March 22, 1960 R. FOURMANOIT 2,929,447

MACHINE FOR THE CONTINUOUS MANUFACTURE OF ASBESTOS-CEMENT PIPES

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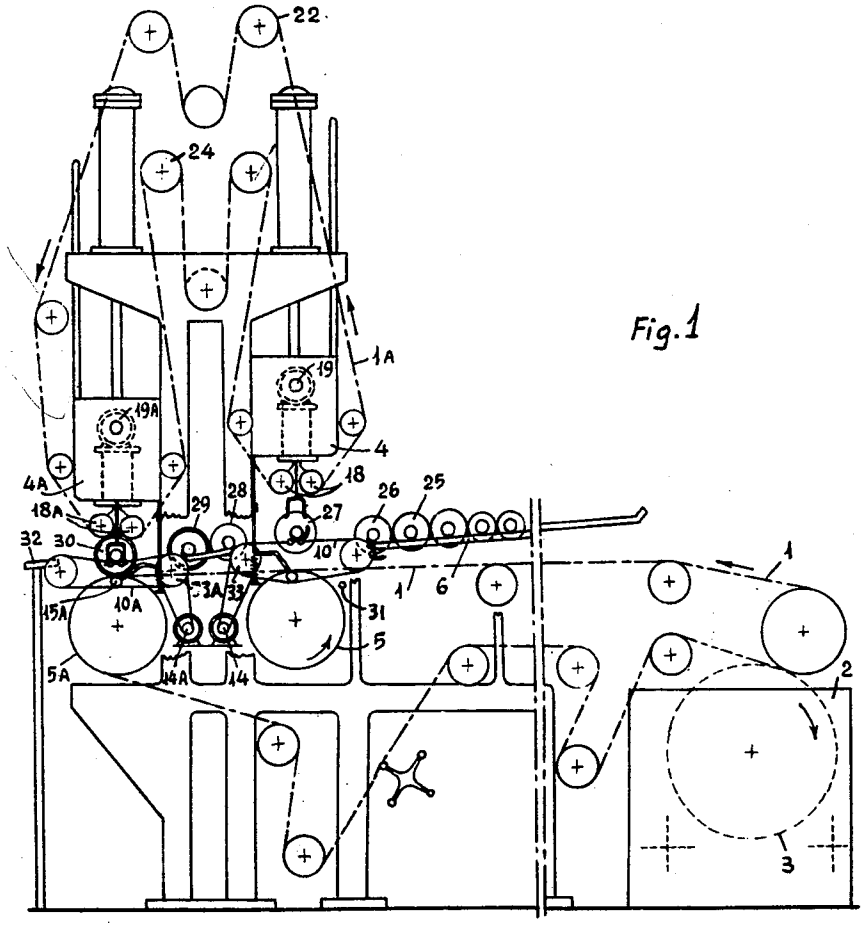


Fig. 1

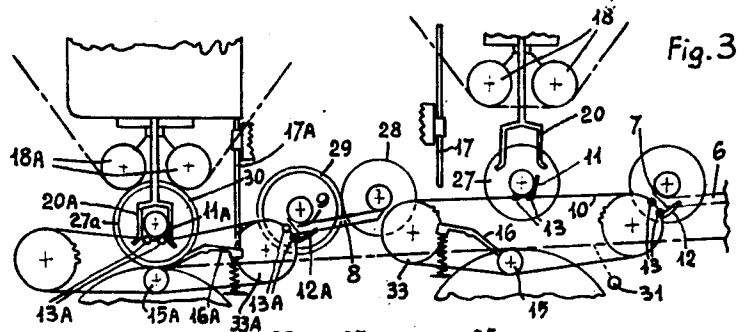


Fig. 3

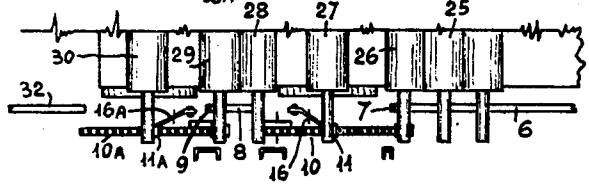


Fig. 2

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MACHINE FOR THE CONTINUOUS MANUFACTURE OF ASBESTOS-CEMENT PIPES

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11 Claims. (Cl. 162—284)

This invention relates to apparatus for forming asbestos-cement pipes, said apparatus performing a continuous process so that asbestos-cement pipes are being continuously formed.

