

April 14, 1964

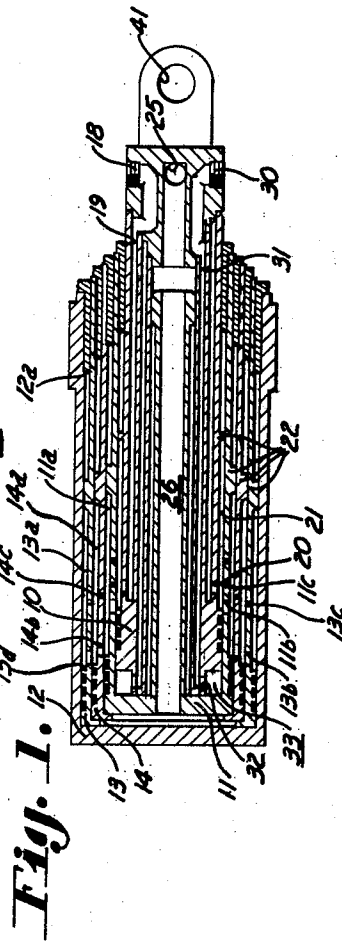
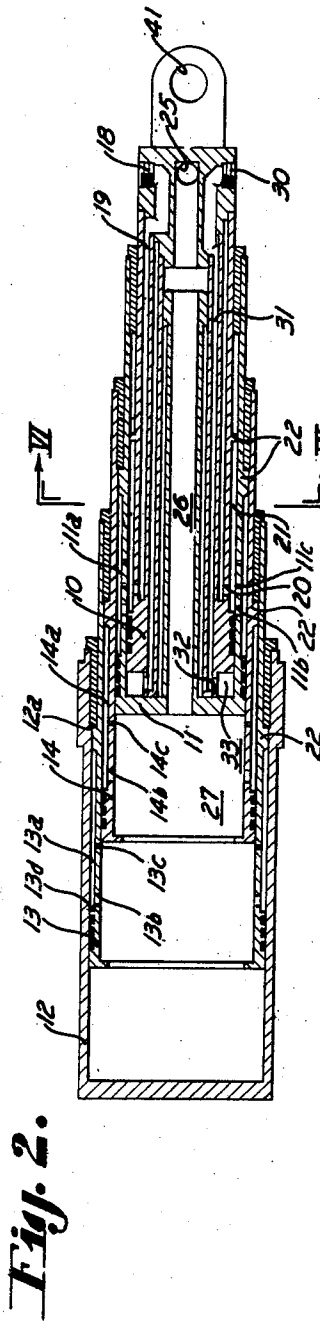
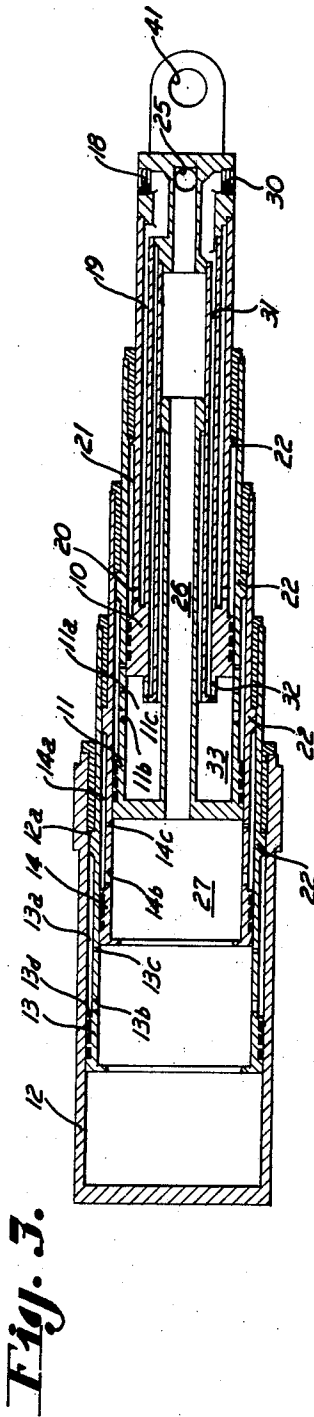
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3,128,674

MULTIPLE STAGE TELESCOPIC CYLINDERS

Filed June 25, 1962

2 Sheets-Sheet 1



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Fig. 6.

