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(56) Documents Cited

GB 2162248 A

US 3974910 A

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INT CL⁷ F15B 15/22

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(54) Abstract Title

Buffer structure for an hydraulic cylinder

(57) In a buffer structure for the piston rod or rear end of hydraulic cylinder 1 the piston 11 has an internal hole 121 extending axially through the piston into the piston rod 12. The hole has large 13 and small 14 vents radially extending through the piston rod. The small vent is adjacent the join between the piston rod 12 and the piston end face 111 facing the rear end cap 15. The large vent 13 is formed at the rear end of the internal hole in the piston rod and is axially spaced from the small vent 14. When the piston moves to a position near the rear end cap, the large vent is first sunk into the rear end cap and blocked. At this time, the oil can only flow through the small vent 14 so as to reduce oil flow and achieve a buffer effect.

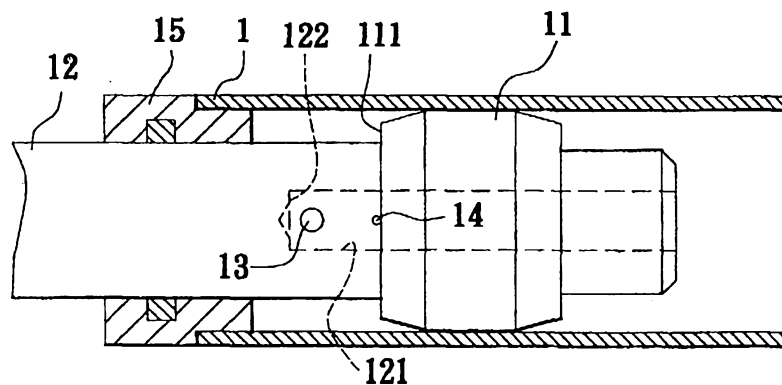


FIG. 1

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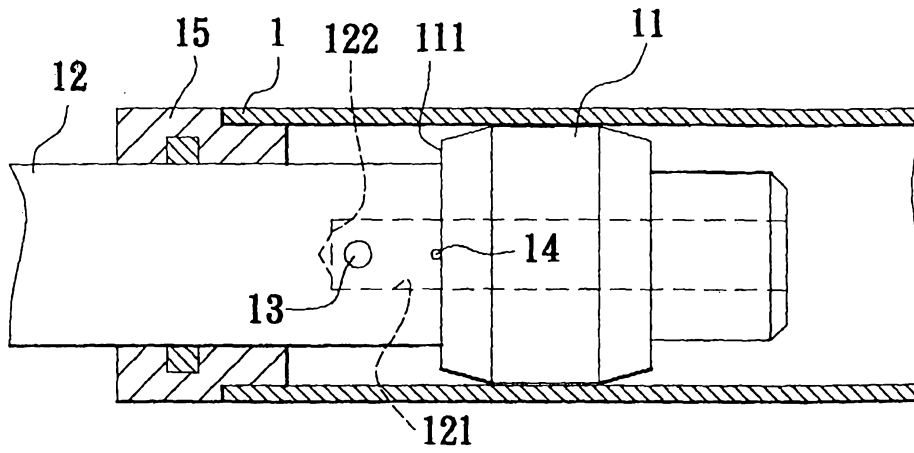


