

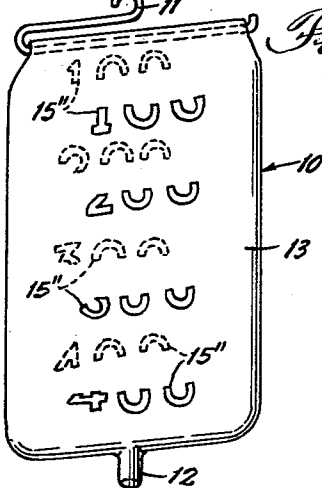
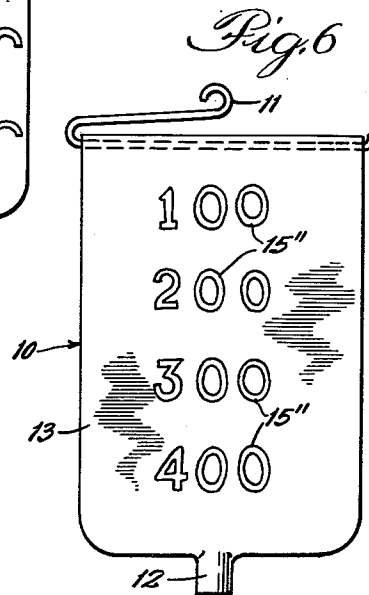
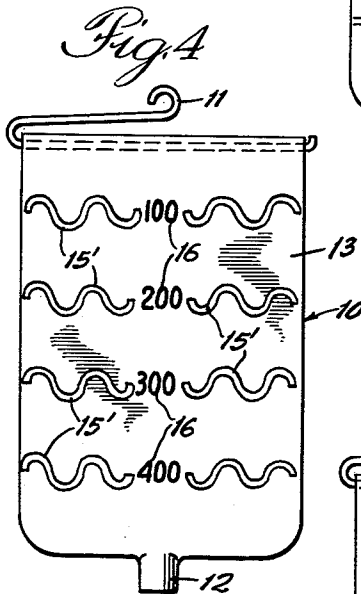
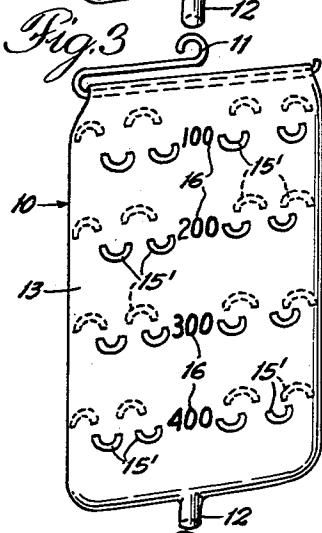
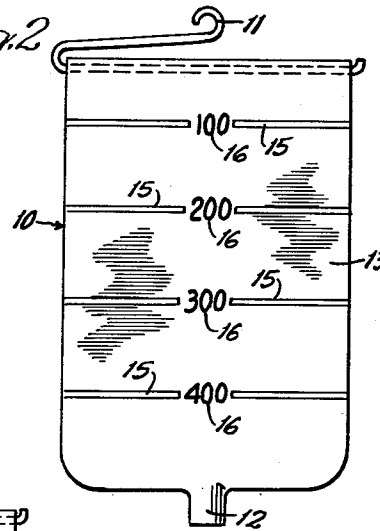
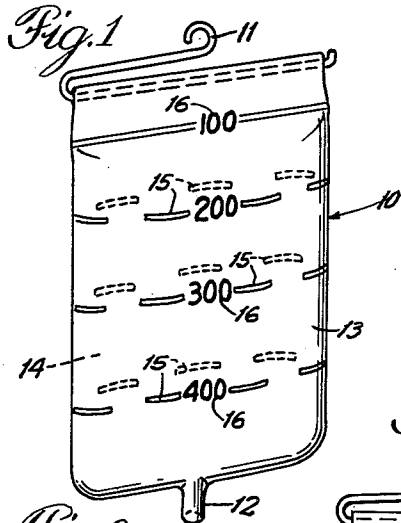
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FLUID LEVEL INDICATING MEANS FOR COLLAPSIBLE BAG

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FLUID LEVEL INDICATING MEANS FOR COLLAPSIBLE BAG

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This invention relates to a collapsible bag, and more specifically, to a collapsible bag having flexible walls and having means for indicating the level of the contents disposed therein.

The present invention is particularly suited for use in connection with the administration of intravenous solutions. Collapsible plastic bags are frequently used for this purpose because, among other things, the walls of such bags fold together or collapse under external air pressure as the solution drains out, thereby eliminating the necessity and possible dangers of introducing air into the container as it empties, a practice ordinarily required when bottles are used for this purpose because of increasing air pressure resistance to liquid flow as the rigid-walled bottle is evacuated. However, because most intravenous solutions are clear and because there is no clearly defined line of demarcation where the walls of a partially evacuated collapsible container meet, it is often quite difficult to detect the liquid level within a transparent flexible bag. Thus, in administering a clear intravenous solution from a transparent plastic bag, a definite problem arises in readily determining the quantity of liquid remaining in the bag. It is this problem to which the present invention is directed.

