ABSTRACT: A method of making a cylinder body for a fluid operated cylinder device including the steps of forming a tubular body member of indefinite length having externally disposed thereon and integral therewith a plurality of ribs extending longitudinally of the body member, each of said ribs including a coaxially extending through bore, severing from the tubular member a segment thereof of desired length, and tapping the ends of each through bore in the tubular segment to adapt the tubular segment to receive therein head screws for attaching a cylinder head to each end of the tubular portion.
METHOD OF MAKING A FLUID OPERATED CYLINDER DEVICE

This application is a division of copending application Ser. No. 543,618, filed Apr. 19, 1966 now abandoned. 

Hereinafter, in order to facilitate the construction of cylin-
ders in a variety of different lengths in accordance with customer requirements, and in order to eliminate the need for an inventory of cylinders in a variety of lengths in anticipation of customer requirements, it has been customary to cut the cylinder body to the desired length from a preconstructed extra long cylinder body, and thereafter attach independently constructed cylinder heads to the opposite ends of the cut cylinder body by means of tie rods interconnecting the heads externally of and independently of the cylinder body.

It is an object of the present invention to provide a new and novel cylinder body construction adding longitudinal strength and rigidity to the cylinder for minimizing lateral bending of the cylinder body, and, at the same time, utilize the new cylinder body construction in a new and novel method of manufacturing a cylinder device to facilitate the cutting of cylinder bodies to length from an extra long cylinder body with the subsequent attachment of cylinder heads directly to the ends thereof by means of standard uniform length screws, thus eliminating the need for maintaining an inventory of more expensive tie rods of varying lengths.

In the present invention, this object is achieved by constructing the cylinder body having integral therewith and externally disposed thereon a plurality of spaced ribs longitudinally extending along the full length of the body providing longitudinal and lateral rigidity. When the extra long cylinder body is transversely cut to the desired length, the end faces of the ribs are provided with tapped holes for receiving screws by which the cylinder heads are attached to the end faces of the cut cylinder body.

This and other objects will become more readily apparent in the following detailed description, taken in conjunction with the drawings, in which:

FIG. 1 is an exploded sectional view, taken substantially along the lines 1-1 of FIG. 2, of a fluid operated cylinder device showing my invention;

FIG. 2 is a sectional view of the cylinder body taken substantially along the line 2-2 of FIG. 1; and

FIG. 3 is an end elevational view of the cylinder device of FIG. 1.

Referring now to the drawing, there is shown a partially assembled fluid operated cylinder device generally indicated at 1 and comprising a cylinder body 2, a piston assembly 3 attached to a piston rod 4 and reciprocable disposed in the cylinder body, a pair of cylinder heads 5 and 6 disposed adjacent opposite ends of the cylinder body, and a plurality of screws 7 attaching the cylinder heads to the cylinder body 2.

In accordance with the present invention, the cylinder body 2 is composed of any suitable metal and may be formed in any suitable manner, as by casting or extrusion where applicable, so as to provide a hollow cylindrical member having externally disposed thereon and integrally formed therewith one or more ribs 8 longitudinally extending the full length of the cylinder body, the ribs 8 providing strength and rigidity to the cylinder body to minimize cylinder body sag, and, at the same time, providing novel means, by way of the rib end faces 9, to attach cylinder heads to the cylinder body and thus eliminate the need for the tie rods heretofore utilized in such attachment. The ribs 8 may be solid or may include through passages 10, as desired. If the ribs 8 are solid, the end faces 9 of the ribs 8 are drilled and tapped at 11 to receive the above-mentioned screws 7, thereby attaching the corresponding cylinder head 5 and 6 to the cylinder body, in a manner hereinafter described. If the ribs contain through passages 10, the ends of the through passages terminating at the end faces 9 of the ribs provide holes which may be tapped thus eliminating the drilling operation.

The piston assembly 3 and the associated piston rod 4 do not comprise part of the present invention, and accordingly, they may be of any suitable type.

