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(71) Applicant: **Furmanite International Limited**
Dockray Hall Road
Kendal Cumbria LA9 4RX(GB)

(72) Inventor: **Jordan, Frederick Arthur**
50, Buttermere Drive
Heron Hill Kendal, Cumbria(GB)

(74) Representative: **Dodd, David Michael et al,**
ROYSTONS 531 Tower Building Water Street
Liverpool L3 1BA(GB)

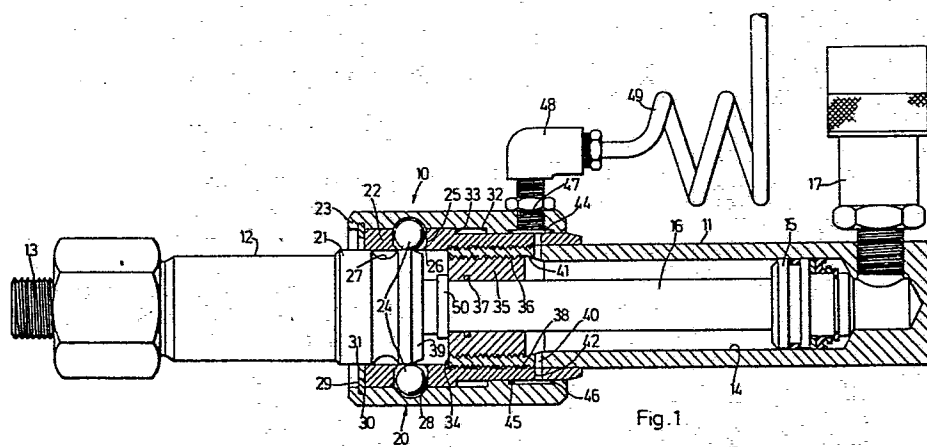
(54) **Injection guns.**

(57) This invention concerns injection guns, particularly for pressurised application of material from a container coupled to a ram of the gun.

A coupling between the ram 11 and the container 12 is proposed that is comprised of three coaxial parts 21, 22, 23 that are relatively axially movable over a region of mutual overlap whereat, during such relative axial movement, an interlocking part or parts, such as balls 24, transfers between interlocking together of one pair of coaxial parts and interlocking together of another pair of coaxial parts.

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Applicant: Furmanite International Limited

Title: Injection Guns

DESCRIPTION

The invention relates to injection guns.

Injection guns are used for pressurised application of sealing compounds into joints or plugs. Such guns have a conventional principle of operation where a barrel or other container for sealing compound is acted upon by an hydraulic ram to apply pressure to the material and force it out of a nozzle communicating with the barrel or other container. Clearly, there must be a way of refilling or replacing the barrel or other container and we have, hitherto, had a screwed retaining ring to couple the barrel to the ram.

It is an object of one aspect of this invention to provide a coupling that is much more readily and quickly released and re-engaged.

Accordingly this invention proposes that a coupling between a ram and a container for material to be pressurised by the ram be comprised of three coaxial parts that are relatively axially movable over a region of mutual overlap whereat, during such relative axial movement, an interlocking part or parts transfers between interlocking together of one pair of the coaxial parts and interlocking together of another pair of the coaxial parts.

In preferred embodiments, the interlocking parts,

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preferably balls, are movable transversely of said axis between seatings in inner and outer ones of the coaxial parts, but always engaged in passages through a middle one of the coaxial parts. Conveniently, of course, the inner and middle parts are each secured rigidly to, or comprise a part of, a different one of the ram and the container, with the outer coaxial part limited in its relative axial movement by mutual abutments with the middle part. Another mutual stop between the inner and middle coaxial parts can serve to limit bringing of the two together on coupling.

Using balls as the interlocking parts, the middle coaxial part may be a ball cage of less thickness than the ball diameter and the seatings may be arcuate section grooves matching and accommodating portions of the outer ball circumference.

Another point concerning injection guns with rams and containers pressurised thereby is that, at the time of recharging, the ram will be at maximum extension and may not be readily retracted prior to decoupling of the ram and container, which is preferred for recharging by cartridges inserted from the coupling end.

