

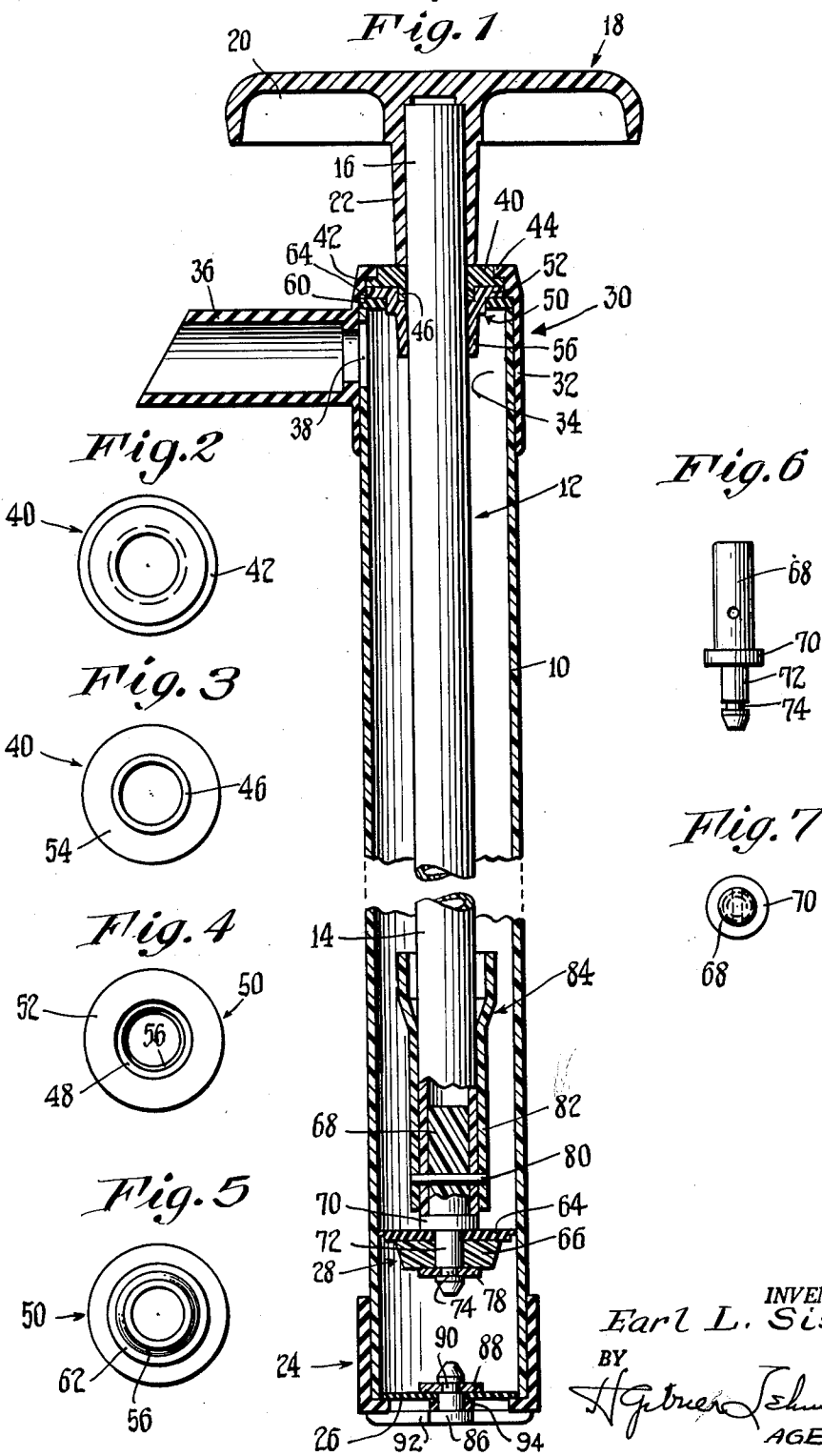
March 10, 1964

E. L. SISSON

3,124,080

PLASTIC PUMP CONSTRUCTION

Filed April 27, 1961



INVENTOR.
Earl L. Sisson
BY
H. Gebner
AGENT

1

3,124,080

PLASTIC PUMP CONSTRUCTION

Earl L. Sisson, Stratford, Conn., assignor to Beckson Manufacturing Corporation, Bridgeport, Conn., a corporation of Connecticut

Filed Apr. 27, 1961, Ser. No. 106,075

2 Claims. (Cl. 103—178)

This invention relates to reciprocating or piston-and-cylinder type pumps, and more particularly to pumps of this kind wherein a reciprocable piston or plunger shank passes through and is guided in a discharge fitting carried by one end of a pump cylinder.

