE OF INVENTION

One or more embodiments of the present invention provide a stage lighting fixture gobo support assembly that is axially compact, requires no axial space to insert and extract the gobo supports, and provides for easy change of the gobo supports in general.

According to an embodiment of the present invention, there is provided a gobo support assembly for a stage lighting fixture, the gobo support assembly comprising at least one disk-shaped gobo; at least one gobo support having a first seat for housing a gobo; and a gobo carrier wheel rotating about an axis and comprising at least one second seat for housing a gobo support; the gobo support assembly being characterized in that the gobo carrier wheel and the gobo support are connectable in sliding manner in a direction perpendicular to the axis, and are locked mutually by a reversible click-on locking mechanism to hold the gobo support in a given position inside said second seat.

One or more embodiments of the present invention also relate to a stage lighting fixture.

According to an embodiment of the present invention, there is provided a stage lighting fixture comprising a casing; a light source for generating a light beam; a reflector; and a lens assembly; the stage lighting fixture comprising any of the disclosed gobo support assembly embodiments, and located between the light source and the lens assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

A number of non-limiting embodiments of the invention will be described by way of example with reference to the accompanying drawings, in which:

FIG. **1** shows a schematic side view, with parts removed for clarity, of a stage lighting fixture;

FIG. **2** shows a plan view, with parts removed for clarity, of a gobo support assembly in accordance with an embodiment of the present invention;

FIG. **3** shows a partly exploded view, with parts removed for clarity, of the FIG. **2** gobo support assembly;

FIG. **4** shows a further exploded view, with parts removed for clarity, of the FIG. **2** gobo support assembly;

FIG. **5** shows a larger-scale side view, with parts removed for clarity, of the FIG. **2** gobo support assembly.

BEST MODE FOR CARRYING OUT THE INVENTION

Number **1** in FIG. **1** indicates as a whole a stage lighting fixture comprising a casing **2**; a light source **3** for generating a light beam L; a reflector **4** for orienting light beam L; and a lens assembly **5** for producing a zoom effect.

The term "stage lighting fixture" comprises both fixed and swivel lighting fixtures.

Lighting fixture **1** normally comprises a number of components (most not shown) located between light source **3** and lens assembly **5** to produce various optical effects, and which include a gobo support assembly **6** for positioning a gobo to intercept light beam L. The other components, such as an effect disk, colour disk, dimmer, frame, and other known equipment (not shown) inside casing **2**, take up a considerable amount of room inside lighting fixture **1**. In this connection, it is important to bear in mind the market demand for small, easy-to-handle stage lighting fixtures, but featuring numerous component parts for numerous optical effects. Moreover, the stage lighting fixture may comprise a number of gobo support assemblies for greater gobo selection and also combining the optical effects of individual gobos.

Gobo support assembly **6** rotates about an axis A**1** substantially parallel to light beam L, is supported on an arm, and is connected by respective transmissions (not shown) to two motors **7** and **8**.

With reference to FIG. **2**, gobo support assembly **6** comprises a gobo carrier wheel **9** that rotates about axis A**1**; and a number of—in the example shown, six—gobo supports **10**, each having a seat **11** for a respective gobo **12**. Gobo support assembly **6**, in fact, is an epicyclic gear train, comprising a central gear **130**, which acts as a sun gear, rotates about axis A**1** independently of gobo carrier wheel **9**, and meshes with each gobo support **10**, which acts as a planet gear, while gobo carrier wheel **9** acts as a planet carrier.

Gobos **12** in respective gobo supports **10** are interchangeable with gobos **12** of different patterns, and gobo supports **10** can be selectively extracted from and inserted into gobo carrier wheel **9**.

More specifically, and with reference to FIG. **3**, each gobo **12** is defined by a metal or glass disk with a pattern in the middle. Each gobo support **10** comprises two rings **13**, **14** connected to rotate with respect to each other by means of a bearing not shown. Ring **13** defines the inner seat **11** housing gobo **12**, which is held inside seat **11** by a snap ring **15** partly engaging a groove **16** in ring **13**; and ring **13** has external teeth **17** that mesh with central gear **130**.

With reference to FIG. **5**, ring **14** comprises an annular body **18**; and an annular flange **19** extending radially outwards from annular body **18**.

With reference to FIG. **2**, gobo carrier wheel **9** comprises a number of seats **20** arranged about axis A**1**. In the example shown, gobo carrier wheel **9** comprises six seats **20**, each for housing a respective gobo support **10**; and an opening **21** for free passage of light beam L (FIG. **1**).

With reference to FIG. **5**, gobo carrier wheel **9** and gobo supports **10** are connectable in sliding manner in a direction perpendicular to axis A**1**, and are locked mutually by a reversible click-on locking mechanism **22** to hold gobo support **10** in a given position inside seat **20**.

