Oct. 9, 1934. P. L. SCOTT 1,976,416

PUMP

Original Filed Oct. 20, 1930

Fig. 1

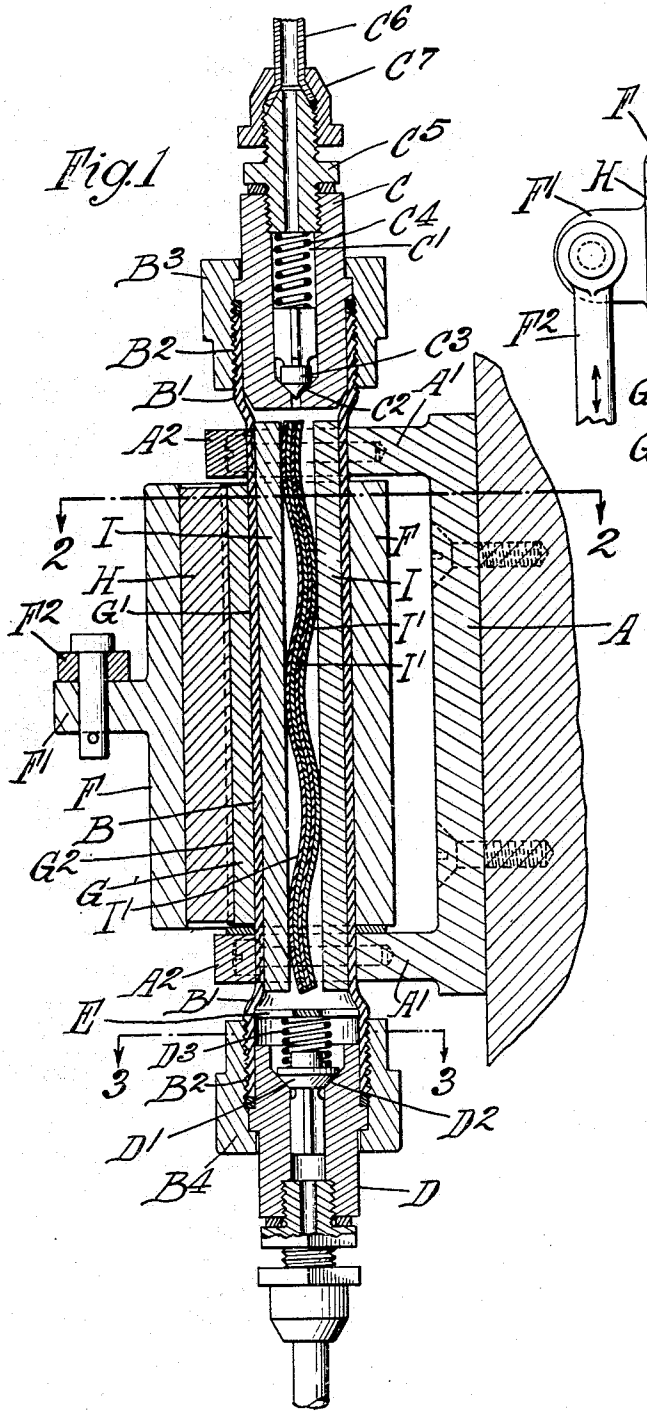


Fig. 2

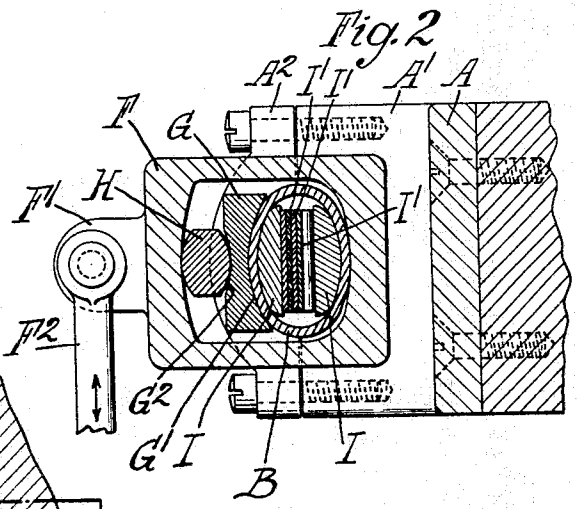
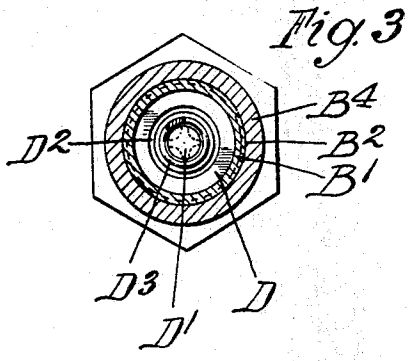


Fig. 3



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PUMP

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27 Claims. (Cl. 103—148)

This invention relates to a pump and particularly to a pump adapted to deliver a small quantity of fluid under great pressure and with great speed.