Asbestos-cement pipes may be manufactured by a variety of methods. The apparatus for producing the strongest asbestos-cement pipe is generally in accordance with that apparatus disclosed in United States patent to Rembert, Patent No. 2,246,537 issued June 24, 1941. A serious disadvantage of this type of apparatus is that the forming apparatus must be stopped after each asbestos-cement pipe is formed so that the mandrel on which the pipe has been formed may be removed. This stopping operation seriously impairs the efficiency of the apparatus so that the production capacity is only 40–50 percent of the theoretical capacity of a continuously operating apparatus. Also, apparatus of the type disclosed by Rembert, supra, has the following disadvantages: (1) the uniformity of the asbestos-cement paste which is deposited through the sieve cylinder onto the felt is impaired by the stopping and starting of the apparatus in that an excessive quantity of the mixture filters through the sieve cylinder with a prevalent deposit of cement on the felt; (2) the tensions occurred in the constant starting and stopping subjects the costly felts to extreme wear to shorten considerably the desired life span of these felts; and (3) the strain of the changing forces acting on the various working mechanisms by the repeated starting and stopping subjects these mechanisms to excessive wear which would not be found in a continuously operating apparatus.

It is an object of this invention to provide apparatus for the formation of asbestos-cement pipes wherein the apparatus functions to continuously form asbestos-cement pipes.

It is another object of this invention to provide apparatus for improving the uniformity and strength of asbestos-cement pipes by continuously forming the pipes from a wet sheet or felt of an asbestos-cement paste carried by a continuously moving endless felt.

The foregoing objects are accomplished in the instant invention by a plurality of adjacent alternately operative upper press units arranged opposite to and cooperating with heavy bottom rollers. An endless moving felt, carrying a continuous wet sheet of an asbestos-cement paste, is trained over the heavy bottom rollers. A novel feeding system selectively positions empty mandrels in proper position between each associated upper press unit and the cooperating heavy bottom roller so that an asbestos-cement pipe may be alternately formed on the mandrel by each unit. The formed pipes are then removed by the system from each unit in such a manner that the apparatus functions to continuously form asbestos-cement pipes.

The invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the following detailed description of a preferred embodiment of the invention and the accompanying drawings in which:

Fig. 1 is a side elevation of a preferred embodiment of the apparatus;

Fig. 2 is a top plan of a portion of the apparatus; and

Fig. 3 is a partial side elevation on an enlarged scale showing particularly the feeding system of the apparatus.

In accordance with the instant invention, there is disclosed in Fig. 1 apparatus for forming asbestos-cement pipe wherein an endless felt **1** is trained over a plurality of rollers so as to pass over a vat **2** which contains an asbestos-cement slurry. A sieve cylinder **3** rotates within the vat **2** and is adapted to pick up a wet sheet or felt of an asbestos-cement paste from the slurry and to deposit the wet sheet on the endless felt **1**. The pipe forming devices consist essentially of a pair of upper press units **4** and **4A** which are positioned opposite and above a pair of adjacent but spaced heavy bottom rollers **5** and **5A**. An endless felt **1A** is trained over appropriate rollers in the upper press units **4** and **4A**. Asbestos-cement pipes are made in the conventional manner, as in the aforementioned, Rembert patent, by transferring the wet sheet of asbestos-cement sheet on the endless felt **1** to a mandrel positioned between the associated upper press unit **4** and heavy bottom roller **5** or upper press unit **4A** and heavy bottom roller **5A**. The consistency of the slurry and the particular method of cooperation of these various elements form no part of the instant invention.