The cylinder head 5 is generally rectangular in form and includes a combined supply and exhaust port 12 internally communicating with a cavity 13 opening at end face 14, the latter communicating with the interior of the cylinder body 2 to supply fluid pressure to or exhaust fluid pressure from the cylinder body, depending upon whether the port 12 is being utilized as a supply or exhaust port. A passage 15, carrying a bearing 16 is provided through the head 5 coaxially with the cavity 13 to reciprocably receive therethrough the piston rod 4 in the manner shown in FIG. 1. A plurality of through passages 17 are located at the corners of the head for axial alignment thereof with respect to the tapped ends 11 of the passages 10 when the head 5 is abutted with the end of cylinder body 2. One of the screws 7 is inserted in each of the through bores 17 and received in tapped ends 11 of passages 10 to tightly hold the cylinder head 5 in sealed engagement with the end of cylinder body 2.

Cylinder head 6 is similar in construction to cylinder head 5 and comprises a rectangular body including a combined exhaust and supply port 18 internally communicating with a cavity 19 opening at end face 20 of the cylinder head to communicate the port 18 with the interior of the cylinder body 2. A plurality of through bores 21 are located near the edges of the cylinder head, each in axial registration with one of the tapped ends 11 of the ribs 8 in the cylinder body 2, through which bores screws 7 are inserted to be received in tapped ends 11 to scalingly engage head 6 with the end of the cylinder body 2.

If desired, suitable conventional cushioning means, not shown, may be provided to cushion movement of the cylinder as it nears the ends of its stroke.

Also in accordance with the invention, the ribbed cylinder body facilitates a new method of making and assembling a cylinder device by cutting to length the desired cylinder body from an extra long ribbed cylinder, drilling and tapping the end faces of the ribs, and attaching the heads to the ends of the cylinder body by screws received in the rib tapers 11, thus eliminating the need for tie rods.

Specifically, the cylinder body 2 is formed by casting or extrusion or in any other suitable manner, as a long cylinder body having ribs externally disposed thereon and formed integral therewith, which ribs extend the full length of the long cylinder body. When a cylinder is desired having a length less than the aforementioned long length, the cylinder body of desired length is made by cutting transversely of the cylinder body, the cut extending, of course, through all the ribs and the cylinder body so that the end faces of the ribs and the cylinder body coincide substantially in a given plane transversely of the cylinder axis, as shown in FIG. 1 of the drawing. The end faces 9 of the ribs are then drilled and tapped at 11, if the ribs are solid, or are simply tapped, if the ribs are formed with through bores 10, and, with the piston assembly 3 and piston rod 4 installed in the cylinder 2 at any convenient time after the cylinder body is cut and before the cylinder heads are attached to the cylinder body, the cylinder heads 5 and 6 are attached to the ends of the cut cylinder body by means of standard uniform length screws 7 inserted through the cylinder heads 5 and 6 into tapped holes 11 of ribs 8.

From the foregoing, it is seen that regardless of the length of the cylinder body, standard uniform length screws may be utilized to attach the cylinder heads to the cylinder body, the length of the screw being determined solely by the thickness of the cylinder head. Moreover, if the ribs are formed to include through bores, the transverse cutting of the cylinder body at any point along its axis provides a convenient already existing hole in the rib end face which hole may be tapped without necessitating drilling.

1. A method for making a cylinder device, comprising:
   a. constructing a long tubular body member having externally disposed thereon and integral therewith rib means longitudinally extending the full length of the tubular body;
   b. cutting the tubular body to a desired length less than the length as constructed;
3. The method of making a cylinder body, comprising:
   a. forming a long tubular body member having externally disposed thereon and integral therewith a plurality of ribs longitudinally extending the full length of the tubular body member, each of said ribs including an axial through bore;
   b. severing from said tubular body member a tubular segment of predetermined axial length; and
   c. tapping the ends of said through bore in each of said ribs in said tubular segment.

4. The method of making a cylinder body, as recited in claim 3, in which the step of forming is effected by extrusion.

5. The method of making a cylinder body, comprising:
   a. forming a long tubular body member having externally disposed thereon and integral therewith a plurality of ribs longitudinally extending the full length of the tubular body;
   b. severing from said tubular body member a tubular segment of predetermined length; and
   c. forming in each end of each of said ribs on said tubular segment an axially extending tapped bore.