The invention especially concerns an improvement in the hand pump construction illustrated and described in my copending application Serial No. 691,193, filed October 21, 1957, now Patent No. 3,006,282, and entitled "All-Plastic Hand Pump."

In this previously-filed copending application above identified a plastic pump cylinder is provided with a discharge end cap molded of resilient plastic substance, such end cap having a side opening for the discharge of liquid, and having a second opening in its end through which latter the plunger shank of the pump passes and in which it is reciprocable. To prevent leakage of the liquid being pumped past the reciprocable shank and through the end opening of the discharge fitting, there is provided an integral depending sealing skirt or collar, such collar extending inward into the pump cylinder and slidably gripping the shank to effect the liquid-tight seal. The end wall of the discharge fitting is also reinforced with a rigid plastic insert washed which encircles the reciprocable shank and provides in part a bearing therefor as well as effecting reinforcement of the flexible end wall of the fitting.

With this prior construction illustrating an all-plastic pump construction, due to the integral arrangement of the sealing skirt or collar and body of the discharge fitting, a limitation is had as to the choice of materials for such portions. A plastic formulation which would provide suitable properties for the discharge fitting in functioning as an end cap might not be suitable for the sealing skirt or collar, and vice versa; further, a plastic formulation found most suitable for the discharge fitting in functioning as an end cap would not necessarily provide the best qualities in a bearing for the plunger shank, as regards wear resistance, resistance to corrosive influences, minimum frictional resistance, etc. While the rigid plastic insert in the end wall of the discharge fitting constituted a satisfactory reinforcement to prevent excessive flexing of such end wall, it had only a thin bearing surface or edge in engagement with the plunger shank, which appreciably reduced its effectiveness as a bearing means. Further, the fabrication of the discharge fitting where it involved incorporation of rigid insert slowed down the molding operation and increased the manufacturing cost.

The above drawbacks of my prior pump construction as above outlined are obviated by the present invention, and one object of the invention is to provide a novel and improved plastic discharge fitting and reciprocable shank assemblage in a pump of the type described, which freely permits a choice of materials to be had for not only the resilient discharge fitting or cap but also for the sealing skirt or collar and additionally for the shank bearing member, whereby each of these components may have the particular properties found to be most desirable for the functions assigned to them. Thus, the discharge fitting and shank assemblage is characterized by not only an extremely effective sealing arrangement but also a similarly effective bearing means for the plunger shank as well as an effective discharge fitting or cap construction adapted for attachment to the discharge end of the cylinder.

In accomplishing the foregoing there is provided by the

2

invention a novel construction comprising an assemblage of separate plastic parts or components, including a fitting or cap proper having the discharge opening or orifice and a cylinder-engageable sleeve or body, a rigid bearing bushing separate from and carried by the fitting or cap and having a relatively large bearing surface engageable with the plunger shank, and further a separate sealing skirt or collar also carried by the discharge fitting or cap and having a cooperable relationship therewith and also with the rigid bearing bushing. Moreover, the said components are constituted in a novel manner by which they not only have simple configurations and may be economically fabricated or molded but are also easily and quickly assembled with an interlocking or interfitted relationship. The invention further provides a rigid plastic retainer ring or annulus which is engageable with the sealing collar and is held in place by the cylinder and when the discharge fitting assemblage is carried thereby, thus insuring proper positioning and anchorage of all of the separate components making up the assemblage. By virtue of the separate pieces provided, the plastic formulations from which the pieces are fabricated may be chosen independently of each other, and may be especially selected for properties found most desirable for the assigned functions of each component.