A double track **6** is supported by a conventional means (not shown) and is inclined toward the forming units so that empty mandrels placed on the track **6** will roll toward the forming units under the influence of gravity. The mandrels have standard end pivots which are in rolling contact with the track **6**. Stop members **7** are positioned at one end of the tracks **6** to arrest the movement of the mandrels so that the track **6** may be used to store a plurality of empty mandrels. Another inclined double track **8** is supported by conventional means (not shown) and located between the upper press units **4** and **4A**. The double track **8** is inclined in the same relative direction as the double track **6** and is adapted to receive the standard end pivots of the mandrels for rolling contact thereover. Stop member **9** on one end of the tracks **8** properly positions the mandrels on the track **8** for a purpose to be later described. A final inclined double track **32** is supported by conventional means (not shown) on the other side of the upper press unit **4A** and is adapted to receive the standard end pivots of the mandrels for rolling contact thereover. The mandrels, having formed pipe thereon, are discharged from the apparatus and roll over the tracks **32** to be collected at a convenient location.

Extending between the one end of the double track **6** and the other end of the double track **8** are endless double chain tracks **10** each of which is trained over conventional sprockets **33** having teeth in engagement with the associated chain track **10**. One of the sprockets is driven and moves the chain tracks **10** in a predetermined direction. At spaced intervals, each of the chain tracks **10** is provided with catches **11** and **12** for a purpose to be later described. Immediately preceding each catch **11** and **12** in the predetermined direction of movement are a pair of idler rollers **13** secured to each of the chain tracks **10** and which are adapted to receive the standard end pivots of the mandrels for a purpose to be later described. Power for rotating the sprockets **33** to move the associated chain track **10** is supplied through conventional gearing from a power source **14**. The driven sprockets **33** are geared to a common source so that the chain tracks **10** are moved the same distance and at the same rate of speed. Another double chain track **10A** extends between the one end of the double track **8** and the adjacent end of the double track **32**. Each chain track **10A** is trained over a pair of conventional

sprockets 33A having teeth in engagement with the associated chain track 10A. One of the sprockets 33A is driven and moves the chain track 10A in a predetermined direction. At spaced intervals, each of the chain tracks 10A is provided with catches 11A and 12A for a purpose to be later described. Immediately preceding the catches 11A and 12A in the predetermined direction of movement are a pair of idler rollers 13A secured to the chain track 10A and which are adapted to receive the standard end pivots of the mandrels. Power for rotating the driving sprockets 33A to move the double chain track 10A is supplied through conventional gearing from a power source 14A. The sprockets 33A are geared to a common source so that the chain tracks 10A are moved the same distance and at the same rate of speed. The tension of the chain tracks 10 and 10A is regulated by appropriate stretcher rollers 15 and 15A which are carried in position by pivotally mounted levers 16 and 16A. The position of the levers 16 and 16A is regulated by a pair of rods 17 and 17A fixed to the upper press units 4 and 4A for movement therewith. The levers 16 and 16A are resiliently urged to a normal position wherein a maximum tension is applied to the chain tracks 10 and 10A.

Each of the upper press units 4 and 4A is supported for movement in a generally vertical plane by conventional mechanism functioning in the usual manner. The supporting mechanisms for this movement form no part of the instant invention. A pair of pressure rollers 18 and 18A of each upper press unit 4 and 4A are connected by conventional gear drives and clutches (not shown) to reduction motors 19 and 19A which are controlled in any desired manner by the lowering and raising of the press units 4 and 4A. Fixed to one end of the press unit 4 are a pair of fork stops 20 which are adapted to straddle the end pivots of a mandrel in contact with the rollers 13 during the formation of an asbestos-cement pipe on the mandrel. Another pair of fork stops 20A, similar to the fork stops 20, are operatively associated with and fixed to the press unit 4A. As illustrated in Fig. 1, fork stops 20A are holding a mandrel 30 in proper position while the fork stops 20 are in a raised position together with the upper press unit 4. The felt 1A for the upper press units 4 and 4A is trained over a series of appropriately spaced and conventionally mounted rollers two of which are indicated as 22 and 24.

As viewed in Fig. 1, a plurality of empty mandrels, such as 25 and 26, are shown in position on the storage tracks 6. An empty mandrel 27 is in a ready position to have an asbestos-cement pipe formed thereon when the upper press unit 4 is moved into the proper forming position. The double tracks 8 are supporting another empty mandrel 28 and a mandrel 29 which has an asbestos-cement pipe formed thereon. A mandrel 30 is held in position by the double fork stops 20A and is in operative position between the upper press unit 4A and the heavy bottom roller 5A so that the asbestos-cement paste carried by the felt 1 is being applied to the mandrel 30 in accordance with conventional pipe forming methods.