A principal object of the present invention is to provide a collapsible transparent or semi-transparent bag equipped with indicating means which enables a user to determine the amount of liquid removed from or remaining within the bag without observing the actual level of fluid within that bag. Specifically, it is an object to provide a collapsible bag having markings on its transparent or semitransparent walls, the markings changing in appearance as the liquid level within the container drops. Other objects will appear from the specification and drawings in which:

FIGURE 1 is a perspective view illustrating an embodiment of the present invention; FIG. 2 is an elevational view illustrating the collapsible container of FIG. 1 in fully emptied condition;

FIGURE 3 is a perspective view of a filled bag constituting a second embodiment of the present invention;

FIGURE 4 is an elevational view of the bag illustrated in FIG. 3 in empty condition;

FIGURE 5 is a perspective view of a filled bag constituting a third embodiment of the present invention;

FIGURE 6 is an elevational view showing the bag of FIG. 5 in empty condition.

In the embodiment of the invention illustrated in FIGURES 1 and 2, the numeral 10 generally designates a collapsible bag formed from flexible transparent plastic material. The material should have low stretch characteristics and its flexibility should remain fairly constant over the normal range of temperatures at which the bag is used. Polyethylene and polyvinyl chloride plastic materials have been used effectively.

The term "transparent" as used herein refers to a plastic material having sufficient transparency so that when two sheets of such material are disposed in contiguous relation imprints or dark markings on the second sheet may be seen through the first sheet. Therefore, while it is preferable to form the bag from clear plastic material, it is to be understood that semi-transparent or translucent

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plastics which are "transparent" within the meaning of the definition given above may also be used.

The upper end of bag 10 is flattened, sealed and folded upon itself to receive a suitable supporting hook 11. At its lower end, the bag is provided with a neck 12 which forms an outlet for the contents of the bag when the integral diaphragm or membrane provided thereby is punctured by a needle. Thus, the bag in the illustration given is identical to the intravenous solution bags in common use except for those features which will be described shortly. If desired, the neck of the bag may be provided with a suitable stopper fixed therein rather than having an integrally-formed diaphragm, as is well understood in the art.

The bag 10 is provided with a pair of opposing and imperforate side walls 13 which are normally spaced apart by the fluid contents 14 of the bag but which are capable of flexing into contiguous relation as the contents are withdrawn. When fully emptied, the bag assumes the flat rectangular shape illustrated in FIG. 2, the flattening of the side walls against each other being directed by the flattened and heat sealed portions at the upper and lower ends of the bag.

In FIG. 1, the bag is shown with its liquid contents partially withdrawn so as to illustrate more clearly the indicating means of the present invention. The indicating means essentially comprises a plurality of short horizontal lines 15 imprinted or otherwise applied to opposite side walls 13 of the bag. The horizontal markings 15 are arranged in horizontal groups at different predetermined levels upon the bag and at each level an appropriate numerical indicia 16 may be provided to indicate either the amount of liquid remaining in the bag or, as in the illustration given, the amount of liquid which has been withdrawn therefrom. The spaced markings on opposite sides of the bag are staggered in complementary fashion. When the walls of the bag are spread apart by the fluid contents therein the markings appear as incomplete or broken graduation lines but when the bag has been emptied (FIG. 2) the side walls are disposed in contiguous relation so that the markings upon one wall are visible through the outer wall and bridge the spacings between the markings of the latter.

From the foregoing, it is believed apparent that as liquid is withdrawn from the bag and the side walls of that bag flex into contiguous relation the markings 15 which formerly appeared as a series of short horizontal lines assume the appearance of unbroken horizontal graduation lines. External air pressure forces the side walls of the evacuated or partially evacuated container into tight surface contact so that the markings upon one side wall simply appear as continuations of the markings upon the opposite transparent side wall. The markings 15 are arranged at predetermined levels so that when the side walls are brought together and the markings at a given level appear as a continuous graduation line an attendant or user may at a glance determine the approximate amount of liquid which has been withdrawn from the bag. For example, FIG. 1 illustrates a bag from which at least 100 cubic centimeters but less than 200 cubic centimeters have been withdrawn since the line at the "100" level appears solid while the graduation line at the "200" level appears broken or composed of a plurality of spaced short lines. It is important to note that such a determination of the amount withdrawn from the bag (or the amount remaining therein) may be made quickly and easily without inspecting or attempting to ascertain the actual liquid level within the bag.

Proper registering of the markings as the bag is emptied arises because of the construction of the bag along at least one of its edges. In the illustration given, the flattened upper end of the bag is largely responsible for guid-

ing the side walls into proper relative positions although the flattened lower end construction and the lines of meeting of the side walls along the vertical edges of the bag contribute to a certain extent in this regard. Depending on the size of the bag and the thickness and flexibility of the material from which it is formed, one or more edges of the bag must be constructed so as to define a fold or flattened margin between the side walls to insure proper registry of the markings upon evacuation of the bag.