FIG. 1

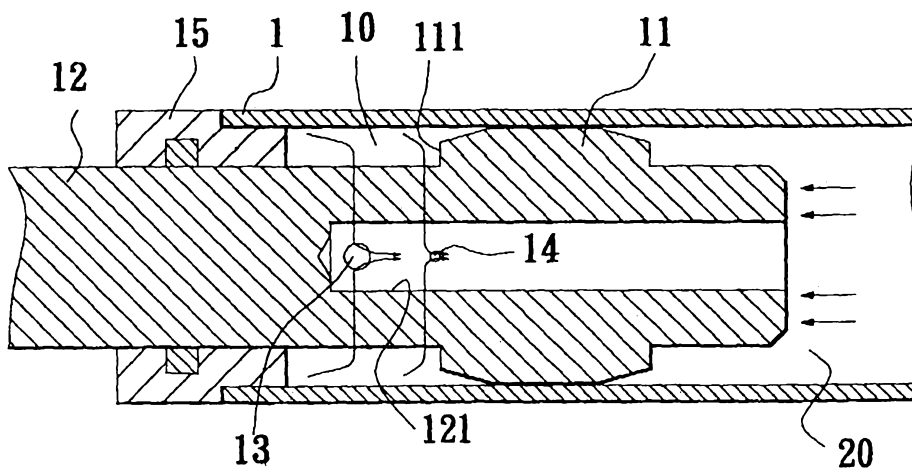


FIG. 2

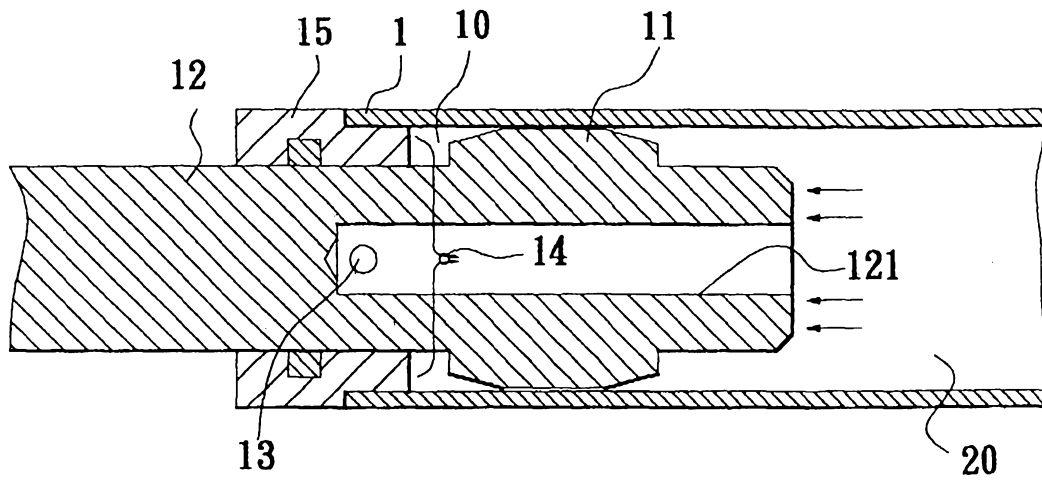


FIG. 3

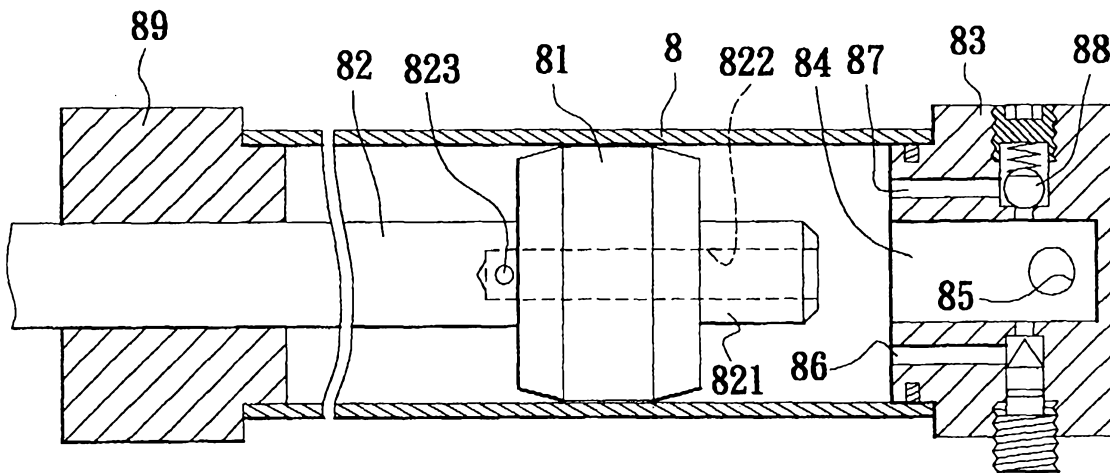


FIG. 4
PRIOR ART

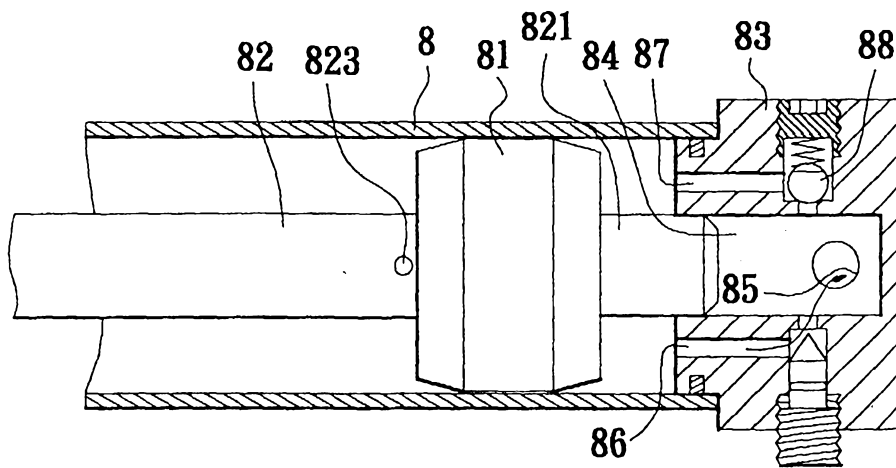


FIG. 5
PRIOR ART

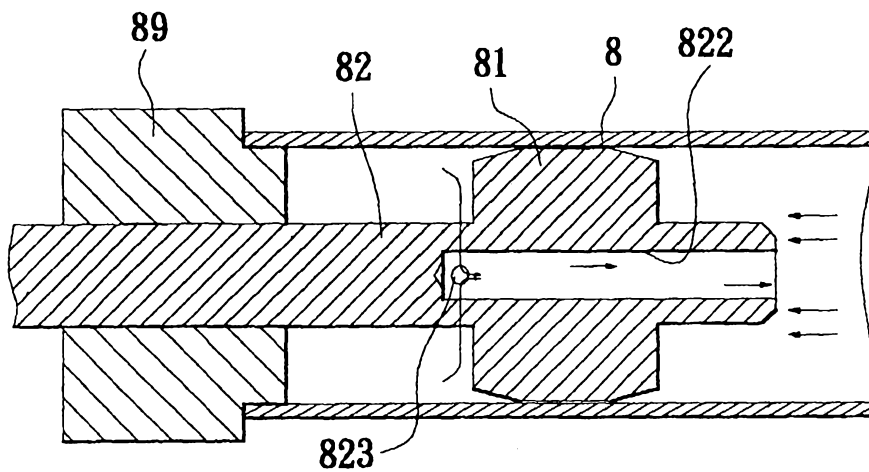


FIG. 6
PRIOR ART

BUFFER STRUCTURE FOR AN HYDRAULIC CYLINDER

The present invention relates to a buffer structure for one end of an hydraulic cylinder and, more particularly, to a buffer structure for the rear end of an all-liquid single-acting hydraulic cylinder.

5 Fig. 4 of the accompanying drawings shows a conventional all-liquid single-acting hydraulic cylinder 8. One end of the piston 81 of the hydraulic cylinder 8 opposite to the piston or rod 82 has a projecting post 821. The cap 83 at the front end of the hydraulic cylinder 8 is formed with an accommodating cavity 84 cooperating with the projecting post 82. The accommodating cavity 84
10 communicates with an oil outlet 85. The cap 83 is further formed with two small diameter flow ways 86, 87 which also communicate with the oil outlet 85. A check ball valve 88 is disposed in one flow way 871 whereby the oil can only flow one-way therethrough during the forward stroke of the piston 81.

 The piston 81 is formed with an internal hole 822 extending into the piston
15 rod 82. The internal hole 822 has a vent 823 formed at the join between the piston rod 82 and the piston 81. The vent 823 radially passes through the piston rod 82.

 Referring to Fig. 5, when the piston 81 moves towards the cap 83 at the front end, the oil in the hydraulic cylinder 8 flows out through the accommodating
