

(21) Application No: 0803445.6
(22) Date of Filing: 26.02.2008

(71) Applicant(s):
Illinois Tool Works Inc.
(Incorporated in USA - Delaware)
3600 West Lake Avenue, Glenview,
Illinois 60026, United States of America

(72) Inventor(s):
John Anthony Rogers
David Simon Schofield

(74) Agent and/or Address for Service:
Fry Heath & Spence LLP
The Gables, Massetts Road, HORLEY,
Surrey, RH6 7DQ, United Kingdom

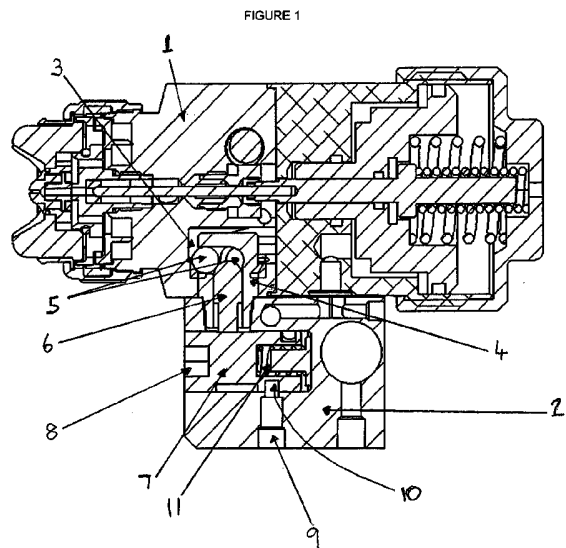
(51) INT CL:
B05B 1/00 (2006.01) **B05B 15/00** (2006.01)
F16B 7/00 (2006.01) **F16B 7/04** (2006.01)
F16B 7/14 (2006.01)

(56) Documents Cited:
EP 1393814 A1 **EP 0572237 A1**
US 3498653 A

(58) Field of Search:
INT CL **B05B**
Other: **ONLINE: WPI EPODOC**

(54) Abstract Title: **Ball connector between manifold and spray head**

(57) A connection between a manifold and spray head, uses a ball connector arrangement. A paint gun assembly comprises two connected body parts, the spray head 1 and the connecting manifold 2. The spray head is provided with a bore which terminates in a radially extending space 3 of gradually increasing radius. Received in the bore is a shaft 4. The shaft has an axially extending bore which connects with radially extending bores in which balls 5 are contained. Received in the shaft is a plunger 6 which has a rounded end and which engages with the balls 5. When forced into the axial bore, the plunger 6 forces the balls 5 into the radially extending bores and out into the tapered, radially extending space 3. Engaging with the plunger 6 in the manifold body 2 is a cam 7. The cam body 7 is exposed at a surface of the manifold body 2 and includes a hexagon drive 8 by means of which the angular rotation of the cam can be adjusted using a suitable key. The manifold body further includes a recess 9 for receiving a retaining pin (not shown). The end of the retaining pin is received in the cam guide profile 10. Axial movement of the cam 7 in its housing is further resisted by compression spring 11.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 2007.