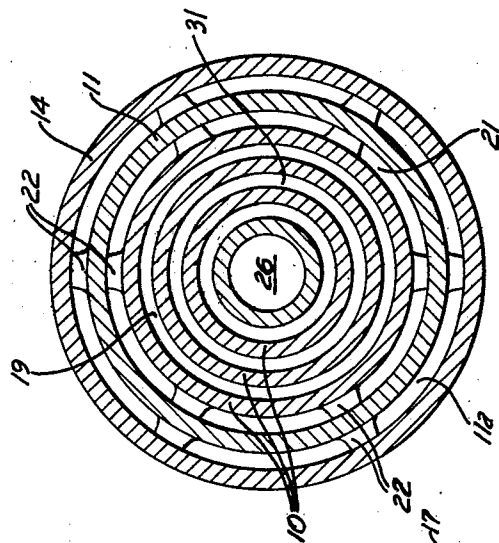


Fig. 4.

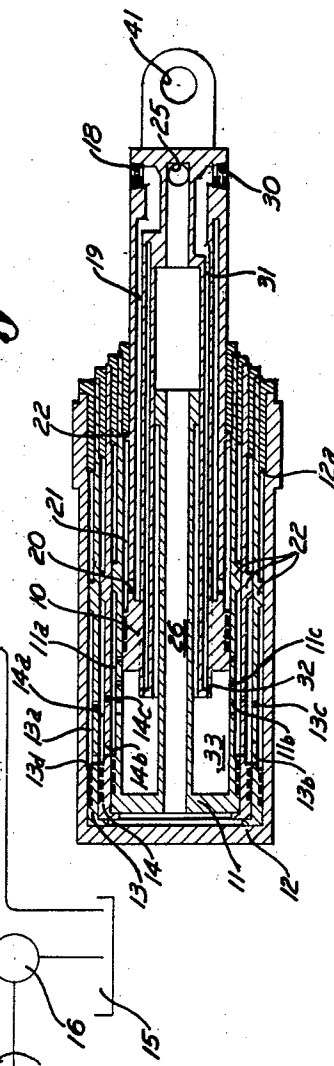
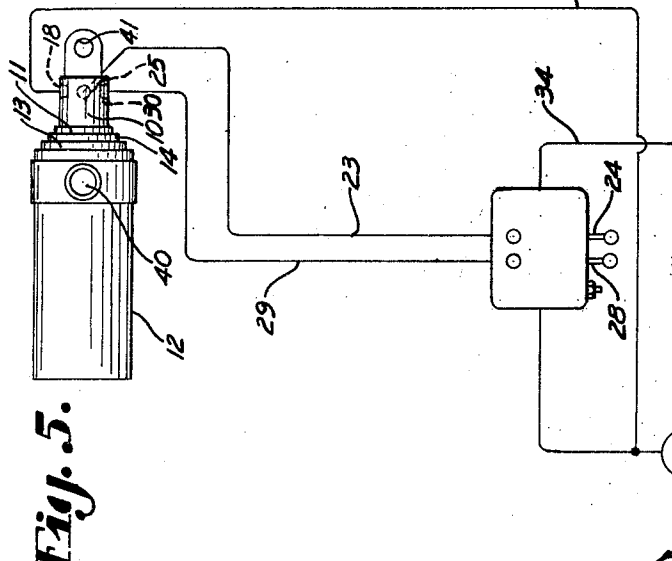


Fig. 5.



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MULTIPLE STAGE TELESCOPIC CYLINDERS
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Company, Youngstown, Ohio
 Filed June 25, 1962, Ser. No. 204,844
 6 Claims. (Cl. 91-167)

This invention relates to multiple stage hydraulic cylinders and particularly to a multiple stage hydraulic cylinder which may be extended in controlled increments.

There has long been a need for a multiple stage telescopic cylinder which could be expanded in controlled positive increments and would be double acting. Such cylinders could be used in a variety of applications, such as for example, the packing cylinder in a refuse truck, in hydraulic press applications, in truck unloading devices or the like. Conventional telescopic cylinders operate slowly over short distances and are difficult to control. This creates very real problems where rapid expansion and contraction are required over a short distance so that only a small part of the cylinder is expanded, whereas full expansion is required cyclically or periodically. In the case of refuse trucks, for example, it is the practice to expand the cylinder over a very short distance periodically to move refuse into a storage portion of the truck remote from the charging door and to finally expand the cylinder over a measured portion of its length periodically to pack the refuse. In such applications, conventional telescopic hydraulic cylinders move too slowly and in the final packing operation may expand too far and damage the truck assembly. No multiple stage cylinder suitable for the service herein described has, to our knowledge, heretofore been available.