Accordingly this invention proposes that a communication with the ram cylinder be alternatively vented and connected to an inlet for compressed gas to retract the ram according to the position of a part or parts of a releasable coupling between the ram and the container to be pressurised.

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thereby. Conveniently, venting is automatic on engagement of the coupling and pressurisation is also automatic from and only after an initial or intermediate stage of decoupling.

This is particularly readily and advantageously achieved using a coupling hereof where a middle one of its three coaxial parts permanently offers through-communication to a cylinder vent, and an outer one of the coaxial parts has the gas inlet and alternatively clears that through-communication and covers it with a chamber fed from the gas inlet. The latter chamber is advantageously annular and permanently end sealed on the middle coaxial part so that compressed gas may be permanently connected to the gas inlet.

Practical implementation of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a longitudinal part-sectional view of an injection gun with its drive ram retracted and at the start of coupling to a container to be pressurised; and

Figure 2 is a similar view with the drive ram partially extended and coupling completed between the drive ram and the container.

In the drawings, an injection gun 10 comprises an hydraulic ram 11 and a barrel 12 constituting a container for flowable material, usually in a cartridge, to be pressurised and expelled via a nozzle 13 at one end of

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the barrel 12. The ram 11 comprises a cylinder 14 and a piston 15 on a plunger 16 that enters the barrel 12 to compress its contents. An hydraulic fluid inlet coupling 17 is shown to the cylinder 14 near its end distal from the barrel 12 so as to serve in extension of the ram 11.

Between the ram 11 and the barrel 12, is a coupling 20 composed of three overlapped coaxial parts, namely end 21 of the barrel 12 as the inner part, ball cage sleeve 22 secured to the proximate end of the cylinder 14 as the middle part, and retaining sleeve 23 as the outer part. The ball cage sleeve 22 carries balls 24 of greater diameter than its thickness in a circumferential slot or race 25 and retained by lips 26 at its inside bore. The barrel end 21 and retaining sleeve 23 have an external and an internal circumferential groove, 27 and 28, respectively, each of arcuate section and capable of seating the balls 24 clear of the other one of the barrel end 21 and retaining sleeve 23 but always engaging the cage sleeve slot or race 25. The balls 24 may thus alternatively lock together the cage sleeve 22 and the barrel end 21, or the cage sleeve 22 and the retaining sleeve 23.

The retaining sleeve 23 is slidable over the cage sleeve 22 between limits determined on the one hand by abutment of circlip 29 protruding from its seating

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in internal groove 30 of the retaining sleeve 23 to abut end face 31 of the cage sleeve 22, and on the other hand by abutment of shoulders 32 and 33 on the interior of the retaining sleeve 23 and the exterior of the cage sleeve 27, respectively. Insertion of the barrel end 21 is limited by abutment with end face 34 of the ram cylinder 14 and, as shown, with a stop ring 35 screwed into the interior of the ram cylinder 14 by threading 36. The stop ring 35 slidably accommodates the plunger 16 and is sealed thereto at 37. The cage sleeve 22 is screwed into the exterior of the ram cylinder by threading 38.

With the retaining sleeve at one limit of its permitted axial movement, as determined by the spring washer 29, its ball seating groove 28 is in register with the balls 24 so that taper 39 on the end of the barrel can push the balls 24 into the seating groove 28 as the barrel end 21 is inserted. When the seating groove 27 of the barrel end registers with the balls 24, at least some of them will drop in and retain the barrel end relative to the cage sleeve 22. This will correspond to abutment of the barrel end 21 on the ram cylinder end face 34 and stop ring 35.

Then sliding of the retaining sleeve towards its other limit determined by abutment of shoulders 32 and 33 will first force all of the balls 24 into the barrel end seating groove 27 and then restrain them therein as

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shown in Figure 2. The coupling is then secure between the ram 11 and the barrel 12 and hydraulic drive thereof may begin.

If desired, of course, the cage sleeve 22 may have an inclined ball race or slot to predispose the balls to roll into one or other seating groove depending on the up or down attitude of the gun, but that is in no way a necessity.