FIGURE 1

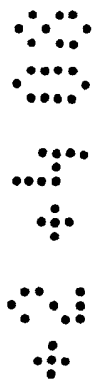
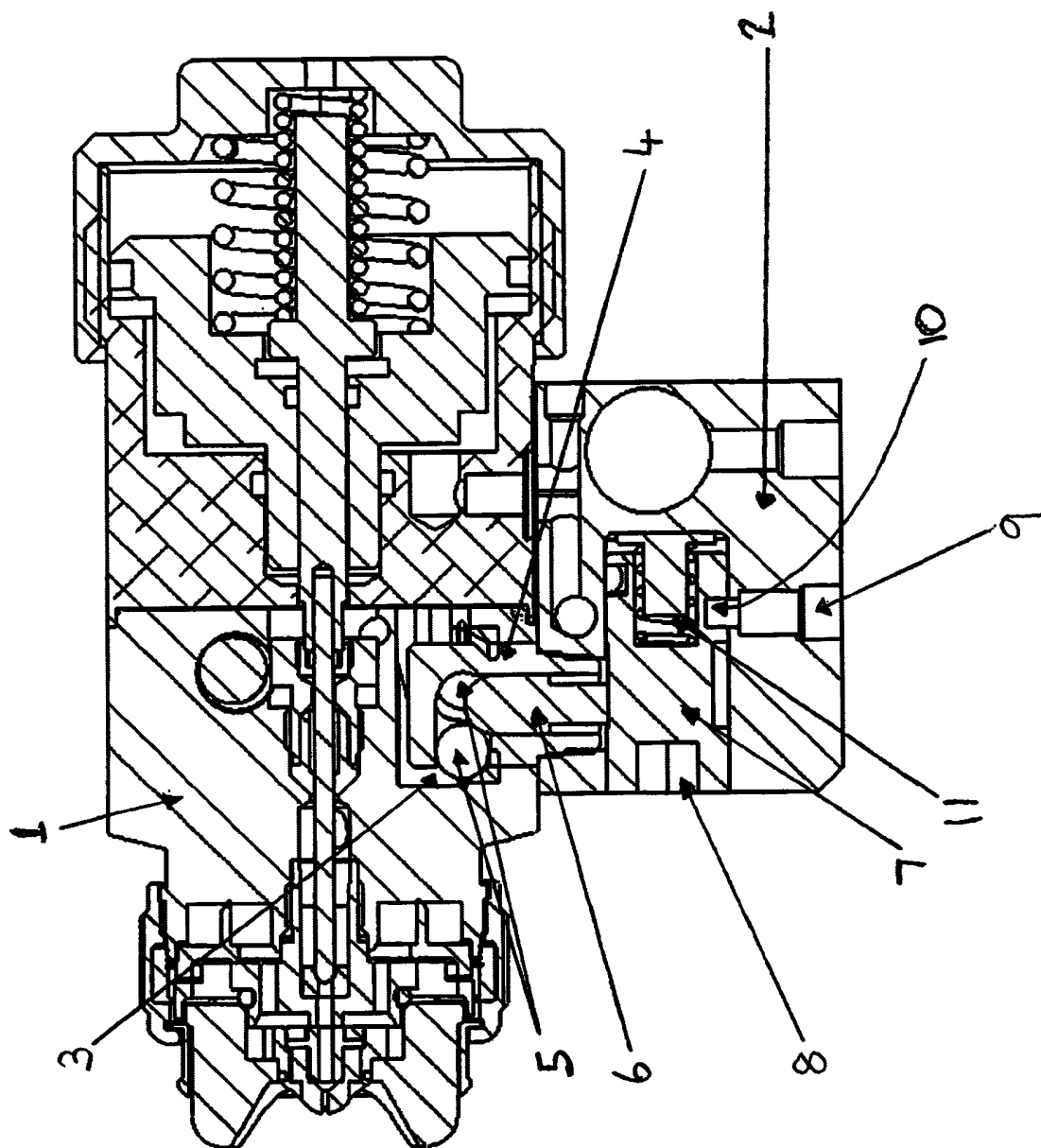