More specifically, each seat **20** comprises a guide **23** engaged in sliding manner by gobo support **10**.

With reference to FIG. **3**, constructionwise, gobo carrier wheel **9** comprises a plate **24** perpendicular to axis A**1** and in turn comprising a central body **25**, and arms **26** extending substantially radially from central body **25**. And each seat **20** is bounded by two arms **26** and central body **25**.

Gobo carrier wheel **9** comprises a plate **27** in turn comprising a central body **28**, and arms **29** extending substantially radially from central body **28**. And each seat **20** is bounded by two arms **29** and central body **28**.

In other words, central bodies **25** and **28** and respective arms **26** and **29** define the edges of seats **20**.

Plates **24** and **27** are fixed parallel to each other and a given distance apart to define a gap **30** at least along the edge of each seat **20** (FIG. **3**); and the two plates **24** and **27** separated by gap **30** define guide **23**.

In the example shown, plate **27** comprises spacers **31** riveted to plate **24** and which define gap **30**.

As shown more clearly in FIG. **5**, annular flange **19** is designed to engage gap **30** in sliding manner with a negligible amount of clearance.

With reference to FIG. **3**, reversible click-on locking mechanism **22** comprises a leaf spring **32**, which is fixed to plate **24**, on the opposite side to plate **27**, extends inside the peripheral portion of seat **20**, and assumes a lock position when a gobo support **10** is pushed inside seat **20**. In the lock position, the free end of leaf spring **32** is located at the angle formed by annular body **18** and annular flange **19** of gobo support **10**.

With reference to FIG. **3**, the free ends of each two arms **26** are connected by a metal strip **33** on the opposite side to plate **27**; and leaf spring **32** extends predominantly circumferentially, and projects axially from metal strip **33** towards plate **27**.

In a preferred embodiment, a single C-shaped metal strip **33** connects all of arms **26**, as shown more clearly in FIG. **4**.

Finally, FIG. **3** shows a shaft **34** which rotates about axis A**1**; and a flange **35** integral with shaft **34** and which is fixed to central gear **130**. Gobo carrier wheel **9** is rotated about axis A**1** by motor **7** (FIG. **1**) to selectively align a gobo support **10** or opening **21** with light beam L (FIG. **1**); and central gear **130** is rotated about axis A**1** by motor **8** (FIG. **1**) to rotate gobos **12** and produce a mobile lighting effect.

In actual use, gobo support assembly **6** provides for easy extraction of gobo supports **10** and even easier gobo insertion: gobo support **10** is extracted by simply detaching leaf spring **32** from annular flange **19** and simultaneously exerting force radially outwards of gobo carrier wheel **9**; and gobo support **10** is inserted inside respective seat **20** by simply placing annular body **18** on leaf spring **32**, inserting annular flange **19** inside guide **23** (gap **30** between plates **24** and **27**), and pushing gobo support **10** towards axis A**1**. Once gobo support **10** is seated inside respective seat **20**, leaf spring **32** clicks automatically into the angle formed by annular body **18** and annular flange **19**.

Clearly, changes may be made to gobo support assembly **6** as described herein without, however, departing from the scope of the accompanying Claims. In particular, the number of seats in gobo carrier wheel **9** may be other than shown, and guide **23** may be formed differently and using different techniques from the one described.

The invention claimed is:

1. A gobo support assembly for a stage lighting fixture, comprising:

at least one disk-shaped gobo;

at least one gobo support having a first seat for housing the at least one disk-shaped gobo; and

a gobo carrier wheel rotatable about an axis and comprising at least one second seat for housing the at least one gobo support;

wherein the gobo carrier wheel and the at least one gobo support are connectable in sliding manner in a direction substantially perpendicular to the axis, and are locked mutually by a reversible click-on locking mechanism to hold the at least one gobo support in a given position inside said second seat; and

wherein the gobo carrier wheel comprises a first plate substantially perpendicular to the axis, a second plate fixed substantially parallel to the first plate a distance apart from the first plate to define a gap along an edge of each second seat so as to define a radial gap extending along the edge of the at least one second seat and configured to be engaged in sliding manner by the at least one gobo support and the reversible click-on locking mechanism being disposed along an outer circumferential periphery of the gobo carrier wheel and extending predominantly circumferentially and projecting axially towards the second plate to prevent radial displacement of the gobo support.

2. The gobo support assembly as claimed in claim 1, wherein the gobo carrier wheel comprises a number of second seats arranged about the axis; each second seat comprising a guide extending along the edge of the second seat and engaged in sliding manner by the gobo support.

3. The gobo support assembly as claimed in claim 2, wherein said first plate comprises a first central body, and first arms projecting substantially radially from the first central body; the edge of each second seat being bounded by two first arms and the first central body; and said guide extending along the edge of the second seat.