In the plastic pump construction of my copending application above identified the inlet fitting parts were permanently assembled to each other, and the plunger assemblage comprising the plunger, valve disk and disk support member were permanently assembled to each other and also assembled to the end of the plunger, making replacement of the valve disk in each instance difficult if not impossible. Further, the plunger assemblage included a spacing sleeve carried by the end of the plunger shank, which sleeve was loosely carried on the shank and by such circumstance likely to give the erroneous impression to a user that the plunger assemblage was failing or coming apart.

These drawbacks of my prior pump construction are also obviated by this invention, and a further object of the invention is to provide an improved plastic inlet fitting assemblage and plastic plunger assemblage for a hand-pump construction of the type under consideration, wherein the valve disk and the disk support member may be easily and quickly removed and replaced at any time should this be required.

The plunger assemblage of the present invention comprises a permanently secured valve attachment pin affixed to the end of the plunger shank, such valve attachment pin carrying the valve disk and also the disk support member or annulus, which two components are now held in place by a resilient locking washer carried in an annular groove at the end of the valve attachment pin. The locking washer normally securely retains the valve disk and disk support member on the attachment pin, yet such washer may be easily stretched and removed by virtue of its resilient construction, thereby enabling the valve disk and disk support member to be slipped off the valve attachment pin without difficulty and replaced when this should be found necessary. A similar stretchable locking washer removably holds the inlet valve disk in place, and may be removed in the same manner.

After such replacement the locking washer is merely forced back over the end of the valve attachment pin and replaced in the annular groove thereof, thereby to again securely position the valve disk and support member, and to maintain these in their operative positions. Further, the spacer sleeve or collar which heretofore was loosely carried by the plunger shank, is now affixed to the inner or lower end of the same, by means of a simple cross pin member which also passes through the shank and the

3

valve attachment pin, thereby fixedly securing all of these components in their properly assembled relation.

A feature of the invention resides in the provision of an improved plastic pump construction as above set forth, wherein the various separate components may be economically fabricated and quickly and easily assembled yet upon such assemblage are securely interfitted so as to be retained in their operative positions against inadvertent displacement, resulting in a reliable functioning of the pump at all times.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters of reference are used to designate like components throughout the several views, in which:

FIG. 1 is an axial sectional view of a plastic hand pump construction as provided by the invention.

FIG. 2 is a top plan view of the rigid bearing bushing carried by the discharge fitting of the pump.

FIG. 3 is a bottom plan view of the rigid bearing bushing shown in FIG. 2.

FIG. 4 is a top plan view of the resilient sealing collar carried by the discharge fitting of the pump.

FIG. 5 is a bottom plan view of the sealing collar shown in FIG. 4.

FIG. 6 is a side elevational view of the valve attachment pin of the plunger assemblage of the pump.

FIG. 7 is a top plan view of the valve attachment pin of FIG. 6.

Referring first to FIG. 1, the plastic pump shown therein as provided by the invention comprises a plastic pump cylinder or barrel 10 in which there is reciprocally movable a plunger assemblage 12 having a hollow plastic rod or shank 14 on the outer end 16 of which there is provided a plastic handle 18 comprising a cross piece or member 20 and an integral mounting collar 22. The handle 18 may be affixed to the shank 14 in any suitable manner, as by the use of an appropriate cement or adhesive.

The pump construction shown in this figure is virtually completely fabricated of plastic substance having properties of resistance to corrosion, flexibility or resilience (where this is desired), resistance to wear, impact resistance, etc. Polyvinyl chloride plastic formulations have in general been found suitable in fabricating the various components of the present improved pump, and all of such components with the exception of a cross pin to be later identified are preferably made of such plastic whereby there is had not only lightness in weight and adequate strength but also resistance to corrosive influences such as corrosive liquids, resistance to abrasion caused by foreign particles, wear and the like.

The operation of the pump construction of FIG. 1 is similar to that of my copending application above identified, being generally simple to understand. At the bottom of the pump cylinder 10 there is an inlet fitting 24 having a flexible inlet flap-valve disk 26 operable in such a manner that liquid may be sucked into the cylinder 10 when the plunger assemblage 12 is raised, such liquid however being prevented from leaving the cylinder through such inlet fitting.