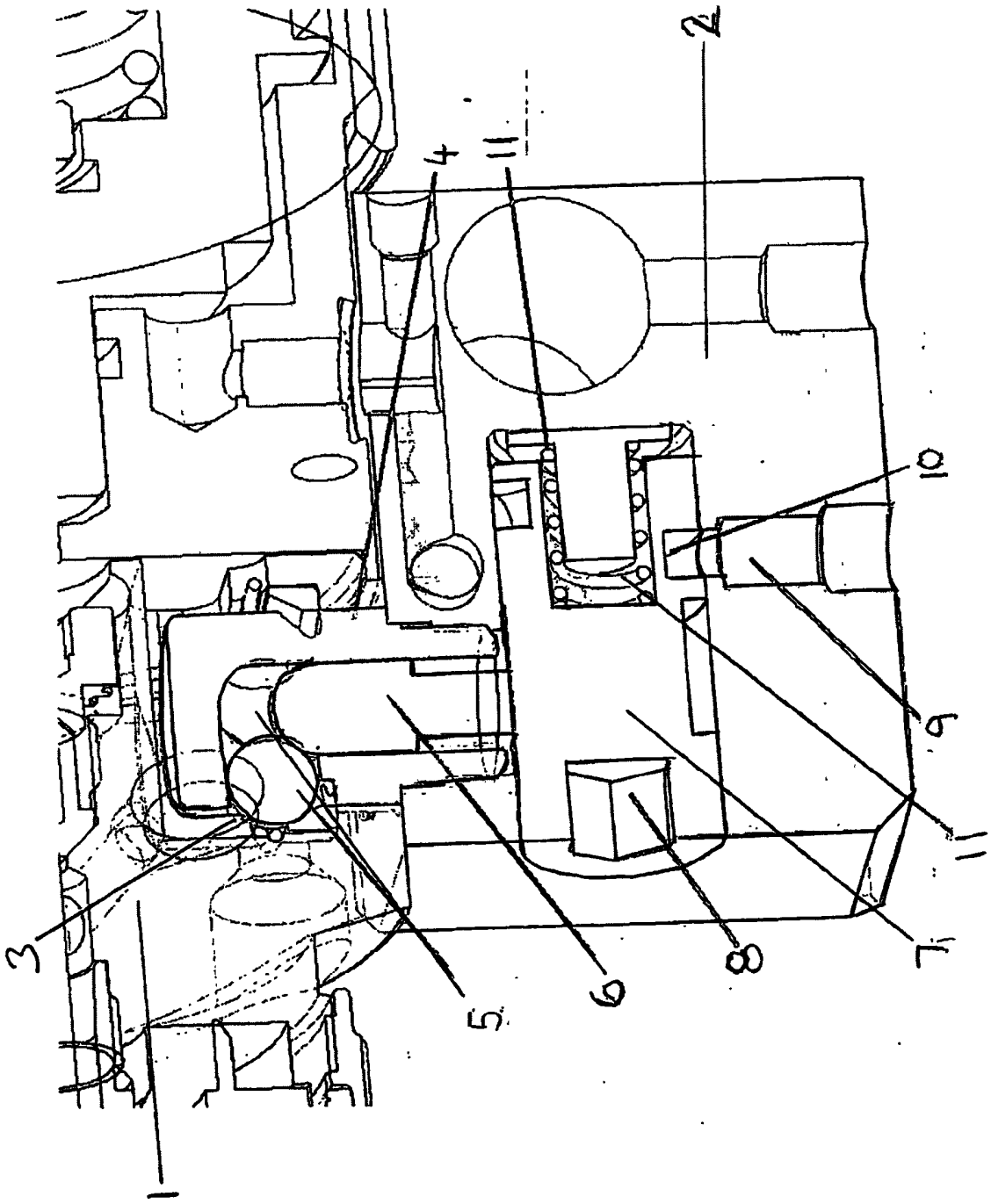
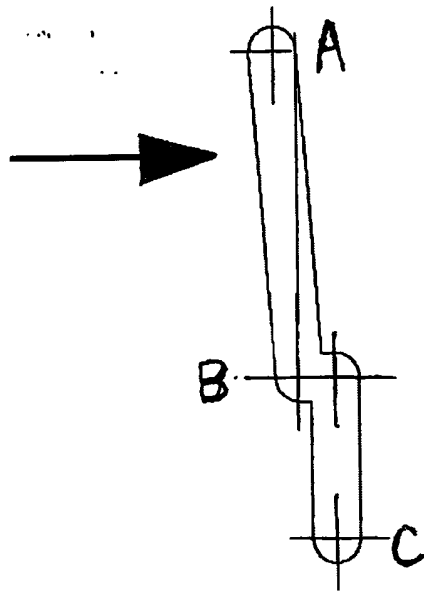