It has for one object to provide a pump in which the mechanical shock due to the movement of the pump and its driving mechanism is reduced to a minimum. Another object is to provide a pump in which sliding surfaces within the pressure chamber are eliminated. Another object is to provide a pump in which the walls or a part of the walls of the pump chamber are elastic.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawing, wherein—

Figure 1 is a longitudinal section through the pump;

Figure 2 is a transverse section taken at line 2—2 of Figure 1;

Figure 3 is a transverse section taken at line 3—3 of Figure 1.

Like parts are designated by like characters throughout the specification and drawing.

A is a pump or housing base. It may be mounted upon any suitable support and may, for example, be mounted upon an engine for which the pump is adapted to furnish fuel. The base A is provided with one or more upstanding bracket members A^1 upon which collars A^2 may be removably fastened in any suitable manner.

B is a pump tube. It is preferably formed of a relatively flexible tubular member which may be oval in cross section as shown throughout a portion of its length. At its ends, for convenience, it may be rounded in cross section, as indicated in Figure 3 at the portions B^1, B^1. At each end it is preferably exteriorly threaded as at B^2. Upon one end is threaded a collar B^3 which removably engages and holds in position a discharge valve assembly. At its other end a collar B^4 is removably mounted and this collar holds in position an inlet valve housing and assembly.

C is a discharge valve housing provided with an opening to the interior of the tube at C^1 and having a valve seat C^2 formed adjacent said opening. A valve C^3 is positioned within a hollow in the housing C and the valve may move into and out of a seating position on the seat C^2. A spring C^4 which bears at one end upon the valve C^3 and at the other upon a perforated connecting plug C^5, normally holds the valve seated. A discharge conduit C^6 may be fastened to the plug C^5 by a collar C^7 in any suitable manner or a discharge connection of any suitable nature might be provided.

D is an inlet valve housing within which a valve D^1 is positioned. The housing is formed with a seat D^2 upon which the valve may be seated. A spring D^3 tends normally to hold the valve seated. The spring, as indicated in Figure 1, bears at one end against a spider E, which is supported from the housing D.

F is a rocker clamp, positioned about the tube B. As indicated particularly in Figure 2, the clamp is hollow and the hollow portion of the clamp is appreciably larger than the outside diameter of the tube so that the rocker clamp surrounds and fits loosely about the tube. The clamp is fitted with an outwardly projecting member F^1 to which a connecting rod or other suitable member F^2 may be attached. This rod is moved backward and forward in the direction indicated by the arrows in Figure 2 to shift or oscillate the rocker clamp.

Positioned within the rocker clamp and contacting the spring pump tube B is a plate G. This plate may be concave on one side as at G^1 to correspond more or less to the shape of the tube and it may have a hollow on its opposite side as at G^2. The plate is preferably of such size that its edges or sides are normally out of contact with the interior of the rocker clamp.

Intermediate the plate G and at one end of the concavity formed in the rocker clamp and preferably resting within the hollow G^2, is a block H of generally oval cross section.

Within the tube B is positioned a pair of stiff plates I, I. As shown, these plates are preferably flat on their interior faces and on their outsides they correspond to the inner surface of the tube B against which they lie. Between the stiff plates I there are mounted a plurality of slightly flexible corrugated plates or members I^1, I^1. These members tend to retain their curvature or corrugation and their number and proportions are such that they exert a pressure against the plates I and consequently against the tube B and force it outward, tending to expand or increase its minor axis.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of my invention and I wish, therefore, that my showing be taken as in a sense diagrammatic. Particularly the form of the springs, such as the corrugated sheets I^1 within the tube, might be almost in-

finitely varied and any sufficiently stiff spring form or spring member might be substituted for the corrugated or bent sheets shown.

The use and operation of my invention are as follows:

The pump of this invention finds an important application in its use as an injection pump to inject fuel into internal-combustion engines. When so used it will be associated with the engine in any suitable fashion and the drive will be operated ordinarily from the engine. The base is mounted in a fixed position and the tube is held against turning or other movement with respect to the base by the portions A^2 and A^1. The rocker clamp which is mounted about the tube is moved, tilted or rocked with a back and forth movement in the direction indicated by the arrows in Figure 2. As the clamp rocks the tendency is for the oval strip H to roll from a position in which its minor axis is normal to the restraining surface, that is, to the plate G and the end of the clamp F, which it engages, to a position in which its major axis is normal to these surfaces. This tends to press the plate G against the tube, flattening it against the resistance of the members I^1, forcing them inward or compressing them, and reducing its minor axis and thus decreasing its contained volume. This effect of flattening the tube B constitutes a pumping stroke. Since the volume of the tube is reduced by this, the discharge valve is opened by the increased pressure thus caused, and discharge of fluid takes place.