At the inner end of the plunger shank 14 a piston and valve assemblage 28 is carried, which operates in a manner to enable liquid to bypass the bottom end of the shank in an upward direction, the piston however functioning as a one-way valve to prevent the passage of liquid downward past the lower end of the shank. Accordingly, reciprocative movements of the plunger assemblage 12 will suck in liquid through the inlet fitting 24 and such liquid will be raised in the cylinder 10, being lifted upward past the valve and piston assemblage 28 so as to occupy the enclosed space surrounding the shank 14. Such liquid, upon the plunger assemblage 12 being raised, will be forced out through a suitable discharge opening at the upper end of the cylinder 10, as will be shortly described in detail.

4

By the present invention there is provided a novel and improved multi-part discharge fitting assemblage 30 at the upper end of the cylinder 10, through which the plunger shank 14 passes, such assemblage serving several important functions as for example the providing of a bearing for the shank 14 and the further providing of an effective seal about the shank to prevent leakage of liquid past the engaging bearing surfaces of the shank and discharge fitting. The multi-part discharge fitting assemblage 30 further functions as a cap and also as a discharge conduit or orifice at the upper end of the pump cylinder 10.

By the invention the discharge fitting assemblage 30 is constituted of a number of pieces or components interfitted in a novel manner, each of which may be fabricated of a different plastic formulation most suited to the individual requirements and functions of the component. Thus the sealing component or member may be fabricated of a flexible plastic substance especially adapted to retain its resilience and resist the action of corrosive elements or liquids. The bearing of bushing component may be fabricated of a formulation which minimizes frictional drag, seizing and galling when engaged with the plastic shank or pump rod 14 while also preventing wear to a maximum degree. The fitting cap and its discharge line or channel may be molded of a formulation having a resilience to permit expansion of the cap body sufficiently to enable the same to be forced over and to frictionally seize the top end of the cylinder 10. Such formulation may also be chosen to facilitate joining of the parts by a suitable adhesive, where these are to be permanently united with each other. The invention further provides novel shapes or configurations for the separate parts of the discharge fitting or assemblage whereby these may interfit in an advantageous manner to produce a sturdy and serviceable assemblage which is not likely to fail during use.

Accordingly, referring to FIGS. 1-5, the discharge fitting assemblage 30 is shown as comprising a molded flexible plastic cap having a generally cylindrical sleeve or body portion 32 which is arranged to be slightly stretched and forced over the upper portion 34 of the pump cylinder 10. The cap member or discharge fitting further has a short flexible discharge line or nozzle portion 36 extending radially from the body or sleeve portion 32 and being integral therewith. The bore or passage of the nozzle portion 36 is continued through the side wall of the sleeve portion 32 to provide a continuous discharge channel which communicates with a side opening 38 in the upper portion 34 of the pump cylinder 10.

The upper end of the sleeve portion 32 of the discharge fitting or cap has a large circular opening to accommodate a rigid bearing bushing 40, FIGS. 1, 2 and 3, the said bearing bushing being of annular configuration and having an external annular recess 42 in its outer peripheral portion to accommodate an internal annular shoulder or flange 44 of the cap whereby an interfitted engagement therewith is had.

The bearing bushing 40 further has a depending annular flange or axial extension 46 which provides an increased bearing surface for engagement with the plunger shank 14, such annular flange being received in a cooperating internal annular recess 48 of a resilient sealing collar 50 which latter is constituted as a separate piece, apart from the cap member and the bearing bushing.

The sealing collar 50 has an outwardly extending mounting flange 52 at its upper end, in which the annular recess 48 is disposed, the said flange being engaged with the undersurface 54 of the bearing bushing 40 as shown. The sealing collar 50 further has a depending sealing skirt or shank-engaging portion 56 adapted to encircle and frictionally engage under continuous light pressure the shank 14 of the pump plunger. The sealing portion 56, as shown, has a slight taper whereby it is generally frusto-conical.

Engaged with the underside of the mounting flange 52

5

of the sealing collar 50 is a rigid plastic support member or ring 60, the said ring being positioned on a shoulder portion 62 of the sealing collar and being arranged to engage the inner wall surface of the sleeve portion 32 of the cap and to also engage an internal shoulder 64 of such sleeve portion so as to be positioned thereby.