FIGURE 2



3/3

FIGURE 3

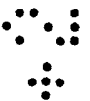
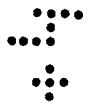
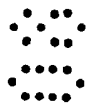


BALL LOCK MOUNTING ARRANGEMENT

The present invention relates to a ball lock mounting arrangement and in particular to a novel arrangement for locking body parts together which utilises a ball lock. The arrangement has particular application in the assembly of body parts of apparatus to be subjected to high pressure, for example, spray guns.

Ball locks are well known, such arrangements are, for example, widely used in the detachable connection of machine tools. An example of such an arrangement is described in US 3498653.

Generally, a ball lock comprises a body having a shank with a centrally, axially extending bore into which is slideably received a ball. At one end, the shank further includes a plurality of radially extending bores which pass through the shank wall. The radially extending bores are no longer in length than the diameter of the balls they receive. The relative proportions of the balls and bores are such that, if the ball of the central bore is driven against the balls in the radial bores, the balls in the radial bores are caused to travel and protrude from the radial bores beyond the outer surface of the shank. Conventionally, axial movement and fixing of the centrally located ball is facilitated by an adjustment screw which is received through a tapped bore in the ball lock body. Appropriate adjustment of the screw forces the centrally located ball against the radially located balls, forcing the radially located balls radially outwards. The screw locks the balls in position. Reversal of the screw allows the balls to travel in the bores, retracting back inside the shank.



It will be appreciated the arrangement facilitates that the body may be received into the proximal end of a bore in a second body; the bore of the second body having a radially larger space at its distal end. Appropriate

adjustment of the screw after insertion of the ball lock body causes the radially located balls to travel into the radially larger space and locks them in position thereby resisting axial withdrawal of the shank.

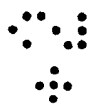
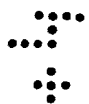
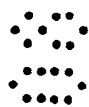
The present invention provides a novel adaptation of this arrangement which is particularly useful in connecting parts of a paint spray gun body. Other uses for the novel arrangement will no doubt occur to the skilled addressee.

In accordance with the present invention there is provided a connecting body for securing to a main body, the main body including a bore, the bore having a distal end which terminates in a radially larger space; the connecting body comprising a shank portion configured to be received in the bore in the main body and having a centrally, axially extending bore and a plurality of radially extending bores passing through the shank wall, a plurality of balls receivable in the radially extending bores and a round headed plunger received in the centrally axially extending bore such that when the plunger engages the balls, the balls are caused to travel through the radially extending bore and protrude into the radially larger space, rise and fall of the plunger being effected by a cam portion which is drivable from a position on the exposed surface of the connecting body when the connecting body is aligned for attachment to the main body.

In one useful application, the main body is the spray head of a spray gun and the connecting body a base manifold of a spray gun.

The cam is conveniently driven by a hexagon drive accessible at the exposed surface of the connecting body. An appropriate key can be provided to drive the cam into the desired position.

Preferably there are three balls, one in each of three radially extending bores and the radially extending bores are equally angularly spaced.



The radially larger space may be bounded by a tapered wall, the radius of the space increasing towards the distal end of the space. In such an arrangement, the balls can be forced outwards as the plunger is driven further into the shank. This eventually provides a tight clamping force between the two bodies.

A retaining pin engages with the guide profile of the cam to retain the position of the cam with respect to the plunger. Optionally, there is further included a cam spring which resists axial motion of the cam.

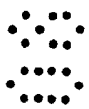
Desirably the cam guide profile is configured to provide three distinct phases; fully engaged, partial engaged and fully disengaged.

An embodiment of the invention will now be further described with reference to the following Figures in which:

Figure 1 shows in cross section an embodiment of a connecting body and a main body secured together in accordance with the invention;

Figure 2 shows the embodiment of Figure 1 in a three dimensional view;

Figure 3 shows a cam guide profile suitable for inclusion in the cam of the embodiment of Figure 1 or 2.



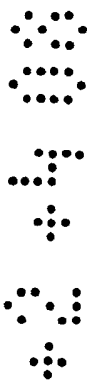
As can be seen from Figures 1 and 2 a paint gun assembly comprises two connected body parts, the spray head 1 and the connecting manifold 2. The spray head is provided with a bore which terminates in a radially extending space 3 of gradually increasing radius. Received in the bore is a shaft 4. The shaft has an axially extending bore which connects with radially extending bores in which balls 5 are contained. Received in the shaft is a plunger 6 which has a rounded end and which engages with the balls 5. When forced into the axial bore, the plunger 6 forces the balls 5

into the radially extending bores and out into the tapered, radially extending space 3.