20 cavity 84 from the oil outlet 85. When the piston 81 moves to the front end of the hydraulic cylinder 8, the projecting post 821 fits into the accommodating cavity 84 to block the same. At this time, the oil in the hydraulic cylinder 8 can only flow through the small diameter flow way 86 into the accommodating cavity 84 and then flow out from the oil outlet 85. The flow way 86 has a small cross-
25 sectional area so that little oil flow is drained out from the hydraulic cylinder 8 and the back pressure is increased to buffer the moving speed of the piston 81.

 Referring to Fig. 6, when the piston 81 returns towards the cap 89 at the rear end of the hydraulic cylinder 8, the oil between the piston 81 and the rear cap 89 flows through the vent 823 and the internal hole 822 into the space
30 between the piston 81 and the front cap 83. Therefore, the piston 81 can move towards the rear cap 89.

According to the above design of flow ways of the front cap 20 83, a buffer effect is achieved when the piston 81 moves towards the front cap 83. However, the piston rod 82 must pass through the rear cap 89 so that it is impossible to design the rear cap 89 with the same structure as the front cap 83. Accordingly, 5 when the piston 81 moves towards the rear end of the hydraulic cylinder 8, the piston 81 will collide with the rear cap 89 at the original moving speed to cause noise and damage. Therefore, it is necessary to provide a buffer structure for rear end of an all-liquid single-acting hydraulic cylinder.