Release of the coupling 20, is, of course, by movement of the retaining ring back to its limit position, determined by the spring washer 29, to register seating groove 28 with balls, and withdrawal of the barrel end 21 then pushes the balls 24 outwardly to release the barrel end 21.

During ram operation, reaction on the balls 24 due to pressure in extension of the ram against the resistance of the contents of the barrel 12 will effectively lock the coupling in its secured state shown in Figure 2.

The ram cylinder 14 is cross-bored 40 through its wall at a bore-widening 41 terminating the counter-bore occupied by the stop ring 35. That bore-widening 41 can thus never be filled and sealed by the piston 15 so that compressed gas, normally air, applied to the cross-boring 40 will apply a retractive force to the piston 15. In register with the cross-bores 40 are cross-bores 42 through the cage sleeve 22. Within the retaining sleeve 23 is an annular chamber 44 sealed at both sides to the

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cage sleeve 22 by O-rings 45, 46. Sliding of the retaining sleeve 23 between its limit positions will take the chamber 44 from communication with the cross-bores 42 (Figure 2) to complete clearance of the cross-bores 42 and thus venting to atmosphere of the ram cylinder 14 (Figure 1). It will be noted that the latter prevails when the coupling 20 is in its securing state and the former first occurs when the retaining sleeve 23 is slid to begin release of the coupling so that the ram piston and plunger 15, 16 will retract if the chamber 44 is pressurised and the hydraulic fluid drained. A gas pressure inlet 47 is shown in the retaining sleeve 23 to a connector 48 and supply pipe 48 for compressed gas, which may be permanently energised.

Retraction of the plunger 16 is conveniently limited by abutment of its shoulder 50 on the stop ring 35.

It will be appreciated that balls 24 are not shown to be biased to any particular position, this being necessary for satisfactory operation. However, if such biasing is preferred, it may be provided. Also, the balls 24 could, if desired, be replaced by elongated slugs with appropriate redesign of their retaining slot in the cage sleeve 22. Then, the slugs need not be circular cylindrical and their ends may be convergently tapered for reaction with retaining sleeve and barrel end grooves. Also, venting to atmosphere of the cylinder need not be through any parts of the coupling so long as

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at least one of those parts causes, by its movement, the alternative venting and gas pressurising indirectly if desired.

Applicant: Furmanite International Limited

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Title: Injection Guns

CLAIMS

1. An injection gun having a coupling for between a ram of the gun and a container for material to be pressurised by the ram, characterised in that the coupling is comprised of three coaxial parts that are relatively axially movable over a region of mutual overlap whereat, during such relative axial movement, an interlocking part or parts transfers between interlocking together of one pair of the coaxial parts and interlocking together of another pair of the coaxial parts.
2. An injection gun according to claim 1 characterised in that the interlocking parts are movable transversely of said axis between seatings in inner and outer ones of the coaxial parts, but always engaged in passages through a middle one of the coaxial parts.
3. An injection gun according to claim 1 or 2 characterised in that the inner and middle coaxial parts are each secured rigidly to, or comprise a part of, a different one of the ram and the container, with the outer coaxial part limited in its relative axial movement by mutual abutments with the middle part.
4. An injection gun according to claim 3 characterised by another mutual stop between the inner and middle coaxial parts which can serve to limit bringing of the two together on coupling.
5. An injection gun according to any one of claims 1 to 4 characterised in that the interlocking parts are balls.