Engaging with the plunger 6 in the manifold body 2 is a cam 7. The cam body 7 is exposed at a surface of the manifold body 2 and includes a hexagon drive 8 by means of which the angular rotation of the cam can be adjusted using a suitable key. The manifold body further includes a recess 9 for receiving a retaining pin (not shown). The end of the retaining pin is received in the cam guide profile 10. Axial movement of the cam 7 in its housing is further resisted by compression spring 11.

Figure 3 shows the guide profile of the cam 7. There are three distinct positions of the plunger which correspond with the positions A, B and C of the cam 7. In the Figure, the arrow represents a load on the cam 7 provided by spring 11.

When the cam engages with the plunger at position A, the spray head 1 and manifold 2 are tightly clamped together. At position B, the clamping force is partially released, the spray head and manifold are still secured together but there sufficient space between them to allow release of any pressure build up within the cavity of the gun. The balls 5 are held more loosely in the radially extending bores and can travel up the taper of the radially larger space allowing a small gap between the still secured manifold body 2 and spray head 1. The position is maintained by the spring force and a retaining pin which together create a stop position. At position C, the balls 5 are no longer forced through the radially extending bores and the spray head and manifold body can be separated. To arrive at position C from position B, the cam 7 must be pushed in an axial direction against the spring force and rotated.

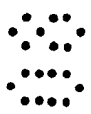


It will of course be understood that many variations may be made to the above-described embodiment without departing from the scope of the present invention.

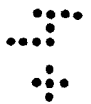
CLAIMS

1. A connecting body for securing to a main body, the main body including a bore, the bore having a distal end which terminates in a radially larger space; the connecting body comprising a shank portion configured to be received in the bore in the main body and having a centrally, axially extending bore and a plurality of radially extending bores passing through the shank wall, a plurality of balls receivable in the radially extending bores and a round headed plunger received in the centrally axially extending bore such that when the plunger engages the balls, the balls are caused to travel through the radially extending bore and protrude into the radially larger space, rise and fall of the plunger being effected by a cam portion which is drivable from a position on the exposed surface of the connecting body when the connecting body is aligned for attachment to the main body.

2. A connecting body for securing to a main body as claimed in claim 1 wherein the main body is the spray head of a spray gun and the connecting body a base manifold of a spray gun.



3. A connecting body for securing to a main body as claimed in claim 1 or claim 2 wherein the cam is driveable by means of a hexagon drive accessible at the exposed surface of the connecting body.



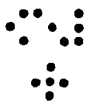
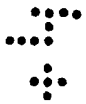
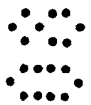
4. A connecting body for securing to a main body as claimed in any preceding claim wherein there are three balls, one in each of three radially extending bores and the radially extending bores are equally angularly spaced.



5. A connecting body for securing to a main body as claimed in any preceding claim wherein the radially larger space may be bounded

by a tapered wall, the radius of the space increasing towards the distal end of the space.

6. A connecting body for securing to a main body as claimed in any preceding claim further including a retaining pin which engages with the guide profile of the cam to retain the position of the cam with respect to the plunger.
7. A connecting body for securing to a main body as claimed in any preceding claim wherein there is further included a cam spring which resists axial motion of the cam.
8. A connecting body for securing to a main body as claimed in any preceding claim wherein the cam guide profile is configured to provide three distinct phases; fully engaged, partially engaged and fully disengaged.
9. A connecting body for securing to a main body substantially as described herein and with reference to the accompanying Figures.



1.

Application No: GB0803445.6

Examiner: Mr Michael Young

Claims searched: 1-9

Date of search: 11 June 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	EP 0572237 A1 (RANSBURG CORP.)
A	-	EP 1393814 A1 (ILLINOIS TOOL)
A	-	US 3498653 A (MCCREERY)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

--

Worldwide search of patent documents classified in the following areas of the IPC

B05B

The following online and other databases have been used in the preparation of this search report

WPI EPODOC

International Classification:

Subclass	Subgroup	Valid From
B05B	0001/00	01/01/2006
B05B	0015/00	01/01/2006
F16B	0007/00	01/01/2006
F16B	0007/04	01/01/2006
F16B	0007/14	01/01/2006