When the clamp is rocked or permitted to move in the reverse direction, the oval strip H returns to its former position in which its minor axis is normal to the restraining surfaces and it thus permits the compression plate G to move outwardly from the position in which the tube was compressed. The tube then moves back to its former position, under the influence of the members I^1 which assume their original position when free to do so, forcing slightly outward the walls of the tube, increasing its minor axis and its volume, thus reducing the pressure within it sufficiently to open the inlet valve to draw in fluid. This action constitutes a suction stroke.

I claim:

1. In combination in a pump, a hollow member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including a resistance member.

2. In combination in a pump, a hollow member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including an approximately rigid resistance member.

3. In combination in a pump, a hollow flexible member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including within the hollow member a resistance member.

4. In combination in a pump, a hollow member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for resisting deformation of the hollow member, said means including within the hollow member a resistance member and a plurality of rigid contact members, the contact members bearing against the inside of the hollow member and the resistance member bearing against the contact members.

5. In combination in a pump, a hollow member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for resisting deformation of the hollow member, said means including within the hollow member an approximately rigid resistance member and a plurality of rigid contact members, the contact members bearing against the inside of the hollow member and the approximately rigid resistance member bearing against the contact members.

6. In combination in a pump, a hollow flexible member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for resisting deformation of the hollow member, said means including within the hollow member an approximately rigid resistance member and a plurality of rigid contact members, the contact members bearing against the inside of the hollow member and the approximately rigid resistance member bearing against the contact members.

7. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for resisting deformation of the hollow member, said means including a resistance member.

8. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including a resistance member.

9. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for resisting deformation of the hollow member, said means including an approximately rigid resistance member.

10. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including an approximately rigid resistance member.

11. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including within the hollow member an approximately rigid resistance member.

12. In combination in a pump, a hollow flexible tubular member, inlet and outlet means in communication therewith, means for deforming the hollow member to alter its volume and means for holding the hollow member at its ends against movement and means for resisting deformation of the hollow member, said means including within the hollow member an approximately rigid re-

sistance member, and a plurality of rigid contact members, the contact members bearing against the inside of the hollow member and the approximately rigid resistance member bearing against the contact members.

13. In combination in a pump, a hollow member defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure upon the hollow member to deform it.

14. In combination in a pump, a hollow member defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure upon the hollow member to deform it, and means for holding the ends of the hollow member against movement.

15. In combination in a pump, a hollow member defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part, a compression part and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it.

16. In combination in a pump, a hollow member defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part, a compression part and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it and means for holding the ends of the hollow member against movement.

17. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure upon the hollow member to deform it and means for holding the ends of the hollow tube member against movement.

18. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part, surrounding the hollow tubular member, and means for moving the housing with relation to the hollow member to bring pressure upon the hollow member to deform it.

19. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part, surrounding the hollow tubular member, and means for moving the housing with relation to the hollow member to bring pressure upon the hollow member to deform it, and means for holding the ends of the hollow tube member against movement.

20. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part surrounding the hollow tubular member, a compression part and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it.

21. In combination in a pump, a hollow member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part surrounding the hollow member, a compression part, out of contact with the housing, and means for moving the housing with relation to the hollow member to bring pressure upon the hollow member to deform it.

22. In combination in a pump, a hollow member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part surrounding the hollow member, a compression part within and out of contact with the housing and contacting the hollow tubular member, and means for moving the housing with relation to the hollow member to bring pressure through the compression block upon the hollow member to deform it.

23. In combination in a pump, a hollow member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part surrounding the hollow member, a compression part within and out of contact with the housing and contacting the hollow member, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it.

24. In combination in a pump, a hollow member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow member to alter its volume, said means including a housing part surrounding the hollow member, a compression part within and out of contact with the housing and contacting the hollow member, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it, and means for holding the ends of the hollow member against movement.

25. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part surrounding the hollow tubular member, a compression part within and out of contact with the housing and contacting the hollow tubular member, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it.

26. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part surrounding the hollow tubular member, a compression part within and out of contact with the housing and contacting the hollow tubular member, and a wedge, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it, and means

for holding the ends of the hollow tube member against movement.

27. In combination in a pump, a hollow tubular member, defining a pump chamber, inlet and outlet means therefor, means for deforming said hollow tubular member to alter its volume, said means including a housing part surrounding the hollow tubular member, a compression part within and out of contact with the housing and contacting the hollow tubular member, and a rocker wedge within and contacting the housing and the compression member, and means for moving the housing with relation to the hollow member to operate the wedge to bring pressure through the compression block upon the hollow member to deform it, and means for holding the ends of the hollow tube member against movement.

PHILIP LANE SCOTT.