As seen in FIG. 1 the upper edge portion of the pump cylinder 10 engages the underside of the rigid plastic support ring 60, thereby to securely retain the same in its operative position whereby it in turn securely retains in place the sealing collar 50 as well as the bearing bushing 40 of the assemblage.

It will now be seen from an inspection of FIG. 1 that the separate components making up the discharge fitting assemblage 30 are securely held in place by an interlocking construction as provided by the invention, the various components closely interfitting and having cooperable shoulders whereby there is avoided any possibility of their shifting from the correct operative positions during operation of the pump.

The sleeve portion 32 of the discharge fitting or cap may be adhered to the upper portion 34 of the pump cylinder 10 by the use of any suitable adhesive, as will be readily understood, and accordingly the components making up the assemblage, comprising the bearing bushing 40, sealing collar 50 and support ring 60 will be securely permanently locked in place.

By virtue of the bushing 40 being fabricated as a separate piece, apart from the sealing collar 50, this being also true with respect to such collar and the discharge fitting or cap, these various components together with the plastic support ring 60 may be molded using different plastic formulations best suited for the individual pieces and the functions required of them. For instance, the bushing 40 may be composed of a plastic chosen for its bearing properties whereby frictional resistance is reduced, and whereby there is no tendency for galling or seizing to occur during the reciprocative movements of the plunger assemblage 12. The material of the sealing collar 50 may be chosen to provide the necessary resilience under various adverse conditions of use. The material of the discharge fitting or cap itself may be chosen to provide flexibility or resilience with a certain amount of dimensional stability, and the materials for all such parts may further be considered from the standpoint of resistance to the action of corrosive influences, liquids and the like. Compatibility with available adhesives or solvents would be a factor when considering the materials of the pump cylinder 10 and the fitting or cap member, where these are to be adhered to each other by such a means.

By the present invention, in effecting the improvement in the pump construction of my copending application above identified there is also provided a novel plunger and piston assemblage at the lower end of the plunger shank 14, by which removal and replacement of the piston and check valve components may be easily and quickly effected as well as providing for an improved and simplified initial assembly of these parts.

Referring to FIGS. 1, 6 and 7, the piston and check valve assemblage comprises a flexible plastic valve disk 64 and a valve disk support annulus 66, the latter being generally rigid and both said components being removably carried by a valve attachment pin 68 secured in the lower end of the hollow plunger shank 14.

As seen in FIGS. 6 and 7, the piston 68 has an integral shoulder or flange 70 intermediate its ends, and a portion of reduced diameter 72 extending below the shoulder 70 and provided with an annular groove 74 adjacent its bottom end. The piston and valve disk 64 and the support annulus 66 are carried on the reduced-diameter portion 72 of the attachment pin, and are retained in place by a resilient locking washer 78 which is carried in the annular groove 74 and engages the bottom surface of the support annulus 66.

By such construction, the assemblage of the piston-

6

valve disk 64, support annulus 66 and attachment pin 68 may be simply and quickly effected by merely slipping the disk and annulus on the portion 72 of the pin and thereafter forcing the locking washer 78 over the end of the pin and into the retainer groove 74. During such action, the locking washer 78 is forcibly expanded a slight amount, and again contracts or regains its original shape as it encounters the groove 74.

Removal of the piston-valve disk 64 and support annulus 66 may be as easily effected. The user merely first forces off the locking washer 78, whereupon the disk and annulus may be readily slipped off the attachment pin 68.

By the present invention, the attachment pin 68 is locked to the bottom end of the plunger shank 14 by a cross pin 80 which passes through both said components, such cross pin also passing through the small diameter portion 82 of a spacer collar 84 which is carried by the lower end of the shank and is arranged to engage the support ring 60 at the time that the plunger is fully raised. The spacer collar 82 thus prevents the piston valve disk 64 from being pulled into engagement with the top wall of the discharge fitting but instead maintains an appreciable spacing between these components whereby there is had at all times an adequate two-point bearing for the plunger shank 14 on the pump cylinder 10. With this construction there is avoided any looseness of the spacer collar 84 on the shank 14, which occurred in the pump construction of my above identified copending application.