The present invention provides a multiplicity of concentric double acting cylinders, one adapted to nest inside the other, to form a telescopic unit, a source of fluid under pressure, a piston member adapted to fit in the smaller of said cylinders, said smaller cylinders receiving fluid under pressure to extend the piston axially of the remaining concentric cylinders, inlet means into the remaining cylinders introducing fluid under pressure into all of the cylinders except said smaller cylinder whereby to expand said cylinders axially one with the other, means supplying a continuous fluid pressure on all cylinders constantly urging them toward the closed position and control means selectively delivering fluid from the source of fluid to the said smaller cylinder and the concentric cylinders to override the constant pressure urging the cylinders to the closed position.

In the foregoing general description we have set out certain objects, purposes and advantages of our invention. Other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which:

FIGURE 1 is a longitudinal section through a telescopic cylinder according to our invention;

FIGURE 2 is a section through the cylinder of FIGURE 1 with all cylinders except one partially extended;

FIGURE 3 is a section through the cylinder of FIGURE 1 with all cylinders extended;

FIGURE 4 is a section through the cylinder of FIGURE 1 with only the base cylinder extended;

FIGURE 5 is a schematic showing of the cylinder of FIGURE 1 and hydraulic circuit for its operation; and

FIGURE 6 is a section on line VI-VI of FIGURE 2.

Referring to the drawings we have illustrated a multiple stage telescopic cylinder made up of a plurality of nesting telescopic cylinders 12, 13 and 14 surrounding an inner smaller cylinder 11 carrying a piston 10. Fluid is continuously delivered from sump 15, through pump 16, and

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line 17 to inlet port 18 in the piston 10. An annular passage 19 carries the fluid through the body of the piston 10 to a passageway 20, communicating from the annular passage 19 to an annular space 21, surrounding the piston 10. Each of the cylinders 13, 14 and 11 are provided with similar annular spaces 13a, 14a and 11a, and with spaced passages through the walls 13b and 13c, 14b and 14c, and 11b and 11c. This fluid acts within the annular space to urge the cylinders into the closed position by acting, for example, upon the shoulder 13d of cylinder 13 and shoulder 12a of cylinder 12, and the corresponding shoulders of each other pair of cylinders. The fluid passes around the stops 22 which are spaced annularly on each of the cylinders to prevent their being forced off one another.

When it is desired to extend cylinders 12, 13 and 14, fluid under pressure is delivered from pump 16 through valve 24 and line 23, into the port 25 from which it passes through axial duct 26 within the cylinder 11 into the enlarged area 27 with the cylinders 12, 13 and 14. As a result, all cylinders 12, 13 and 14 are elongated, overcoming the pressure of the fluid acting on the smaller shoulder areas 13d, for example, of the several cylinders.

If it is desired to operate the small piston 10 alone, fluid is introduced from the pump 16 through valve 28, line 29, into port 30. It passes along the annular axially extending passage 31, through port 32 into the area 33 between the piston 10 and the cylinder 11, thus forcing the piston 10 out of the cylinder 11.

When it is desired to operate all of the cylinders and the piston 10, both valves 24 and 28 are opened and fluid is introduced through both ports 18 and 30. When the valves 28 and 24 are closed, the fluid is returned from the enlarged area 27, back through the line 23, the valve 24 and into return line 34, delivering the fluid back to sump 15 and simultaneously from the area 33 through line 29, valve 28 and line 34 to the sump 15. This is all accomplished by the continuous pressure which is applied on the shoulders of the cylinders by the fluid from the line 17 and port 18.

Trunnions 40 are provided on the outer housing of the cylinder 12 to mount the piston and cylinder assembly. A clevis 41 is provided on the end of piston 10 for attachment to a driving member to be operated by the piston.

While we have illustrated and described a presently preferred embodiment of our invention in the foregoing specification it will be understood that this invention may be otherwise embodied within the scope of the following claims.