It is a primary object of the present invention to 5 provide a buffer structure for rear the end of an hydraulic cylinder. The piston of the hydraulic cylinder is formed with an internal hole which axially extends through the piston and more into the piston rod. The internal hole has a large vent and a small vent which radially extend through the piston rod. The small vent is adjacent to the join between the piston rod and an end face of the piston facing the rear end 10 cap. The large vent is formed at a rear end of the internal hole, more deeply into the piston rod. When the piston moves to a position near the rear end cap of the hydraulic cylinder, the large vent is first sunk into the rear end cap and blocked. At this time, the oil can only flow through the small vent with the smaller cross-sectional area so as to reduce oil flow and achieve a buffer effect for the travel of 15 the piston.

The present invention will be better understood from the following description and accompanying drawings, in which:

Fig. 1 is a sectional view of a structure embodying the present invention;

Fig. 2 is a sectional view showing the movement of the piston of Fig. 1;

25 Fig. 3 is a sectional view showing the piston moved to the rear end to achieve a buffer effect;

Fig. 4 is a sectional view of a conventional all-liquid single-acting hydraulic cylinder;

Fig. 5 is a sectional view of the conventional all-liquid single-acting 30 hydraulic cylinder, showing movement of the piston towards the opposite end of the; and

Fig. 6 is a sectional view of the conventional all-liquid single-acting hydraulic cylinder, showing movement of the piston towards the opposite end of the cylinder.

Referring to Fig. 1 which shows a part of the hydraulic cylinder 1 embodying the present invention adjacent a rear end cap 15, a piston 11 is disposed in the hydraulic cylinder 1 and coupled with a piston rod 12 passing through the rear end cap 15 of the hydraulic cylinder. The central portion of the bottom of the piston 11 is formed with an internal hole 121 which axially extends through the piston 11 and deeply into the piston rod 12. The internal hole 121 has a large vent 13 and a small vent 14 which radially extend through the piston rod 12. The small vent 14 is adjacent to the joint between the piston rod 12 and an end face 111 of the piston 11 facing the rear end cap 15. The large vent 13 is formed at a rear end 122 of the internal hole 121 in the piston rod 12. The large vent 13 is axially spaced from the small vent 14 by a certain distance.

Referring to Fig. 2, when the piston 11 is pushed by the oil towards the rear end cap 15, the oil in the space 10 on left side of the piston 11 flows through the large and small vents 13, 14 and then flows from the internal hole 121 into the space 20 on right side of the piston 11. Accordingly, the piston 11 can move within the hydraulic cylinder 1. When the piston 11 moves to a position near the rear end cap 15 of the hydraulic cylinder 1, the large vent 13 is first sunk into the rear end cap 15 and blocked, as shown in Fig. 3. At this time, the oil in the left space 10 can only flow through the small vent 14, with its smaller cross-sectional area, with the internal hole 121 and the right space 20. Due to the smaller cross-sectional area of the small vent 14, the oil flow is reduced so as to decrease the moving speed of the piston 11 and achieve a buffer effect.

CLAIMS

1. A buffer structure for the rear end of an hydraulic cylinder, in which a piston disposed in the hydraulic cylinder has a piston rod passing through a rear
5 end cap of the hydraulic cylinder, and an internal hole extends axially through the piston and into the piston rod, and in which the internal hole has a larger vent and a smaller vent which radially extend through the piston rod, the smaller vent being disposed adjacent to the join between the piston rod and the end face of the piston facing the rear end cap, and the larger vent being disposed at the
10 rear end of the internal hole in the piston rod and being axially spaced from the smaller vent.
2. A buffer structure for an hydraulic cylinder constructed and adapted to operate substantially as hereinbefore described with reference to Figs 1, 2 and 3
15 of the accompanying drawings



INVESTOR IN PEOPLE

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Claims searched: 1,2

Examiner: J. C. Barnes-Paddock
Date of search: 29 October 2002

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): F1D (DG1, DG2, DG3)

Int Cl (Ed.7): F15B15/22

Other: Online: WPI EPODOC PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB2162248 A (FESTO) See Figure 1. Cushioning sleeve 3 closes endcap vent.	
A	US3974910 (PAPAI) See Figure 2. Sequentially covered vents in piston rod.	

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.