The embodiment of the invention illustrated in FIGURES 3 and 4 of the drawings is identical to the structure already described except that the level indicating means comprises horizontal groups of curved markings 15' rather than straight horizontal lines. On one side wall of the bag, and spaced semi-circular marks face upwardly while on the opposite side wall of the bag such marks face downwardly. These complementary marks combine to define the composite graduation lines shown in FIG. 4 when the side walls of the transparent bag move into contiguous relation upon partial or complete removal of the bag's contents.

The markings for determining liquid level may also take other forms. Thus, in FIG. 5, the markings 15" constitute complementary portions of numerical indicia, the complementary portions being imprinted or otherwise applied to opposite side walls of the bag. Until the side walls of the bag are brought together, these markings appear as random and meaningless lines. However, when the bag is partially or fully collapsed, the complementary portions of the numerical indicia appear to merge and form the completed numerals illustrated in FIG. 6. In this embodiment, the markings not only join to indicate the level of the bag's contents but also serve a secondary purpose, such as being the numbers that are the volume indicia for the bag.

In all forms of the invention shown in the drawings and described above, the complementary markings of the respective side walls of the bags are brought into juxtaposition when those walls are in contiguous relation to define distinctive composite markings viewed in part through the bag's transparent walls. Each bag is provided with incomplete or discontinuous markings on one side wall which appear to merge with similarly incomplete but complementary markings on the opposite side wall when the bag is partially or completely emptied and which permit a user or attendant to determine quickly and easily the approximate liquid level within the bag.

In the foregoing specification, I have disclosed the present invention in connection with a bag for administering intravenous solutions. For that reason, the volume markings increase in magnitude from the upper to the lower portions of the bag. By observing the lowest merged lines or numbers, an attendant may easily determine the amount of liquid which has been removed from the bag. It is to be understood, of course, that where the bag is used to collect rather than administer liquids, such as, for example, an evacuated drainage bag for collecting body fluids, the volume indicia might increase in order in an upward direction. Also, in such a case, the bag might have an opening at the top rather than at the bottom; that is, an inverted form of the bag already described. Whether the bag is used for collection or administration, however, it would in any event be part of a closed system wherein air is neither introduced nor expelled therefrom.

While in the foregoing I have disclosed an embodiment of the present invention in considerable detail for purposes of illustration, it will be understood by those skilled in the art that many of these details may be varied without departing from the spirit and scope of the invention.

I claim:

1. In a collapsible air-evacuated bag formed of flexible

transparent plastic material and equipped with indicating means for indicating the level of the contents thereof, said bag having a pair of opposing side walls capable of assuming a spaced-apart relation when said bag is filled and of flexing into contiguous relation when the contents of the bag are withdrawn, said indicating means comprising complementary markings upon the respective side walls of said bag, said side walls being flattened together along at least one edge of said bag for the guiding of said side walls into register with each other as the contents of said bag are withdrawn and for thereby bringing said complementary markings into juxtaposition to define distinctive composite markings visible through the bag's transparent walls.

2. In a collapsible air-evacuated bag formed of flexible transparent plastic material and provided with indicating means for indicating the level of the contents thereof, said bag having a pair of opposing side walls and having an opening for the passage of fluid between the interior and exterior of said bag, said walls being capable of assuming a spaced-apart relation when said bag is filled and of flexing into contiguous relation when the fluid contents thereof are withdrawn, said side walls being flattened together along at least one edge of the bag for the guiding of said side walls into register with each other as said contents are withdrawn, said indicating means comprising portions of graduation markings at predetermined levels along the surfaces of said side walls, said portions of said markings at the same levels along the respective side walls being complementary to each other and being brought into juxtaposition to define complete graduation markings visible through said side walls when said side walls flex into contiguous relation and into register with each other upon the withdrawal of the contents of said bag.

3. The structure of claim 2 in which said complementary portions of said graduation markings are horizontally spaced apart at predetermined levels upon each side wall.

4. In a collapsible bag formed of flexible and substantially non-stretchable transparent plastic material, said bag having flattened upper and lower ends and having a pair of imperforate side walls normally spaced apart by the contents of said bag but being flexible into contacting register with each other as said contents are drained therefrom, said side walls being provided with complementary groups of markings at predetermined levels thereon, the markings of the respective side walls at each of said predetermined levels being brought into juxtaposition to define distinctive composite markings visible through the transparent walls of the bag when said walls flex into contact upon the withdrawal of the contents from said bag.

5. In a collapsible bag formed from flexible plastic material and provided with indicating means for indicating the level of the contents thereof, said bag having a pair of transparent opposing side walls being flexible into juxtaposition when said bag is empty and being capable of spreading apart to support fluid contents within said bag, said indicating means comprising complementary groups of markings at predetermined levels upon said respective side walls, the markings of the respective side walls at each of said predetermined levels being brought into visible association with each other to define complete graduation markings visible through said transparent side walls when corresponding portions of said side walls at each of said predetermined levels are in juxtaposition.

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