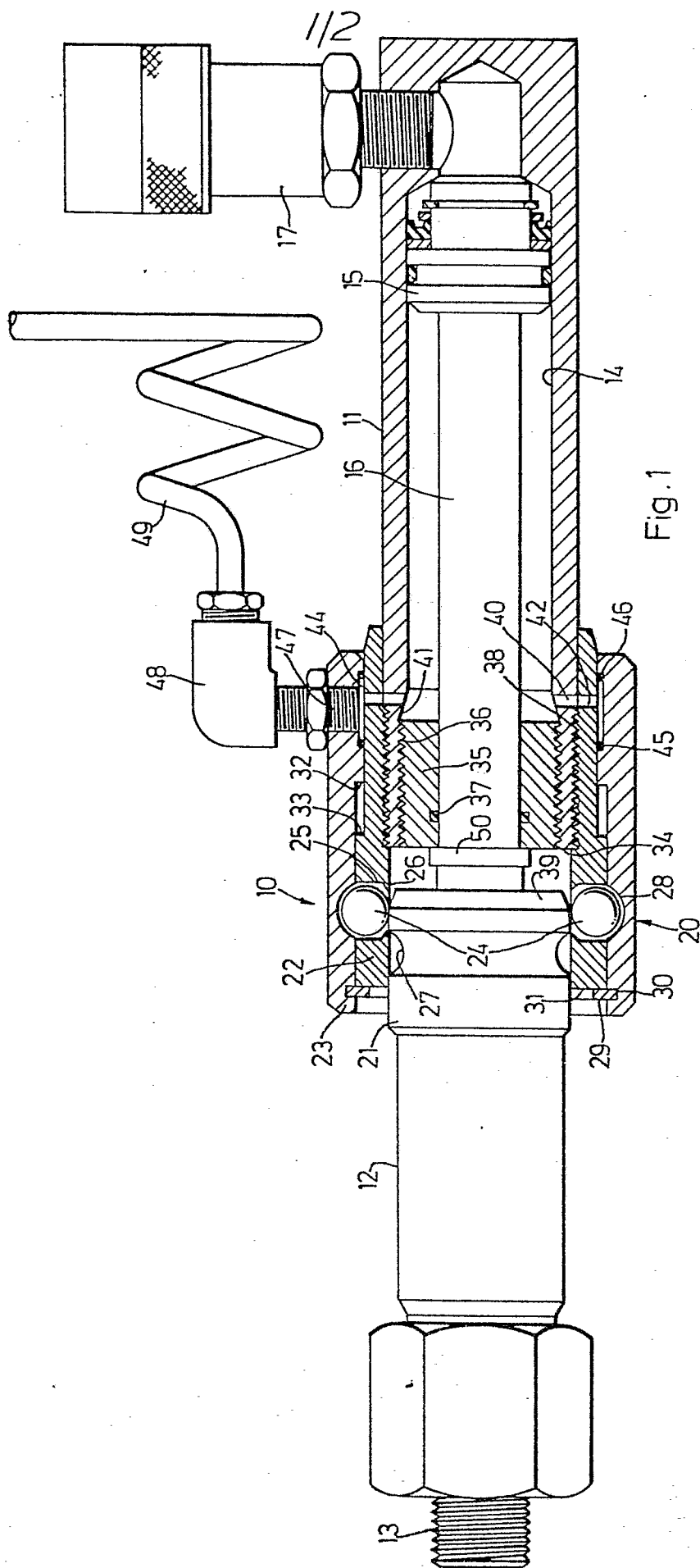
6. An injection gun according to claim 5, characterised in that the middle coaxial part is a ball cage of less thickness than the ball diameter and the seatings are arcuate section grooves matching and accommodating portions of the outer ball circumference.

7. An injection gun according to any one of claims 1 to 6 characterised in that a communication with the ram cylinder is alternately vented and connected to an inlet for compressed gas to retract the ram according to the position of a part or parts of the coupling.