We claim:

1. A multistage telescoping cylinder unit comprising a plurality of concentric cylinders, one adapted to nest inside the next adjacent one to form a telescopic unit, a source of fluid under pressure, a piston member adapted to fit the smallest of said cylinders, said smallest cylinder receiving fluid under pressure to extend the piston axially thereof, inlet means in the piston communicating with the interior of all of the cylinders introducing fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, means supplying a continuous fluid pressure between the walls of the several cylinders constantly urging them towards the closed position and control means selectively delivering fluid from the source of fluid to the smallest cylinder and the concentric cylinders whereby to override the constant pressure urging the cylinders to the closed position.

2. A multistage telescoping cylinder unit comprising a plurality of concentric cylinders, one adapted to nest inside the next adjacent one to form a telescopic unit, a source of fluid under pressure, a piston member adapted

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to fit in the smallest of said cylinders, said smallest cylinder receiving fluid under pressure to extend the piston axially thereof, inlet means in the piston communicating through the piston and smallest cylinder between the source of fluid and the interior of all of the cylinders introducing fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, means supplying a continuous fluid pressure between the walls of the several cylinders constantly urging them towards the closed position and control means selectively delivering fluid from the source of fluid to the smallest cylinder and the concentric cylinders whereby to override the constant pressure urging the cylinders to the closed position.

3. A multistage telescoping cylinder unit comprising a plurality of concentric cylinders, one adapted to nest inside the next adjacent one to form a telescopic unit, a source of fluid under pressure, a piston member adapted to fit in the smallest of said cylinders, a chamber in the smallest cylinder at the end of the piston member, inlet means on the piston communicating between said chamber and the source of fluid, said smallest cylinder receiving fluid under pressure through said inlet to extend the piston axially thereof, second inlet means in the piston communicating through the piston and smallest cylinder from the source of fluid to the interior of all of the cylinders introducing fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, third inlet means in the piston communicating with the source of fluid supplying a continuous fluid pressure between the walls of the several cylinders constantly urging them towards the closed position and control means selectively delivering fluid from the source of fluid to the smallest cylinder and the concentric cylinders whereby to override the constant pressure urging the cylinders to the closed position.

4. A multistage telescoping cylinder unit comprising a plurality of concentric cylinders, one adapted to nest inside the next adjacent one to form a telescopic unit, and spaced from each other to form an annular space therebetween, a sealing shoulder adjacent each end of each such cylinder sealing engaging the next adjacent cylinder, a source of fluid under pressure, a piston member adapted to fit in the smallest of said cylinders, a chamber in the smallest cylinder at the end of the piston member, inlet means on the piston communicating between said chamber and the source of fluid, said smallest cylinder receiving fluid under pressure through said inlet to extend the piston axially thereof, second inlet means in the piston commu-

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nicating with the interior of all of the cylinders introducing fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, third inlet means in the piston communicating with the source of fluid supplying a continuous fluid pressure into the annular spaces between the walls of the several cylinders and bearing on the sealing shoulders constantly urging the cylinders towards the closed position and control means selectively delivering fluid from the source of fluid to the smallest cylinder and the concentric cylinders whereby to override the constant pressure urging the cylinders to the closed position.

5. A multistage telescoping cylinder comprising a plurality of concentric cylinders of successively larger diameters, one adapted to nest inside the next adjacent larger one to form a telescopic unit, a piston member adapted to fit in the smallest of said cylinders, said smallest cylinder receiving fluid under pressure to extend the piston axially thereof, inlet means in the piston communicating with the interior of all of the cylinders admitting fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, and inlet means admitting a continuous fluid pressure between the walls of the several cylinders constantly urging them towards the closed position.

6. A multistage telescoping cylinder comprising a plurality of concentric cylinders of successively larger diameter, one adapted to nest inside the next adjacent larger one to form an annular space therebetween, a sealing shoulder adjacent each end of each said cylinder sealing engaging the next adjacent cylinders to close said annular space, a piston member adapted to fit in the smallest of said cylinders, a chamber in the smallest cylinder at the end of the piston member, inlet means on the piston communicating with said chamber, said smallest cylinder receiving fluid under pressure through said inlet to extend the piston axially thereof, second inlet means in the piston communicating with the interior of all of the cylinders introducing fluid under pressure into the interior of all of said cylinders except the smallest cylinder whereby the cylinders may be expanded, third inlet means in said piston admitting a continuous fluid pressure and means communicating through the walls of said cylinders between the annular spaces whereby fluid admitted by said third inlet means enters between the walls of the several cylinders constantly urging them towards the closed position.

No references cited.