4. The gobo support assembly as claimed in claim 3, wherein said second plate comprises a second central body, and second arms projecting substantially radially from the second central body; the edge of each second seat being bounded by two second arms and the second central body; and the first and second plate being fixed substantially parallel to each other and a distance apart to define said gap along the edge of each second seat.

5. The gobo support assembly as claimed in claim 4, wherein the at least one gobo support comprises a first ring in turn comprising an annular body that is positioned on the first plate, along the edge of the second seat, and an annular flange that projects radially outwards from the annular body to engage said gap in sliding manner.

6. The gobo support assembly as claimed in claim 5, wherein the reversible click-on locking mechanism comprises a leaf spring that is fixed to the first plate, projects inside the peripheral portion of the second seat from a radial edge of the gobo carrier wheel, and assumes a lock position in an angle formed by the annular body and the annular flange.

7. The gobo support assembly as claimed in claim 6, wherein free ends of each of the two first arms on either side of a given second seat are connected to each other across the given second seat by a metal strip disposed radially outward relative to the second plate; said leaf spring projecting from said metal strip inwardly towards the second plate and axis.

8. The gobo support assembly as claimed in claim 5,

wherein the at least one gobo support comprises a second ring that is connected in rotary manner to the first ring, defines said first seat, and comprises external teeth; and

a gear that is substantially coaxial with the axis, rotates independently with respect to the gobo carrier wheel, and meshes with the teeth of each gobo support.

9. The gobo support assembly as claimed in claim 8, wherein the at least one gobo support comprises a snap ring that fits inside the first seat and inside a respective groove formed in the second ring, inside the first seat.

10. A stage lighting fixture comprising a casing; a light source for generating a light beam; a reflector; and a lens assembly; the stage lighting fixture comprising a gobo support assembly as claimed in claim 1, and located between the light source and the lens assembly.

11. A gobo support assembly for a stage lighting fixture, comprising:

at least one disk-shaped gobo;

at least one gobo support having a first seat for housing the at least one disk-shaped gobo;

a gobo carrier wheel which is configured to rotate about an axis, and includes:

at least one second seat, which includes a radial gap guide extending along an edge of the at least one second seat and is configured to be engaged in sliding manner by the gobo support in a direction substantially perpendicular to the axis; and

a reversible click-on locking mechanism, which comprises a leaf spring located at an outer circumferential periphery of the gobo carrier wheel and extending predominantly circumferentially and projecting axially to hold the at least one gobo support in a given position inside the at least one second seat.

12. A gobo support assembly for a stage lighting fixture, comprising:

at least one disk-shaped gobo;

at least one gobo support having a first seat for housing the at least one disk-shaped gobo;

a gobo carrier wheel which is configured to rotate about an axis and comprises:

a first plate substantially perpendicular to the axis;

a second plate fixed substantially parallel to the first plate a distance apart to define a guide;

at least one second seat, which is formed in the first and second plate and includes a guide extending along an edge of the second seat and is configured to be engaged in sliding manner by the gobo support in a direction substantially perpendicular to the axis; and

a reversible click-on locking mechanism, which comprises a leaf spring located at an outer circumferential periphery of the gobo carrier wheel and extending predominantly circumferentially and projecting axially towards the second plate to prevent radial displacement of the gobo support.

13. A gobo support assembly for a stage lighting fixture, comprising:

at least one disk-shaped gobo;

at least one gobo support having a first seat for housing the at least one disk-shaped gobo; and

a gobo carrier wheel rotatable about a central axis and comprising at least one second seat for housing the at least one gobo support;

wherein the gobo carrier wheel and the at least one gobo support are connectable in sliding manner in a direction substantially perpendicular to the axis, and are locked mutually by a reversible click-on locking mechanism disposed along an outer circumferential periphery of the

gobo carrier wheel and extending predominantly circumferentially and projecting axially to hold the at least one gobo support in a given position inside said second seat; and

wherein the at least one second seat includes a guide recess extending along an edge of the at least one second seat and configured to be engaged in sliding manner by the at least one gobo support.

14. The gobo support assembly as claimed in claim **1**, wherein the at least one gobo support remains substantially perpendicular to the axis during an entire insertion or removal motion as the at least one gobo support is inserted into the gobo carrier wheel.

15. The gobo support assembly as claimed in claim **11**, wherein the at least one gobo support remains substantially perpendicular to the axis during an entire insertion or removal motion as the at least one gobo support is inserted into the gobo carrier wheel.

16. The gobo support assembly as claimed in claim **12**, wherein the at least one gobo support remains substantially perpendicular to the axis during an entire insertion or removal motion as the at least one gobo support is inserted into the gobo carrier wheel.

* * * * *