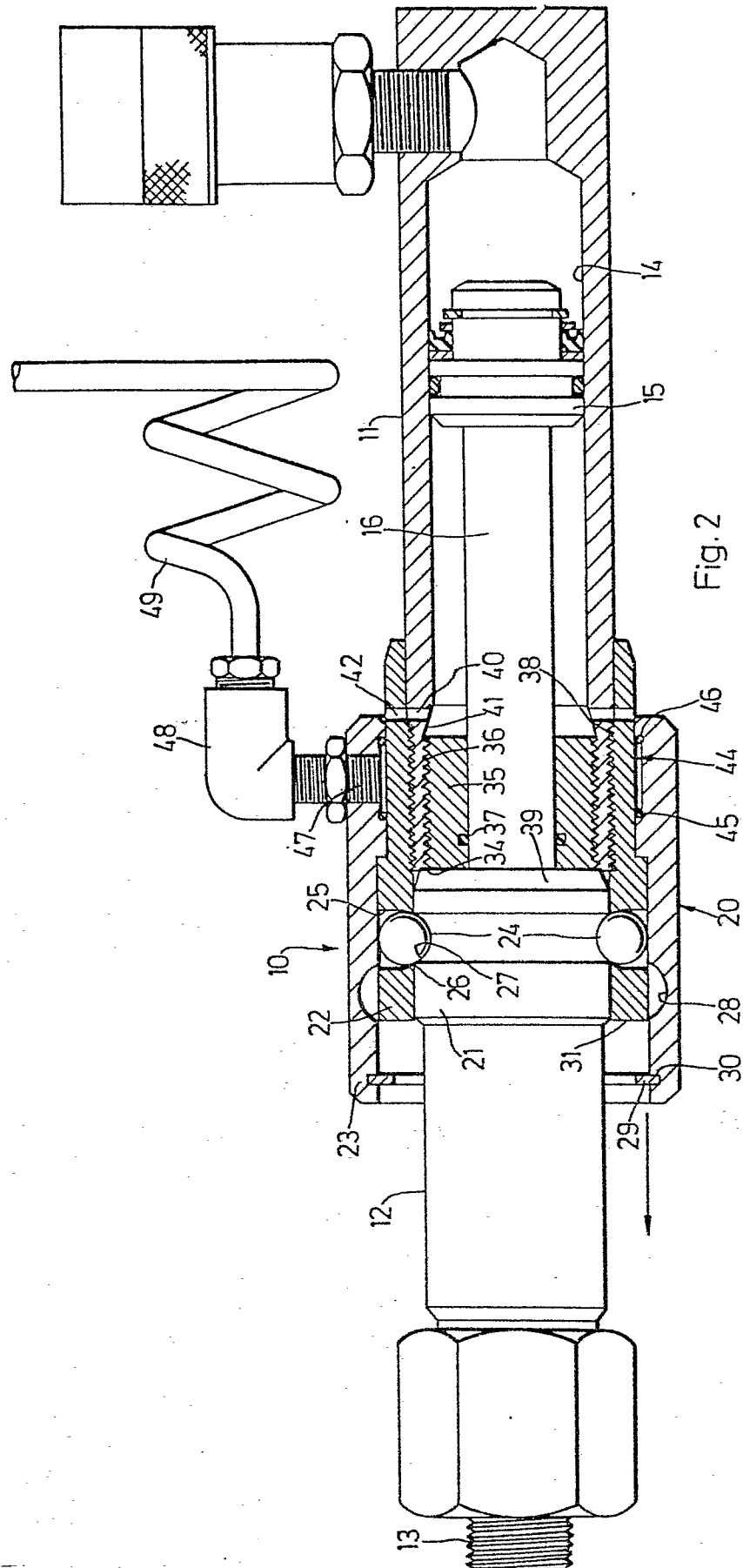
8. An injection gun according to claim 7 characterised in that venting is automatic on engagement of the coupling and pressurisation is also automatic from and only after an initial or intermediate stage of decoupling.

9. An injection gun according to claim 7 or 8 characterised in that the middle coaxial part permanently offers through-communication to a cylinder vent, and the outer coaxial part has the gas inlet and alternatively clears that through-communication and covers it with a chamber fed from the gas inlet.

10. An injection gun according to claim 9 characterised in that the chamber is annular and permanently end sealed on the middle coaxial part so that compressed gas may be permanently connected to the gas inlet.



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European Patent
Office

EUROPEAN SEARCH REPORT

Application number

EP 80 30 0032.2

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>CH - A - 438 674</u> (N.K. MADSEN) * fig. 1, 2 * ---		E 04 F 21/30
A	<u>FR - A - 2 036 347</u> (G. LEBON) * fig. 1, 2 * ---		
A	<u>FR - A - 1 512 485</u> (G.J. UTEZA) * fig. 1 to 5 * ---		TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>FR - A - 1 255 990</u> (G.J. UTEZA) * fig. 1, 2 * ----		E 04 F 21/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 18-06-1980	Examiner V. WITTKEN