A small pipe 31 is positioned adjacent the heavy bottom roller 5 and just beneath the surface of the felt 1 and is supported with its longitudinal axis generally parallel to the axis of rotation of the heavy bottom roller 5. The pipe 31 is connected in any conventional manner (not shown) to a source of water under pressure. A series of orifices (not shown) in the pipe 31 are adapted to pass the water under pressure in a predetermined direction so that the water acts as a blade for cutting the asbestos-cement paste at the zone where it is detached from the felt 1 when the mandrel 27, having a formed pipe thereon, is raised as a function of the apparatus to be later described.

The operation of the apparatus is described particularly in relation to the illustration in Fig. 2 of the drawing wherein the upper press unit 4A is in its active forming phase and an asbestos-cement pipe is being formed on the mandrel 30. When the asbestos-cement pipe on the mandrel 30 reaches a predetermined thickness, a remote control switch (not shown) is tripped and the control circuit activated by this switch is adapted to lower the upper press unit 4 and to start the motor 19 which rotates the pair of rollers 18.

As the upper press unit 4 moves into operative position, the fork stops 20 straddle the end pivots of the mandrel 27, the idler rollers 13 and the catch 11. The mandrel is retained by these elements for rotation on the rollers 13. The felt 1A moving with and over the pressure rollers 18 contacts the mandrel 27 and starts it to rotate. Moving downwardly with the upper press unit is the rod 17 which contacts and actuates the pivoted lever 16. As the lever 16 rotates about its pivot, the tension applied by the stretcher rollers 15 is relaxed allowing the upper reaches of the chain tracks 10 to be moved downwardly by the upper press unit 4 and the weight of the mandrel until the mandrel 27 is strongly compressed by the pressure rollers 18 toward the bottom roller 5 so that the mandrel 27 contacts the asbestos-cement paste on the felt 1. A new asbestos-cement pipe then starts to be formed on the mandrel 27 as the asbestos-cement paste is transferred from the felt 1 to the surface of the mandrel 27.

After the upper press unit 4 has been lowered into position to form the asbestos-cement pipe on the mandrel 27, the upper press unit 4A is raised by an upper remote control apparatus (not shown) and the rod 17A moves with the unit 4A to allow the lever 16A to be returned to its normal position in which the stretcher rollers 15A apply a maximum tension to the chain tracks 10A so that the mandrel 30 is lifted from engagement with the felt 1. The fork stops 20A also rise with the upper press unit 4A to free the standard end pivots of the mandrel 30, the rollers 13A and the catch 11. When the upper press unit 4A reaches a predetermined position, a control switch (not shown) is tripped to start the motor 14A which moves the chain tracks 10A in a counterclockwise direction, as viewed in Fig. 2. The mandrel 30 with the formed asbestos-cement pipe thereon, moves with the chain tracks 10A to be delivered to the adjacent end of the inclined double track 32 so that the mandrel 30 rolls on the standard end pivots down the double tracks 32 to be collected at a convenient location. The catches 12A on the chain tracks 10A contact the standard end pivots of the mandrel 29 to lift the mandrel 29 off the double track 8 over the stops 9. The chain tracks 10A continue the counterclockwise movement and the mandrel 29, with the formed asbestos-cement pipe thereon, is delivered to the inclined double track 32 so that the mandrel 29 rolls on the standard end pivots down the double track 32 to be collected at a convenient location. After the mandrel 29 has been removed from the double track 8, the mandrel 28 rolls on the standard end pivots down the double track 8 until its movement is arrested by the stops 9. The endless chain tracks 10A continue in their counterclockwise movement and the catches 11A move under the standard end pivots of the mandrel 28 to lift the mandrel 28 off the double track 8 and over the stops 9 so that the end pivots of the mandrel 28 are positioned between the idler rollers 13A. The double chain tracks 10A continue to move in a counterclockwise direction until exactly one complete revolution has been made and the mandrel 28 is in proper position beneath the upper press unit 4A.