In accordance with the invention, the inlet fitting 24 is also arranged in a manner to enable easy and quick replacement of the intake valve disk 26 to be effected. In accomplishing this, the fitting 24 has a supporting spider 92 provided with a hollow hub or boss 94 in which there is disposed a rigid plastic retainer pin 86, the latter having an annular groove 90 carrying a resilient locking washer 88. The flap valve or disk 26 rests on the central hollow boss 94 of the inlet fitting, and is held against the said boss by the resilient washer 88 which is removably carried on the pin 86. In order to remove the flap valve 26, the washer 88 is merely forced off the pin 86, whereupon the disk 26 is freed and may be replaced by a new disk, when this should be desired. Positioning of the new valve disk on the pin 86 and replacement of the resilient locking washer 88 completes the replacement operation. It will be understood that the valve disk 26 at its outer peripheral portion engages an inwardly extending annular shoulder of the inlet fitting 24 to provide a tight seal therewith whenever there is greater internal pressure in the cylinder below the plunger 28, the valve disk 26 being supported at intermediate points by the spider 92.

It will now be seen from the foregoing that there has been provided by the invention an improvement in the pump construction illustrated and described in the identified copending application. An improved discharge fitting assemblage is illustrated, wherein separate components or pieces interfitting in a novel and advantageous manner may be fabricated of plastic substance having different formulations best suited for the individual functions and structures of the pieces.

With the present construction an effective and wear resistant bearing means is provided for the plunger shank, as well as an effective leakproof sealing element and a fitting or cap structure, all inter-related to provide for improved operation, effectiveness and reliability in use. The inlet fitting and also the piston-valve assemblage of the plunger are so constituted so as to enable quick and easy removal and replacement of the inlet valve and piston-valve disk and disk-support annulus, whenever this is necessary. The various components in spite of the interfitting configuration and improved operation may be economically fabricated and produced with simple molded equipment, and may be easily, quickly assembled whereby the fabrication cost of the pump construction is held to a minimum.

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

I claim:

1. In a plastic hand pump construction, in combination, a pump cylinder and plunger shank reciprocable therein; a flexible plastic discharge fitting comprising a cap secured to the cylinder, said cap having an outlet passage for liquid and having a bearing opening through which latter the plunger shank extends; a substantially rigid plastic bearing bushing for the plunger shank, extending around the latter and carried by the discharge fitting at the bearing opening thereof, said bushing being constituted as a piece separate from the discharge fitting; a resilient plastic sealing collar separate from the bearing bushing and the discharge fitting and having a mounting flange portion and a depending skirt portion, said collar extending around the plunger shank with the skirt portion projecting inward of the pump cylinder, engaging the bearing bushing and discharge fitting and being carried by the latter, the skirt portion of the collar closely fitting and sealingly engaging the plunger shank under continual pressure and preventing the passage of liquid between the bearing bushing and plunger shank as the latter is moved outward of the cylinder; a rigid plastic support ring disposed within the discharge fitting and engaged with the flange portion of the sealing collar, for holding the collar in the fitting, said discharge fitting having a sleeve portion receiving one end of the pump cylinder and the end edge of said cylinder abutting the

support ring and retaining the same engaged with the flange portion of the sealing collar, said bearing bushing having an annular recess in its outer periphery and said discharge fitting having an internal annular flange disposed in said recess and providing an interfitting engagement between the fitting and bushing, the periphery of the bearing bushing and flange portion of the sealing collar together with the support ring being clamped between the end edge of the cylinder and the internal annular flange of the discharge fitting.

2. A hand pump construction as in claim 1, wherein the depending skirt portion of the plastic sealing collar is of cylindrical configuration, having a cylindrical inner wall and a substantially cylindrical outer wall which is co-extensive with the inner wall for the major portion of the length of the latter, the outer surface of the skirt portion being devoid of any support in radial directions whereby such skirt portion may be readily flexed and may engage the plunger shank under light pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

148,775	Steward	Mar. 17, 1874
745,876	Medley	Dec. 1, 1903
1,657,469	Heston	Jan. 31, 1928
1,977,489	Ruthren	Oct. 16, 1934
2,261,834	Morgan	Nov. 4, 1941
2,577,417	Halpin	Dec. 4, 1951
2,605,717	Canon	Aug. 5, 1952
2,915,986	Sisson	Dec. 8, 1959