When the asbestos-cement pipe being formed between the upper press unit 4 and the associated bottom roller 5 reached a predetermined thickness, a limit switch (not shown) is tripped and the control circuits activated thereby function to lower the upper press unit 4A and to raise the upper press unit 4. As the upper press unit 4 is raised, the rod 17 moves therewith allowing the lever 16 to return to its normal position and the stretcher rollers 15 apply

maximum tension to the double chain tracks 10. This tensioning by the stretcher rollers 15 lifts the mandrel 27 off the felt 1. At this instant, a switch (not shown) operates to supply water under pressure to the pipe 31, the water being adapted to cut the asbestos-cement paste clinging to the pipe on the mandrel 27 as it is lifted.

When the upper press unit 4 reaches a predetermined position, a switch (not shown) actuates the motor 14 to move the double chain track 10 in a counterclockwise direction, as viewed in Fig. 2. The mandrel 27, with the finished pipe thereon, moves with the double chain track 10 and is delivered to the other end of the double track 8. The mandrel 27 then rolls on its end pivots down the double track 8 until the movement is arrested by the stops 9. The catches 12 on the double chain tracks 10 move under the end pivots of the mandrel 26 on the double track 6 to lift the mandrel 26 off the double track 6 over the stops 7. The mandrel 26 then moves with the double chain tracks 10 to be deposited on the double track 8 and rolls on its standard end pivots down the double track 8 until its movement is arrested by the mandrel 27 with the formed asbestos-cement pipe thereon. The double chain tracks 10 continue in a counterclockwise direction and the catches 11 move under the end pivots of the mandrel 25 on the double track 6 to lift the mandrel 25 off the double track 6 over the stops 7 so that the end pivots of the mandrel 25 are in position between the idler rollers 13. The double chain tracks 10 continue to move in a counterclockwise direction until one complete revolution has been made and the mandrel 25 is in proper position beneath the upper press unit 4 to have an asbestos-cement pipe formed thereon by the next cycle of the apparatus.

The upper press unit 4A moves downwardly and the rollers 18A are rotated by the motor 19A. The fork stops 20A straddle the end pivots of the mandrel 28 to hold it in proper position on the idler rollers 13A. Moving downwardly with the upper press unit 4A is the rod 17A which contacts and actuates the pivoted lever 16A. As the lever 16A rotates about its pivot, the tension applied by the rollers 15A is relaxed allowing the upper reaches of the chain tracks 10A to be moved downwardly by the weight of the mandrel 28 and the upper press unit 4A until the mandrel 28 is strongly compressed by the pressure rollers 18A toward the bottom roller 5A so that the mandrel 28 contacts the asbestos-cement paste on the felt 1. A new asbestos-cement pipe then starts to be formed on the mandrel 28 in a conventional manner. A full cycle of the apparatus has now been completed. Thus, the above apparatus functions to continuously form asbestos-cement pipe from an asbestos-cement paste on a continuously moving endless felt.

With the usual type of feeding system or a manual feeding system, it is not possible to take full advantage of the very short time required for the formation of asbestos-cement pipe on a mandrel. In the formation of relatively small diameter pipe, the forming time amounts only to a few seconds. The feeding system of the instant invention operates very swiftly and is completely automatic to allow the attainment of a maximum production.

What I claim is:

1. Apparatus for continuously forming asbestos-cement pipes comprising a plurality of alternately operative pipe forming devices, means defining a first guideway located on one side of said pipe forming devices, said first guideway being adapted to store a plurality of empty mandrels which are normally urged toward said pipe forming devices, means on said guideway for arresting the movement of said mandrels at a predetermined position, means defining a second guideway located on the other side of said pipe forming devices, said second guideway being adapted to receive the mandrels having asbestos-cement pipes formed thereon and to allow said mandrels to move thereover to a collection station, means defining a third guideway located between said pipe forming devices, said third guideway being adapted to receive mandrels for movement thereover, means on said third guideway for arresting the movement of said mandrels thereon, conveyor means extending between said first guideway and said third guideway, said conveyor means being adapted to intermittently move mandrels in proper sequence to predetermined positions, a second conveyor means extending between said third guideway and said second guideway, said second conveyor means being adapted to intermittently move mandrels in proper sequence to other predetermined positions, so that pipes of asbestos-cement may be continuously formed by said apparatus.

2. Apparatus as in claim 1 and further including means on each of said pipe forming devices cooperating with means on each of said conveyors for holding a mandrel in a predetermined position within the associated pipe forming device so that said pipe forming device may form an asbestos-cement pipe on said mandrel.

3. Apparatus as in claim 2 wherein each of said pipe forming devices includes a bottom roller rotating about a fixed axis over which passes a felt carrying an asbestos-cement paste, and a movable upper press unit having a top felt trained over pressure rollers so that an asbestos-cement pipe may be formed on a mandrel positioned between said bottom roller and said pressure rollers, and means associated with each of said conveyors for controlling the tension of said conveyors so that a mandrel on said holding means may be moved into and out of contact with the asbestos-cement paste on said felt.

4. Apparatus as in claim 3 and further including means associated with each of said movable upper press units for actuating said tension controlling means on each of said conveyors so that the mandrels will be moved in proper sequence into and out of contact with the asbestos-cement paste on said felt.

5. Apparatus for continuously forming asbestos-cement pipes comprising a plurality of alternately operative pipe forming devices, means defining a first guideway located on one side of said pipe forming devices, said first guideway being adapted to store a plurality of empty mandrels so that said mandrels are normally urged toward said pipe forming devices, means on said first guideway for arresting the movement of said mandrels at a predetermined position, means defining a second guideway located on the other side of said pipe forming devices, said second guideway being adapted to receive the mandrels on which asbestos-cement pipes have been formed and to allow said mandrels to roll thereover to a collection station, means defining a third guideway located between said pipe forming devices, said third guideway being adapted to receive a mandrel on which an asbestos-cement pipe has been formed and also an empty mandrel for movement thereover, means on said third guideway for arresting the movement of said mandrels thereon, a first spaced pair of endless chain tracks trained over sprockets and extending between said first guideway and said third guideway so that a mandrel positioned on said chain tracks will pass through one of said pipe forming devices, means for moving said chain tracks in a predetermined direction, said endless chain tracks being adapted to intermittently move mandrels in proper sequence to predetermined positions, a second spaced pair of endless chain tracks trained over sprockets and extending between said third guideway and said second guideway so that a mandrel positioned on said second endless chain tracks will pass through a second pipe forming device, said second endless chain tracks being adapted to intermittently move mandrels in proper sequence to other predetermined positions so that pipes of asbestos-cement may be continuously formed by said apparatus.

6. Apparatus as in claim 5 and further including means on each of said pipe forming devices cooperating with means on each of said endless chain tracks for holding a mandrel in a predetermined position so that each of

said pipe forming devices may form asbestos-cement pipes on said mandrels.

7. Apparatus as in claim 6 wherein said holding means comprises a first pair of aligned catches, one catch of each pair on each of said train tracks, said catches being adapted to lift a mandrel off an associated guideway, and a pair of rollers secured to said chain tracks preceding each of said catches in said predetermined direction of movement, said rollers being rotatably adapted to support the mandrel lifted by said catches.

8. Apparatus as in claim 7 and further including a second pair of aligned catches, one catch of each pair on each of said chain tracks, said second pair of said catches being spaced a predetermined distance behind said first pair of catches in said predetermined direction of movement, said second pair of catches being adapted to lift a mandrel off an associated guideway, a second pair of rollers secured to each of said chain tracks preceding each of said second catches in said predetermined direction of movement, and means moving said chain tracks so that mandrels lifted by said second pairs of catches are moved in a continuous motion between the associated adjacent guideways.

9. Apparatus as in claim 8 wherein each of said pipe forming devices includes a bottom roller rotating about a fixed axis over which passes a felt carrying an asbestos-cement paste, a movable upper press unit having a top felt trained over pressure rollers so that an asbestos-cement pipe may be formed on a mandrel positioned between said bottom roller and said pressure rollers, and

means for applying tension to each of said endless chain tracks so that a mandrel on said holding means may be moved into or out of contact with the asbestos-cement paste on said felt.

10. Apparatus as in claim 9 and further including means on each of said upper press units for actuating said tension applying means so that the mandrels will be moved in proper sequence into and out of contact with the asbestos-cement paste on said felt.

11. Apparatus as in claim 10 and further including means adjacent one of said bottom rollers for severing the layer of asbestos-cement paste clinging to the asbestos-cement pipe formed on a mandrel in said one forming device.

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